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The Influence of an Interdisciplinary Approach on Student Confidence in Undergraduate Anatomy and Physiology

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Abstract

While many studies have demonstrated a positive correlation between learning in the arts and students' critical thinking disposition, few studies have investigated the influence of an interdisciplinary art-related teaching approach and its correlation with academic student behavior confidence in anatomy and physiology (A&P). Therefore, this study aims to demonstrate the impact of an interdisciplinary approach – reading, discussion, and drawing on students' academic confidence in undergraduate A&P. The investigation utilized a self-reported pre- and post-survey design to explore the change in confidence in A&P between course entry and exit. Sixty undergraduate students completed surveys while taking an elective course called Medical Literature, Anatomy, and the Arts, at a public state university in Southwest Florida. Results indicate a statistically significant difference in student-reported confidence levels in knowledge and experience of A&P. Additionally, the students' perceptions of the course were positive, citing more engagement and better support from peers and instructor as a result of this interdisciplinary approach. These outcomes suggest that teaching undergraduate students in A&P using medical arts enhances student academic confidence. This study provides encouraging support to existing scholarly work on higher education course design and instructional methods relative to improving student confidence and class engagement in A&P. https://doi.org/10.21692/haps.2024.012

Key words: academic behavior confidence, interdisciplinary teaching, anatomy and physiology, art, medical illustration

Introduction

Improving student achievement in higher education by enhancing student academic behavior confidence has been the focus of many theoretical models (Sander et al., 2000; Sander & Sanders, 2003, 2006, 2009). Academic behavior confidence refers to the student's belief in his/her capability to perform tasks required to successfully learn and achieve at the university level. Sander and Sanders (2003) developed the Academic Behavioral Confidence Scale (referred to as the ABC scale) in order to understand variations in teaching preferences and learning behaviors for different groups of students. The ABC scale is useful for educators to grasp their students' proclivities, enabling the design of more effective teaching. Nicholson et al. (2003) extended Sander and Sanders' previous work by demonstrating that students earning higher end-of-semester grades take more responsibility for their learning and are more confident in their studying and class participation. This concurs with the findings of Stankov et al. (2014), who identified that confidence is the best non-cognitive predictor of academic achievement.

Not only does confidence play a role in an undergraduate's success, but so does the innovative delivery of course content, specifically via interdisciplinary, art-based instruction. The study of the arts represents an evidence-based, powerful pedagogical strategy contributing to academic achievement and student success (Ruppert, 2006). Moreover, a growing body of evidence highlights the ways that creativity and critical thinking are interconnected in higher education (Dumitru, 2019).

Ayala et al. (2017) demonstrated that engaging in creative outlets while enrolled in medical school can provide significant benefits to the student's overall well-being. A qualitative study by Jones et al. (2014) at the University of Michigan Medical School found that incorporating artwork into the medical school curriculum had significant positive

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effects on students, including profound personal growth and a greater sense of community. Another study across five U.S. medical schools tested and confirmed the hypothesis that exposure to the arts and humanities enhanced positive personality qualities in medical students, shaping them into more well-rounded and empathetic physicians (Mangione et al., 2018). An exploratory study by Shapiro et al. (2009) at University of California Irvine School of Medicine reported that integrating creative projects into an anatomy course can significantly enhance medical students' ability to reflect on their professionalism and manage stress. Moreover, medical students enrolled at the University of Bristol in the United Kingdom are required to submit creative works for assessment as part of their core curriculum. Thompson et al. (2010) noted that requiring medical students to engage in art projects as part of the standard curriculum can be particularly impactful for those who normally dismiss such activities. By pushing these medical students out of their comfort zones, the curriculum fosters significant personal and professional development.

Less research exists at the undergraduate level about evaluating the effects of creating art to boost students' confidence in the learning of anatomy and physiology (A&P). Moyer (2020) reported on undergraduate students enrolled in A&P courses at Elizabethtown College, who can earn extra credit by making a creative piece highlighting a concept learned throughout the semester. A participant observed that the divide between the sciences and the arts is a misconception and that the combination of the two subjects gave them a creative outlet for the knowledge learned in class and deepened their understanding of the human body. Platt et al. (2021) evaluated the effect of assigning creative projects during a large, undergraduate, two-semester anatomy course to promote student engagement. The authors found that incorporating various forms of innovative expression via drawing, sculpture, or poetry into anatomy coursework is attainable and valuable to a student's education. Finally, Weiss and Casazza (2021) found that an undergraduate course in medical illustration offered during the COVID-19 pandemic allowed students to relax and feel less isolated while simultaneously learning anatomy.

To contribute to the body of evidence supporting the use of art for learning anatomy, this study aimed to demonstrate the impact of an interdisciplinary approach — reading, discussion, and drawing, on students' academic confidence in undergraduate A&P. The following two research questions guided this study:

1. What is the relationship between an interdisciplinary way of teaching undergraduate A&P and students' academic confidence in learning this discipline?
2. What are the perceptions of students enrolled in a course on the use of reading, discussion and drawing as an instructional method for enhancing academic confidence?

Methodology

The work described in this manuscript is the result of an opportunity to design and teach an elective course called Medical Literature, Anatomy, and the Arts at a public state university in Southwest Florida. The curriculum integrates elements of art, medical literature, and A&P to create a multifaceted approach to learning. The course is divided into seven units, each lasting two weeks, and focusing on a specific theme from the assigned reading. The readings are curated from Dr. Atul Gawande's (2002) book, Complications, A Surgeon's Notes on an Imperfect Science.

Student Population

A purposive convenience sampling was used for this mixed method study design. Data was collected from students enrolled in this course during the spring semesters of 2021, 2022, and 2023. All sixty students were invited to complete the pre- and post-survey. Participation was voluntary and without compensation, including receiving any course points for its completion. The course population included 60 students (N), comprised of 4 males and 56 females. While the students varied in grade level and major, most had some interest in a health-related field (e.g., pre-nursing, exercise science, bioengineering, psychology, health science, public health, or biology) as shown in Table 1. Pre-nursing was the most popular major (N=26), followed by health science (N=10).

Freshmen		Sophomores		Juniors		Seniors		Other		Subtotal	
n	%	n	%	n	%	n	%	n	%	n	%
5	8	39	65	7	12	5	7	4	7	60	100

Table 1. *Numbers and percentages of students by grade level.*

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This study was approved by the Florida Gulf Coast University Institutional Review Board (IRB #2021-04) and informed consents were received from all participants.

Description of the Interdisciplinary Course with Curriculum

Medical Literature, Anatomy, and the Arts, is a 3-credit elective course that has no specific prerequisites (students do not need to have taken prior anatomy courses nor drawing classes). Lessons in both anatomy and drawing (with in-class practice) are integrated into seven units with distinct themes created based on the readings (Table 2). The course uses a multi-pronged interdisciplinary approach to learning: reading, discussion, and drawing (Figure 1).

Each unit starts with the students reading a medical-based short story from Dr. Atul Gawande's (2002) book, a thought-provoking collection of stories that delves into the complexities of modern medicine. The idea that every illness has a story highlights the importance of understanding the contextual dimensions of sickness beyond its clinical manifestations. From Gawande's book, the students gain valuable insight into each patient and the human aspect of medical conditions and their treatments. For the class discussion, students anonymously write down an open-ended question pertaining to the assigned reading on a blank note card which further guides sharing of opinions among the class. Active listening is encouraged to build trust and rapport among the students. Students become curious about the patients' stories and their corresponding medical conditions, prompting them to learn more about the relevant anatomy and physiology. The clinical scenario presented in the reading helps students to grasp and apply anatomical knowledge. In this way, Dr. Gawande's storytelling is balanced with presentation of anatomical information, leading to rich and engaging class discussions about medical uncertainties, ethical dilemmas, and, sometimes, the fallibility of doctors.

Course Themes
• Cancer, Mortality, & Difficult Decisions
• Suspicions in Medicine: The Case of Dead Babies
• The Mystery of Appetite and the Science of Hunger
• Autopsy and Medical Discoveries
• Medical Uncertainties and Human Survival
• The Paradox of Medical Training
• Common Symptoms in Medicine: Nausea and Vomiting

Table 2. *Medical literature, anatomy, and the arts course themes.*

After a thorough discussion of the reading and anatomy, hands-on drawing exercises are taught covering the basic principles of illustration such as light, shadow, color, and composition. The drawing lessons allow students to build on their artistic skills, regardless of initial skill level. Instructor-led sketching practice is completed in class, but not for a letter grade, allowing students to learn by receiving immediate feedback. Students are able to start with basic art exercises before progressing to more advanced ones. The culmination of each unit becomes the creation of an original medical illustration with the theme being the reading discussed, the anatomy lesson learned, and the illustration techniques gained. Ultimately, the seven final illustration projects are critiqued and graded for accurateness, decision-making, and innovativeness during the creative process.

The course curriculum, as described in the syllabus with its multi-prong interdisciplinary approach to learning, is outlined in Table 3.

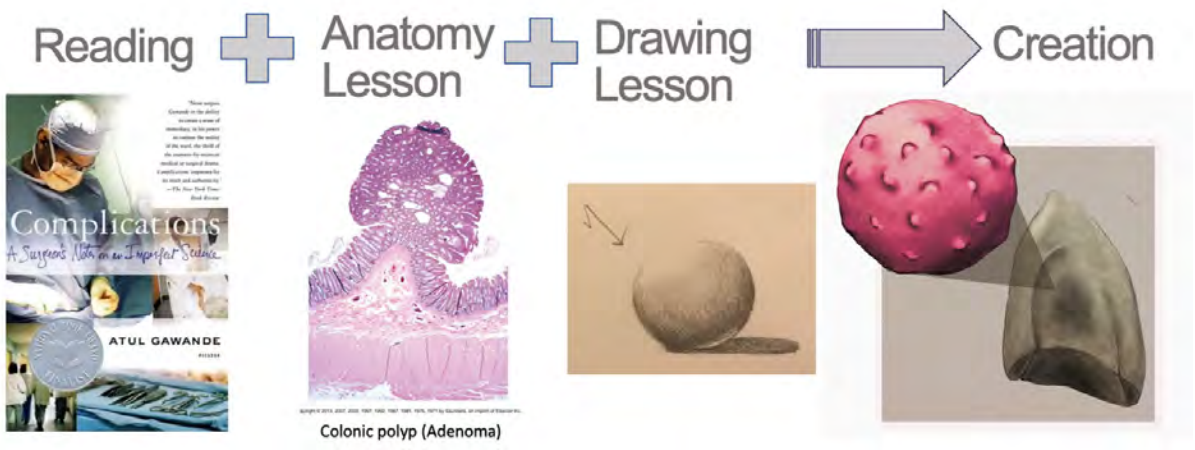

Figure 1. *Multi-pronged interdisciplinary approach to learning.*

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Unit Theme	Reading	Drawing Lesson	In-Class Sketch	Anatomy Lesson	Medical Illustration Project
1. Cancer, mortality, & Difficult Decisions	"Whose Body Is It Anyway?" (pp. 208-227)	Introduction to medical illustration: Light & shadow; Outline & contour; Color & simultaneous contrast	Sketches of spheres with a light source	Introduction to cancer: Biology of tumor growth; Grading & staging; Clinical treatment	Illustrating the story of cancer
2. Suspicions in Medicine: The Case of Dead Babies	"The Dead Baby Mystery" (pp. 202-207)	Patterns, textures, and graphic design; Learning how to use pen & ink	Blindfolded ink designs	Accidents, diseases, & causes of death in children	Patient education piece on child mortality
3. The Mystery of appetite and the Science of Hunger	The Man Who Couldn't Stop Eating" (pp. 162-183)	Introduction to medical legal illustration	Simplifying the stomach for a lay audience	Overview of gastrointestinal anatomy	Medical-legal drawing demonstrating gastric bypass surgery
4. Autopsy and Medical Discoveries	The Final Cut" (pp. 187-201)	Introduction to composition and mixed media	Mixed media flowers	Diseases and illnesses that may be proved by autopsy	Educational piece illustrating a disease which may be discoverable by autopsy
5. Medical Uncertainties & Human Survival	"The Case of the Red Leg" (pp. 228-252)	Experimenting with colored pencils and gradients	Glass marble colored pencil drawings	Anatomy of the skin: Highlights of cellulitis and necrotizing fasciitis	Advanced anatomical education piece of the skin or a skin pathology
6. The Paradox of Medical Training	"Introduction" (pp. 5-8) and "Education of a Knife" (pp. 11-34)	Illustrating arteries vs. veins, Drawing the heart upside down to eliminate preconceived notions	Draw arteries and veins, Basic guided heart drawing	Cardiovascular anatomy	The heart: An iconic organ from Valentine's Day to medicine
7. Common Symptoms in Medicine: Nausea and Vomiting	"A Queasy Feeling" (pp. 130-145)	Introduction to editorial illustrations	Brainstorm editorial sketch of a condition or disease having symptoms of nausea & vomiting	Symptoms of many conditions: Nausea & vomiting	Editorial illustration of a disease or condition with nausea and/or vomiting

Table 3. *Course curriculum, including selected readings from Gawande (2002).*

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A brief description and corresponding sample of projects are included below (Figures 2-9). For example, the theme of the first unit is *Cancer, Mortality, & Difficult Decisions.* Students were assigned to read Gawande's chapter titled, "Whose Body is it Anyway?" This thought-provoking chapter acquaints the reader to a man faced with terminal cancer and the decisions he must face. The drawing lesson for this first unit not only introduced students to medical illustration but also provided a foundation for the fundamentals of drawing, such as light and shadow, outline and contour, as well as color and simultaneous contrast. Following the art lesson, students were directed to observe and sketch light and shadow on a sphere. By lighting a sphere directly, the highlight or whitest area is the brightest part of the sketch. Students were then instructed to draw the core shadow, the dark area on the object that is not reached by the direct light, as well as the cast shadow, the shadow that the sphere casts on the surface upon which it is resting. Finally, students were instructed to observe and draw the reflected light which bounces off the surface and illuminates the shadowed side of the sphere slightly (Figure 2).

The anatomy lesson for the first unit familiarized students with cancer, including a lesson in basic cells, DNA, and cell division. From there, students learned about the biology of tumor growth, cancer's grading and staging, potential causes, as well as highlights of clinical treatment. The culmination of the course's first unit was to illustrate the story of cancer. Because cancer derives from a rogue cell (or sphere), students were encouraged to incorporate knowledge learned from their first in-class sketch into their final illustration piece. Figure 3 demonstrates a sample student drawing from the first unit's project.

The theme of the second unit is *Suspicions in Medicine: The Case of Dead Babies.* This chapter called, "The Dead Baby Mystery," explores the perplexing spike of infant mortality rates in one family. After discussing the reading, students learned how to create patterns and textures with pen and ink such as cross-hatching, stippling, and scumbling. Blindfolded drawing was used as a class exercise to enhance creativity and intuition. Students were blindfolded as a warm-up exercise in order to create a sketch. From there, pen and ink practice could be incorporated by observing the patterns already created and adding to them. To enhance the reading's discussion, students learned about diseases and cases of death in children as a significant public health concern, and the final unit project was to create a patient education piece on child mortality (Figure 4).

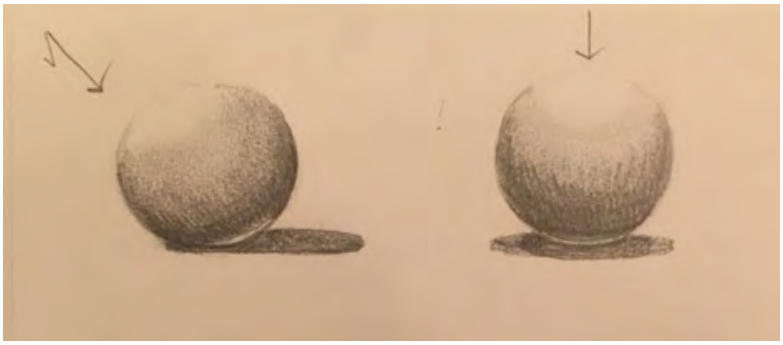

Figure 2. *Illustration: Light on spheres.*

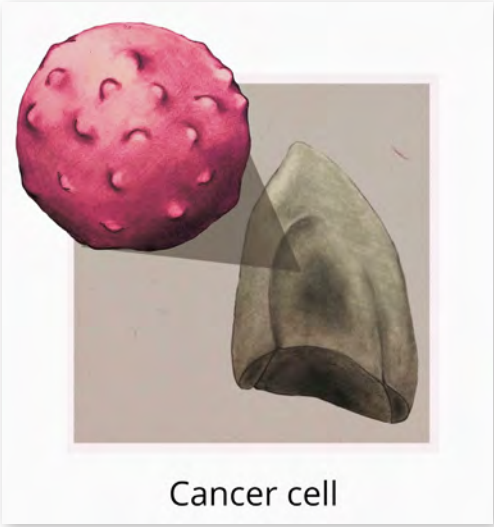

Figure 3. *Illustration: Cancer, mortality and difficult decisions (Credit: Raquel Costa e Silva – A closer look at lung cancer).*

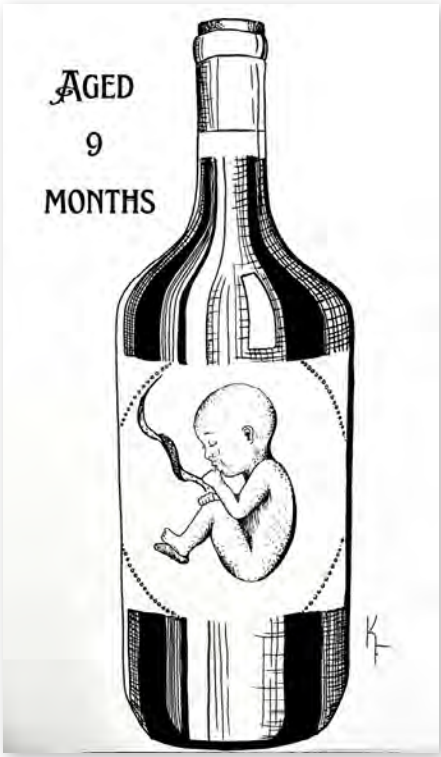

Figure 4. *Illustration: Suspicions in medicine: The case of dead babies (Credit: Katelin Foster – Fetal alcohol syndrome).*

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Unit Three's theme is *The Mystery of Appetite and the Science of Hunger*. Gawande's reading, "The Man Who Couldn't Stop Eating," tells the story of a patient who undergoes gastric bypass surgery in an attempt to address his severe obesity. The class discussion not only focused on morbid obesity as a disease but the challenges and medical considerations that one might face on this journey. The students learned how the body regulates food intake and the structure and functions of the gastrointestinal tract. Students were introduced to medical legal illustration, a specialized field that translates complex medical concepts into clear, compelling images that can be understood by lay audiences, such as juries. Together, sketches of the stomach were completed in class while the final project was to create a medical legal illustration demonstrating gastric bypass surgery (Figure 5).

Autopsy and Medical Discoveries is the theme of Unit Four. Students read Gawande's short story called, "The Final Cut," a compelling read about the human side of medicine, where despite advanced technology and extensive training, there is still unpredictability and human error requiring autopsies. Class discussion focused on autopsies as a detailed examination of a body after death for various reasons: medical education and research, public health and safety, as well as family closure and peace of mind. The drawing lesson for this unit guided students through the basics of composition in art and introduced them to the use of mixed media. By practicing with flowers picked outside, the goal was to help students create visually balanced and engaging artworks by combining different materials and techniques. The final project was to make an educational piece illustrating a disease which may be discoverable by autopsy (Figure 6).

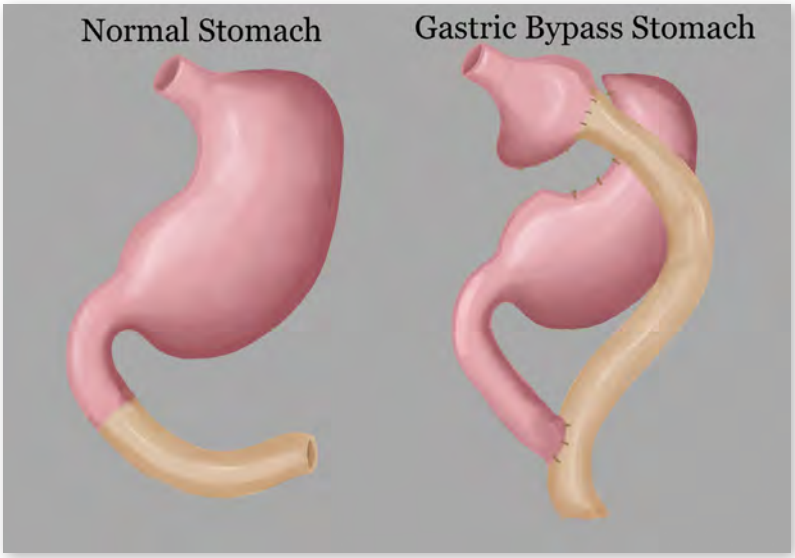

Figure 5. *Illustration: The mystery of appetite and the science of hunger (Credit: Melanie Barrientos – gastric bypass surgery).*

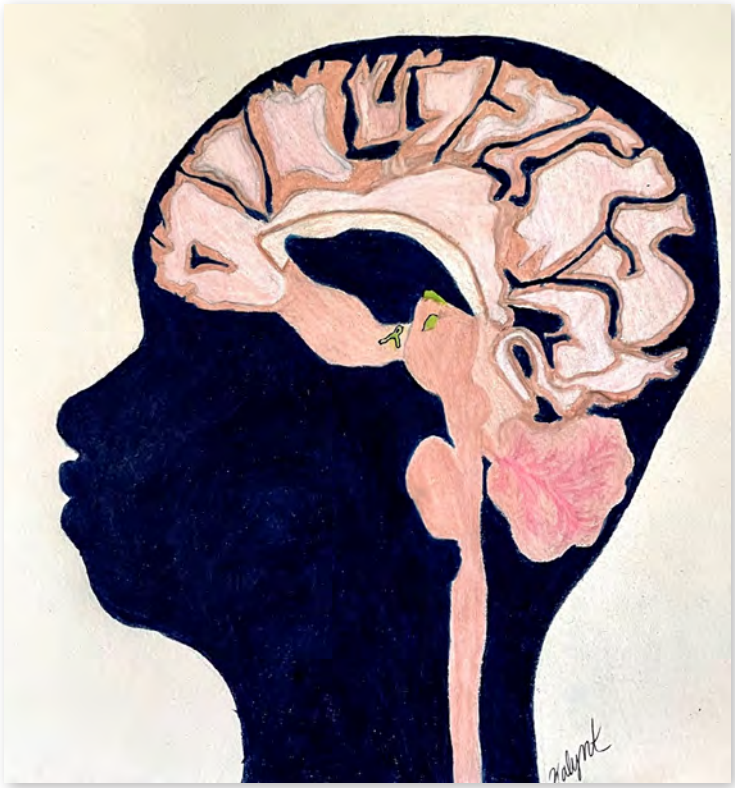

Figure 6. *Illustration: Autopsy and medical discoveries (Credit: Kalyn Alexus – Alzheimer's disease).*

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The next unit's theme focuses on *Medical Uncertainties and Human Survival* after reading, "The Case of the Red Leg." This chapter explores how both doctors and patients navigate the complexities and unpredictability inherent in medical practice when a young woman is faced with a diagnosis of necrotizing fasciitis. Students explored the anatomy of skin and its layers, the subcutaneous tissues, and fascia. By understanding the anatomy of the skin, the distinction between two diagnoses—the more benign cellulitis and potentially deadly necrotizing fasciitis—becomes very clear. In the art lesson, students experimented with colored pencils to create color gradients while making sketches of colored marbles. The goal of this in-class drawing exercise was to advance the students' illustration techniques such as observing, layering, and blending. The final project was to make an advanced anatomical piece detailing a disease of the skin (Figure 7).

The Paradox of Medical Training is the theme of Unit Six. Students were assigned to read Dr. Gawande's "Introduction" as well as the first chapter in his book called, "Education of a Knife." These chapters set the tone of the book by highlighting the inherent uncertainties and imperfections in the field of medicine. In these chapters, Gawande delves into his own training as a surgical resident, exploring the balance between the scientific knowledge gained and the artistry of experience, further illustrating how surgical practice is both a science and an art, requiring a blend of analytical thinking and artistry. This complex theme became the starting point for learning about the heart, an organ that embodies both artistic elegance and analytical complexity. Students gained a comprehensive understanding of cardiovascular anatomy from both an artistic perspective — drawing it upside to eliminate preconceived notions as well as illustrating arteries and veins to illustrate their functions — and an analytical perspective — learning detailed anatomy and blood flow pathways. The final project was to create an illustration that highlighted the aesthetic beauty and intricate functionality of the heart (Figure 8).

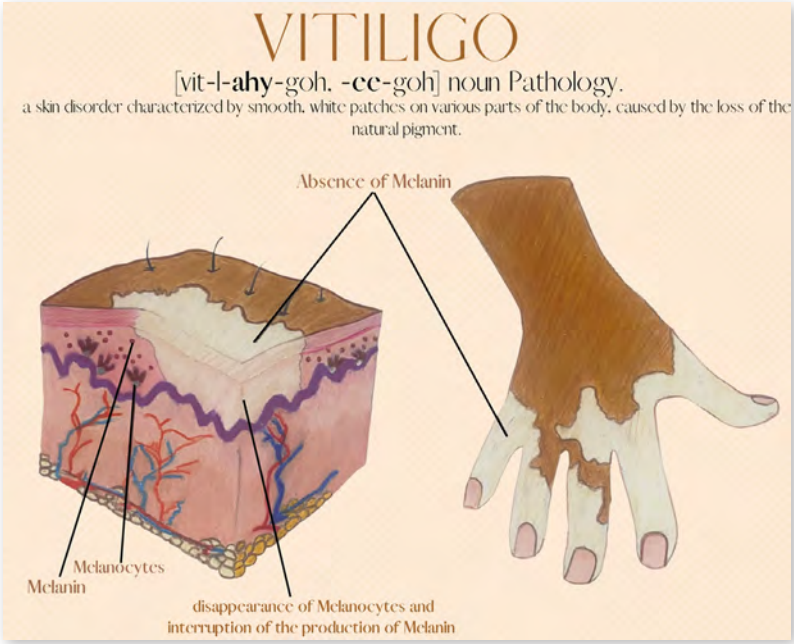

Figure 7. *Illustration: Medical uncertainties and human survival (Credit: Jai-Raelle Whitfield – Vitiligo).*

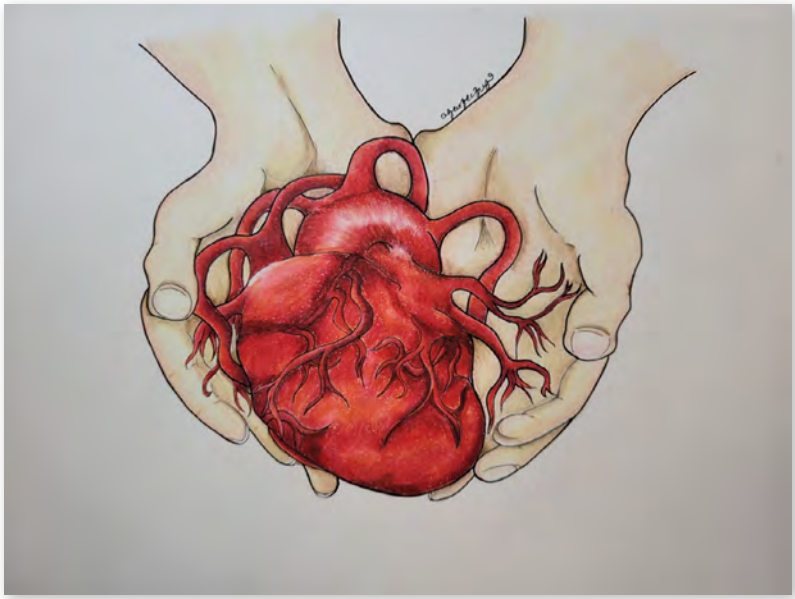

Figure 8. *Illustration: The paradox of medical training (Credit: Angelina Zarzeczny – The heart: An iconic organ).*

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The final unit is on *Common Symptoms in Medicine: Nausea and Vomiting*. "A Queasy Feeling" is another chapter from Atul Gawande's book. In "A Queasy Feeling," a pregnant woman experiences severe morning sickness, a common yet poorly understood aspect of pregnancy. From this reading, students were introduced to the concept of editorial illustrations. These illustrations are used to visually communicate complex ideas and narratives, often accompanying narratives in books or magazines. Students brainstormed about the many conditions in which nausea and vomiting are symptoms and then categorized those causes by organ system and disease. The final project was to create an editorial illustration depicting these symptoms (Figure 9).

Data Collection

Surveys were administered to students on the first day (pre-course survey) and on the last day of the semester (post-course survey). The survey included a 10-point Likert-type scale whereby students rated their confidence level (knowledge and experience of anatomy), with a "10" being the most confident and a "1" being the least confident. Additionally, students provided written comments, providing a deeper understanding of their experiences in the course. (See Appendices 1 and 2).

Data Analysis

The Statistical Package for the Social Sciences software Version 28.0 was used for the quantitative data analysis. Data analysis included the survey responses from 2021, 2022, and 2023 Spring semesters. The survey data reflected a normal distribution.

Therefore, the paired t-test was used for pre and post comparison. The Spearman's correlation coefficient was used to correlate findings. An alpha of 0.05 for all statistical tests was used. Inductive thematic analysis described by Vears and Gillam (2022) guided the analysis of the open-ended questions.

Figure 9. *Illustration: Common symptoms in medicine: Nausea and vomiting (Credit: Taylor Speer – Editorial illustration of experiencing nausea and vomiting).*

Results

Figure 10 demonstrates the increase in the mean (± SD) student reported confidence levels from those measured pre-course (7.0 ± 1.9) to after-course (8.2 ± 1.6). The paired t-test revealed a statistically significant difference between the pre-course and post-course survey responses ($t(59) = 6.8$, $p < 0.001$; Table 4). Figure 11 summarizes the frequency of responses for the pre-course and post-course confidence level in anatomy in response to the question "From a scale of 1 (least) -10 (greatest), what is your confidence level of anatomy (knowledge and experience of anatomy)?" The "Always" response increased from 3% (pre-course) to 29% (post-course).

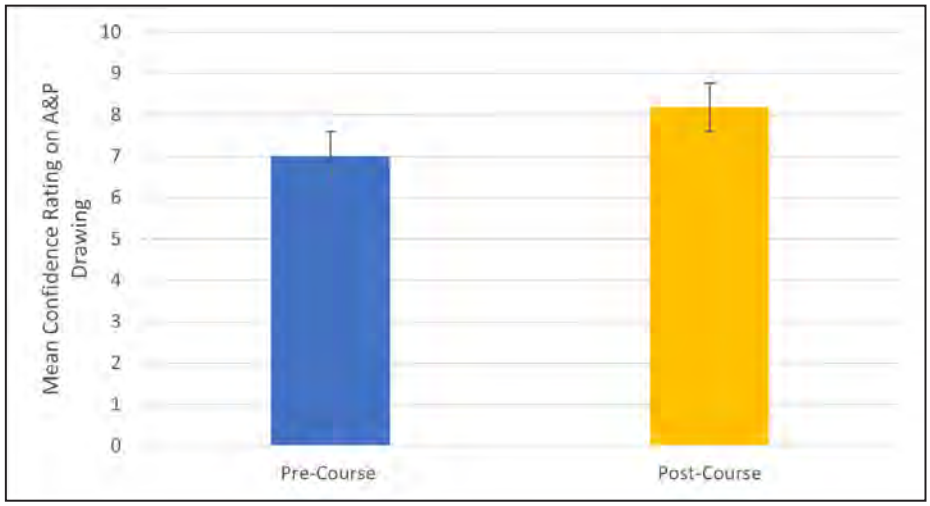

Figure 10. *Student confidence mean and standard deviation pre-course and post-course.*

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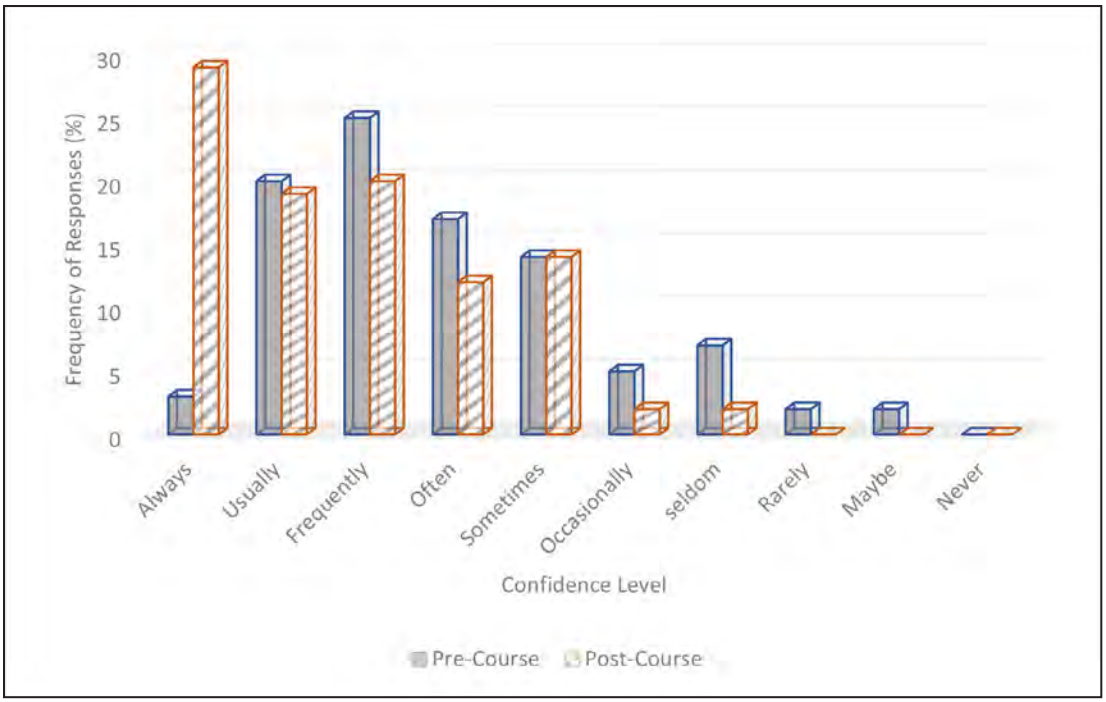

Figure 11. *Pre-course and post-course frequency of Likert scale responses.*

P-value	5.74E-09
Test stat T	6.8069
N	60
Average of difference	1.1833
SD differences	1.3466
Normality p-value	0.003249
A priori power	0.9678
Past hoc power	1
Skewness	0.04157
Cohen's D	0.8788

Table 4. *Paired t-test between pre-course and post-course confidence in anatomy.*

Spearman's correlation coefficient was used to test the correlation between student grade level and pre-course and post-course student confidence levels in anatomy. The results indicate no statistically significant correlation between student grade level and pre-course student confidence, r (58) = 0.132, $p = 0.165$. Similarly, there is no statistically significant correlation between student grade level and post-course confidence r (58) = 0.139, p = 0.288.

An inductive thematic analysis described by Vears and Gillam (2022) was used to review the answers to the open-ended questions. Qualitative responses (n=34) from the open-ended questions revealed three themes related to the students' perception of using reading, discussion and drawing as an instructional method for enhancing academic confidence: learning, engagement, and support.

Within the theme of improved learning, twenty students made comments related to how drawing helped them learn anatomy, such as *"drawing did significantly help me understand anatomy because I was able to immerse myself and learn more about it".* Another student noted how "*drawing the anatomy in each project greatly reinforced my knowledge about each organ and system that we covered".* A second set of fourteen comments described how the course was enjoyable and captivating by *"having assignments that are engaging and always spark a new idea in all of us", "creating amazing*

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art pieces throughout the semester", and setting up the class "for anyone to be able to participate". Finally, ten comments such as *"I never felt judged, just supported, and I feel that the positive reinforcement made me do even better", "everyone is just so kind and open-minded, and I thought the environment makes it a great way to learn",* and *"I was a little nervous about being able to pick up all the different drawing techniques we learned, but the slow, learning pace made all skill levels feel welcome"* referenced how the course fostered a supportive environment.

Discussion

Learning A&P can be challenging, especially given the volume of information and the complexity of the human body. While traditional lecture-based approaches have their place, incorporating innovative methods may enhance students' learning experience leading to increased academic confidence.

The purpose of this study was to determine the impact of an interdisciplinary approach—reading, discussion, and drawing on students' academic confidence in undergraduate A&P. The primary research question centered around how the creative interdisciplinary teaching influenced student confidence levels in the learning of A&P. The results of this investigation provide encouraging support for anatomy instructors as well as institutions that offer A&P. Given that many students struggle with A&P taught in a traditional format, uncovering creative tactics to facilitate student learning while enhancing academic confidence is helpful. The findings indicate that teaching undergraduate A&P via an interdisciplinary approach—reading, discussion, and drawing, positively impacts student academic confidence in knowledge and experience of anatomy. Just as the famous early medical illustrators such as da Vinci and Michelangelo learned the human body by studying and drawing from human cadavers, it seems only natural that reading medical-based literature, learning the relevant anatomy, and creating illustrations could be a reimagined way of teaching and learning in the 21st century. The improved rate of *"Always"* responses to the post-course survey compared to that of the pre-course survey indicated student self-confidence in knowledge and experience of anatomy improved following participation in an interdisciplinary approach to learning.

The secondary research question centered around the relationship between perception of participating in the Medical Literature, Anatomy and the Arts course and enhancing academic confidence. This study's results agree with past research on the utilization of creative works for learning and assessment as part of the required core curriculum in which students' perceptions were positive (Thompson et al., 2010). Additionally, students in this investigation reported more engagement and better support from peers and instructor as a result of the interdisciplinary approach. These results are consistent with previous research (Platt et al., 2021; Weiss & Casazza, 2021), demonstrating that creative projects allowed students to stay engaged, relax, and feel less isolated while simultaneously learning anatomy.

This study is unique in its pedagogical approach and multi-disciplinary course design. Instructor-facilitated group discussions guided students' reflection of the readings. Interactive A&P lessons reinforced the material learned from the reading. Additionally, various illustration techniques were taught in class, tailored to medical illustration. Practice drawing assignments, with hands-on instructor-guided exercises, were then completed as a group. Although grades were not given for the practice drawing exercises, the final culmination of each unit was an original, graded medical illustration which contributed to the final course grade. Students were evaluated on their illustrations for technical accuracy, creativity and presentation, as well as comprehension and reflection of the unit's theme. Throughout the course, open dialogue was encouraged in a collaborative environment.

This investigation was limited by an absence of test or quiz assessments in the course, which could have demonstrated differences in pre- and post-course knowledge and experience of A&P. The inclusion of assessment(s) in the curriculum could have provided more robust evidence to support this study's findings. Without these assessments, it may be challenging to quantify the academic impact of this investigation. Moreover, this study was limited by the number of students (n=60) and their uneven gender distribution, with only 4 males and 56 females. The skewed gender ratio somewhat reflects the Florida Gulf Coast University's gender distribution of 42% male versus 58% female compounded by more female students choosing majors in pre-nursing and health science. Regardless of how the imbalance in gender enrollment occurred, there was no correlation between gender and confidence levels pre- and post-course. Another limitation of the study was that the student surveys were not completed anonymously. This could have introduced bias, as students may have felt pressure to report positive results. Future research could aim for a larger and more balanced student sample with formal test assessments to demonstrate knowledge of A&P earned in addition to confidence gained.

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Conclusion

Regardless of these limitations, one theme is clear: integrating an interdisciplinary approach (reading, discussion, and drawing) in the teaching and learning of undergraduate A&P positively impacted student academic confidence in knowledge and experience gained. Students were able to immerse themselves in their learning, become more engaged, be creative, and ultimately become more confident in the discipline of A&P.

About the Authors

Valerie Weiss teaches undergraduate anatomy and physiology at Florida Gulf Coast University. She designed the curriculum for the course in Medical Literature, Anatomy and the Arts. As a trained medical illustrator, her research interest is in using drawing to enhance her students' anatomy education. Nicola Khalaf teaches undergraduate anatomy and physiology at Florida Gulf Coast University. Her passion for teaching anatomy and physiology is superseded only by her enthusiasm for student success in the course. Rob Sillevis teaches in the Doctor of Physical Therapy program at Florida Gulf Coast University. He has a long-standing interest in student success and how the classroom experience can be optimized.

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Appendix 1. Student Pre-Questionnaire for Medical Literature, Anatomy, and Arts Course

Name: _____

1. What is your current major? _____

2. What year are you? _____

3. What is your reason for taking this course? _____

4. Do you already know someone in this course? or Are you looking to make new friends?

_____

5. By taking this course, is there any topic or skill you are particularly interested in learning this semester?

_____

6. On the scale below 1 (least) -10 (greatest), how often do you DRAW for enjoyment?

1 (Never)	2 Maybe once	3 Rarely	4 Seldom	5 Occasionally	6 Sometimes	7 Often	8 Frequently	9 Usually	10 Always

7. On the scale below 1 (least) -10 (greatest), how often do you READ for enjoyment?

1 (Never)	2 Maybe once	3 Rarely	4 Seldom	5 Occasionally	6 Sometimes	7 Often	8 Frequently	9 Usually	10 Always

8. From a scale of 1 (least) -10 (greatest), what is your confidence level of anatomy (knowledge and experience of anatomy)?

1 I know nothing	2	3	4	5	6	7	8	9	10 I've had advanced A&P or am an SI leader for A&P etc.

9. From a scale of 1 (least) -10 (greatest), how confident are you in your drawing skills?

1 I'm not confident with drawing at all	2	3	4	5	6	7	8	9	10 I'm extremely confident when it comes to art

10. From a scale of 1 (least) -10 (greatest), how confident are you in your ability to draw anatomy (produce medical illustrations)?

1 I'm not confident with drawing medical illustrations at all	2	3	4	5	6	7	8	9	10 I'm extremely confident when it comes to medical illustration

Please turn over the paper and write down anything you would like to share with Dr. Weiss ☺

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Appendix 2. Student Post-Questionnaire for Medical Fiction, Anatomy, and Arts Course

Name: _____

1. What is your current major? _____

2. What year are you? _____

3. What was your reason for taking this course? _____

4. Did you meet anyone in class (or feel like you were part of this class community)?

_____

5. By taking this course, was there any topic or skill you particularly liked learning this semester?

_____

6. AFTER TAKING THIS CLASS, On the scale below 1 (least) -10 (greatest), how often do you think you will draw for enjoyment?

1 (Never)	2 Maybe once	3 Rarely	4 Seldom	5 Occasionally	6 Sometimes	7 Often	8 Frequently	9 Usually	10 Always

7. AFTER TAKING THIS CLASS, On the scale below 1 (least) -10 (greatest), how often do you think you will read for enjoyment?

1 (Never)	2 Maybe once	3 Rarely	4 Seldom	5 Occasionally	6 Sometimes	7 Often	8 Frequently	9 Usually	10 Always

8. AFTER TAKING THIS CLASS, From a scale of 1 (least) -10 (greatest), what is your confidence level of anatomy (knowledge and experience of anatomy)?

1 I know nothing	2	3	4	5	6	7	8	9	10 I've had advanced A&P or am an SI leader for A&P etc.

9. AFTER TAKING THIS CLASS, From a scale of 1 (least) -10 (greatest), how confident are you in your drawing skills?

1 I'm not confident with drawing at all	2	3	4	5	6	7	8	9	10 I'm extremely confident when it comes to art

10. AFTER TAKING THIS CLASS, From a scale of 1 (least) -10 (greatest), how confident are you in your ability to draw anatomy (produce medical illustrations)?

1 I'm not confident with drawing medical illustrations at all	2	3	4	5	6	7	8	9	10 I'm extremely confident when it comes to medical illustration

Please turn over the paper and write down anything you would like to share with Dr. Weiss about this class. ☺

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