Poster 101
MYOE (Make Your Own Exam) in Human A & P: Student Response to Peer-Written Exams
Laura Kabiri, Rice University, laura.kabiri@rice.edu
Based on a 2022 HAPS workshop, undergraduate students (n=67) in Human Anatomy and Human Physiology courses were taught to create test banks which were then exclusively used by the instructor to assemble course exams. Anonymous surveys indicated that 84.6% - 92.9% of students felt the practice should be retained. Surveys also showed that compared to instructor generated exams, peer-written exams improved student perception of learning and retention of material as well as engagement and satisfaction with the assessment process. The use of peer-written exams should be considered as an assessment technique in the human anatomy and physiology classrooms.

Poster 102
Physiological Knowledge Retention in Second-Year Bachelor of Science and Psychiatric Nursing Students
Raj Narnaware, MacEwan University, narnawarey@macewan.ca
Co-Authors: Brandi Pawliuk, MacEwan University pawliukb@macewan.ca, Melanie Neumeier, MacEwan University, neumeierm@macewan.ca, Sarah Cuschieri, University of Malta, sarah.cuschieri@um.edu.mt, Paul Chahal, MacEwan University, chahalp@macewan.ca
Numerous studies have demonstrated the difficulty of retaining and applying anatomical and physiological knowledge experienced by students in medical and allied health disciplines, although few studies focus on nursing students (Narnaware and Neumeier, 2020, 2021a). MacEwan University students in the Bachelor of Science in Nursing (BScN) and Psychiatric Nursing programs take the same first-year physiology course. With the understanding that discipline choice potentially impacts knowledge retention, this study aimed to determine the overall difference in physiological knowledge retention between second-year BScN and psychiatric nursing students and if there is a difference based on the organ system.

Poster 103
Development of a Cadaver Experience Outreach Program
Mary Schilling, Northern Kentucky University, schillingm2@nku.edu
Co-Authors: Anthony Avenido, Northern Kentucky University, avenidoa@nku.edu
The Biological Sciences department of Northern Kentucky University has developed a Cadaver Experience outreach program aimed at high school (14-18) students. This program seeks to expose students to biomedical careers. With the guidance of faculty, as many as 30 students at a time use the pathology lab to investigate organ specimens, biomechanical tools, 3D-printed knee replacements, and models that coordinate with the cadaver portion of the experience. Students also spend 20-30 minutes in the prosectorium for a hands-on exploration of the cardiovascular, central nervous, musculoskeletal, and digestive systems. Almost 1500 students have experienced this program in the first 18 months.

Poster 104
The Impact of Content Reinforcement on Anatomical Knowledge Retention of Cardiovascular and Lymphatic Systems in Nursing Students
Kiara Ukrainetz, MacEwan University, ukrainetzk3@mymacewan.ca
Co-Authors: Raj Narnaware, MacEwan University, narnawarey@macewan.ca, Melanie Neumeier, MacEwan University, neumeierm@macewan.ca, Sarah Cuschieri, University of Malta, Malta sarah.cuschieri@um.edu.mt
Medical & allied health students struggle to transfer the anatomical knowledge from the first year to the future years of their disciplines, although few studies focus on nursing students. As an intervention strategy to improve long-term knowledge retention, the present study demonstrates that repeated evaluation of the cardiovascular and lymphatic systems over eight weeks can significantly increase anatomical knowledge retention of these systems compared to the evaluation of the same organ systems in the first week. Our results show that content reinforcement can be used as an effective interventional strategy to improve long-term anatomical knowledge retention in nursing students.
Poster 105  
**HAPS Curriculum & Instruction 2022 Laboratory Survey: the Impact of COVID-19 on Laboratory Instruction**
Carol Britson, University of Mississippi, cbritson@olemiss.edu  
Co-Authors: Rachel Hopp, University of Louisville, rachel.hopp@louisville.edu, James Clark, Los Medanos College, jclark@losmedanos.edu, Heather Armbruster, Southern Union State Community College, harmbruster@suscc.edu, Chris Kule, Pennsylvania College of Technology, ckule@pct.edu, Chinenye Anako, Georgian Court University, ccanako@gmail.com, Julia Schmitz, Piedmont University, jschmitz@piedmont.edu, Jeff Huffman, Salt Lake Community College, Jeff.Huffman@slcc.edu, Marnie Chapman University of Alaska Southeast - Sitka Campus, mdcchapman@alaska.edu, Cynthia Schmaem, Auburn University at Montgomery, cschmaem@aum.edu, Cynthia Schmaem, Auburn University at Montgomery, cschmaem@aum.edu, Janay Dennis, Mitchell Community College, jdennis@MitchellCC.edu, Kathleen Ahles, University of Texas-Arlington, kathleen.ahles@uta.edu

In early 2022, the Human Anatomy & Physiology Society (HAPS) launched its survey of instructors for introductory undergraduate-level course sequences in human anatomy and physiology for the nursing and allied health student. We present final analyses for the survey section on how laboratory instruction has evolved, and continues to evolve, due to the COVID-19 pandemic. Results are compared to those from the first and second offerings of the lab survey from 2014 and 2017.

Poster 106  
**HAPS Curriculum & Instruction 2022 Laboratory Survey: Curriculum, Laboratory Activities, and Learning Outcomes**
Carol Britson, University of Mississippi, cbritson@olemiss.edu  
Co-Authors: Rachel Hopp University of Louisville rachel.hopp@louisville.edu, James Clark Los Medanos College, jclark@losmedanos.edu, Heather Armbruster, Southern Union State Community College, harmbruster@suscc.edu, Chris Kule, Pennsylvania College of Technology, ckule@pct.edu, Chinenye Anako Georgian Court University, ccanako@gmail.com Julia Schmitz, Piedmont University, jschmitz@piedmont.edu, Jeff Huffman, Salt Lake Community College, Jeff.Huffman@slcc.edu, Marnie Chapman University of Alaska Southeast - Sitka Campus, mdcchapman@alaska.edu, Cynthia Schmaem, Auburn University at Montgomery, cschmaem@aum.edu, Cynthia Schmaem, Auburn University at Montgomery, cschmaem@aum.edu, Janay Dennis, Mitchell Community College, jdennis@MitchellCC.edu, Kathleen Ahles University of Texas-Arlington, kathleen.ahles@uta.edu

In early 2022 the Human Anatomy & Physiology Society (HAPS) launched its survey of instructors for introductory undergraduate-level course sequences in human anatomy and physiology for the nursing and allied health student. We present final analyses for the survey section on implementation of activities and learning outcomes in the laboratory. Results are compared to the data obtained from the first and second offerings of the lab survey from 2014 and 2017.

Poster 107  
**HAPS Teaching Tips - A Valuable Resource for New Ideas on Tough Topics**
Rachel Hopp, University of Louisville, rachel.hopp@louisville.edu  
Co-Authors: Wendy Rappazzo, Harford Community College, wrappazzo@harford.edu, Abbey Breckling, University of Illinois at Chicago, abreck2@uic.edu, Ellen Krumme, Galen College of Nursing, ekrumme@galencollege.edu, Edgar Meyer, University of Mississippi Medical Center, emeyer@umc.edu, Kayla Pavlick, University of Mississippi Medical Center, kpavlick@umc.edu

Are your students struggling with certain topics in A&P? HAPS Teaching Tips can help! A Teaching Tip is a “ready to go” activity which instructors can download and use as is or edit to fit their teaching style. Each tip includes an instructor’s guide and formative assessment. The topics of recently published Teaching Tips include the integumentary, muscular, nervous, urinary, and cardiovascular systems. Visit us to see examples of some of these tips and learn how easy it is to submit a Teaching Tip (and receive recognition for your academic portfolio).

Poster 108  
**Evaluating the Impact of Prior Anatomical Experience on Student Performance in a Medical Human Gross Anatomy Course**
Nicole Geske, Michigan State University, geskenic@msu.edu

At Michigan State University’s College of Osteopathic Medicine, anatomy is not a prerequisite for acceptance into the medical (DO) program. In their first semester, osteopathic medical students with varying levels of anatomical knowledge take a medical human gross anatomy course. This research evaluated the impact of prior anatomy experience on how students prepared for assessments and their overall successfulness in a hybrid version of the course offered in summer of 2021. Common themes were noted between the bottom and top performers, including differences in anatomical experience, preparation, and usage of course materials. Recommendations are provided for future students.
Poster 109
Interactive Small Group Learning Sessions Significantly Improved Academic Performance in Physiology Course for Health Professions Students
Anastasia Mashukova, NSU MD, amashukova@nova.edu
Co-Authors: Alvin Ledesma Nguyen, Nova Southeastern University, Dr. Kiran C. Patel College of Allopathic Medicine, an1089@mynsu.nova.edu, Marye Lee, Nova Southeastern University, Dr. Kiran C. Patel College of Allopathic Medicine, ml2521@mynsu.nova.edu
During the last decade, reorganization efforts in medical school curricula highlighted the importance of active learning. Yet, the foundational sciences curricula for health professions rely primarily on didactic lectures. We evaluated the effect of including virtual active learning sessions into physiology course for health professions otherwise delivered as in-person didactic lectures. We found a significant increase in three out of four average exam scores. There was also significant pretest-posttest score increase indicating overall improvement in learning outcomes. Our study provides an effective strategy of incorporating small group active learning into any foundational science course with large number of students.

Poster 110
Engaging in higher-order thinking with concept maps: a student’s perspective
Jessica Cisneros Lerma, University of North Georgia, lermax328@gmail.com
Concept mapping, an active learning strategy that graphically represents interrelationships among concepts, facilitates the transfer of information from short-term to long-term memory. Instead of relying on lower-order cognitive skills such as rote memorization, concept mapping promotes meaningful learning by encouraging the development of higher-order cognitive skills. Constructing concept maps allows me to connect new information with prior knowledge and reveals gaps in my understanding. In this presentation, I will present a review of the current pedagogical research on concept mapping in pre-nursing education and then summarize how this learning tool has facilitated my deeper understanding of anatomy and physiology content.

Poster 111
Engaging Undergraduates by converting your classroom into a scientific conference
Emily Bradshaw, University of Central Florida, Emily.Bradshaw@ucf.edu
Engaging biomedical science and health science undergraduates in a large enrollment neuroscience course and encouraging scientific discussion can be a daunting task. This poster will discuss how to engage students by creating a semester-long project that mimics presenting at a neuroscience scientific conference. Students investigate a primary literature article of their interest, create and present a poster in a team. During the presentation portion, students are taught how to evaluate a poster and engage their classmates. Overall, this can be a very effective way to inspire students to learn about a neuroscience topic, communicate science, and develop professionalism behaviors.

Poster 112
Third-Year Nursing Student’s Physiological Knowledge Retention
Prabal Sharma, MacEwan University, sharamp47@mymacewan.ca
Co-Authors: Raj Narnaware, MacEwan University, narnawarey@macewan.ca, Caroline Foster-Boucher, FosterBoucherC@macewan.ca, Melanie Neumeier, MacEwan University, neumeierm@macewan.ca, Paul Chahal, MacEwan University, chahalp@macewan.ca
There is a growing concern that medical, allied health & nursing students struggle to retain & apply physiological knowledge in the subsequent years of their disciplines (Narnaware & Neumeier, 2020). The present study evaluates physiological knowledge retention in third-year nursing students. The results show that the mean class average in the first year was 64.9 ± 10.5 (±SD), which significantly (P<0.05) decreased to 50.95 ± 9.2 (±SD), in the third year. Although organ-specific knowledge retention was found, this study identifies the potential gaps in knowledge retention, which help develop interventions to improve knowledge retention in nursing students.
Poster 113
The Impact of Figure-Based vs. Practical-Style Quizzes on Students’ Practical Exam Performance in Undergraduate Anatomy and Physiology Lab
Lacy Cleveland, Colorado Christian University, lcleveland@ccu.edu
Co-Authors: Faith Brandt, Colorado Christian University, faith.e.brandt@gmail.com
Undergraduate A&P Laboratory is a challenging course required for pre-health students. Students identify vast quantities of tissues and structures. Instructors often assess students’ ability to identify structures via a small number of high-stakes practical exams (PE). However, formative assessments provide students low-stake opportunities to assess their knowledge. We sought to determine if the type of formative assessment impacted students’ PE performance and interpretation of medical images. Students in different sections, participated in weekly formative assessments, either a practical-style or figure-based quiz. Preliminary data indicates students taking practical-style quizzes initially scored lower on their quizzes but displayed higher histology-related PE scores.

Poster 114
Factors that Improve a Sense of Belonging in a Human Anatomy and Physiology Classroom
Nicole Pinaire, St. Charles Community College, npinaire@stchas.edu
Co-Authors: Suzanne Hood, Bishops University, shood@ubishops.ca, Ron Gerrits, Milwaukee School of Engineering, gerrits@msoe.edu, Murray Jensen, University of Minnesota, msjensen@umn.edu
Students’ feelings of belonging have been linked to achievement and retention. Implementing classroom strategies to enhance students’ sense of belonging could be an effective means of retaining students. In this study, guided inquiry and cooperative quizzes were used to promote a sense of belonging. Students were surveyed about their perceptions of belonging. Thematic analysis of comments suggested a shift in how students perceived their sense of belonging from beginning to end of semester. Class educational activities increased a sense of belonging. This study suggests using guided inquiry and cooperative quizzing can facilitate a student’s sense of belonging.

Poster 115
Active Learning Activities Utilizing Digital Wrist Blood Pressure Cuffs: Investigating their possible effects on Student Comprehension and Learning in the Classroom.
Cynthia Foote, Georgia State University, Perimeter College, cfoote@gsu.edu
Co-Authors: Kathryn Crowther, Laura Carruth
Cardiac physiology is one of the more challenging concepts for students in A&P2. An increasing number of studies have shown the benefit of incorporating active learning into the STEM classroom (Freeman et. al, 2014). This study examines whether use of a digital wrist blood pressure cuff in conjunction with an active in-class activity will improve student understanding of regulation of heart rate and blood pressure. We hope to show that incorporation of new technology that facilitates active participation of students versus the traditional lecture presentation of this material will improve student learning.

Poster 116
Coanda Effect in Coronary Artery
Nhan Bui, Methodist Hospital, Merrillville IN, Drtrinhanbui@gmail.com
The Coanda effect is the action in fluid mechanics whereby a flow along a solid surface tends to follow the curvature of the surface rather than separating. The Coanda effect entrains fluid from the surroundings so that a region of lower pressure develops. In right coronary artery, the coanda effect is seen in the internal boundary layer with prolonged arterial phase, causing delayed oxygen delivery to the myocardium resulted in chest pain. Images of coronary flow with thick internal boundary will be presented.

Poster 117
Meander Effect in Coronary Flow
Nguyen Nguyen, Palmetto General Hospital, Hialeah FL, Drnguyen299@gmail.com
In general, laminar flow is the standard. When the blood turns a curve, the layers at the center and outer border flow faster while the flow at the inner border flow at a slower speed. When the difference between these 2 speeds is large, there is recirculation flow and turbulence in the inner border. This is the Meandering effect. With recirculation, turbulence could injure the intima and start the atherosclerotic process. An anatomical curve can happen at any bifurcation and is predilected to develop plaque. The plaque will not grow if there is high LDL level.
Poster 118
Does Endothelial Shear stress or turbulent flow rupture the plaque? and where?
Hien Nguyen, Methodist Hospital, Merrillville IN, nguyenquanghienmd@gmail.com
In a plaque, the base of the upslope entry is of low endothelial shear stress (ESS) whereas at the most severe stenotic area in the lumen, the ESS is labeled to be high. These results are from animal studies. In our new technique of coronary imaging, the plaque at the base of the upslope entry is seen eroded by the antegrade coronary flow. In contrast, the plaques at the distal right coronary artery are injured by the systolic retrograde flow and ruptured at the base of the exit slope. Flow mechanics can explain the mechanism of disease better than ESS

Poster 119
Aerospace physics in coronary artery: How does the vortex form and injure artery?
Duc Nguyen, Methodist Hospital, Merrillville IN and Tan Tao University School of Medicine, Long An Vietnam, hoangduc.fsh@gmail.com
In iliac artery, there is fast antegrade systolic flow and late systolic and diastolic retrograde flow. In case of uncontrolled systolic or diastolic hypertension, there is a collision between the antegrade and retrograde flow, creating one vortex or multiple vortices. These vortices move with the flow, fuse with each other, develop turbulence and so damage the intima of adjacent arterial segment. This is the start of the atherosclerotic process. However, these phenomena develop and disappear with each cardiac cycle. Images of the birth and death of vortices in iliac arteries will be presented.

Poster 120
Presentation of a Persistent Metopic Suture in a Human Anatomical Donor
Trisha Waldman, University of Saint Mary, trisha.waldman@stmary.edu
John Martin Second Timers Award Winner
Upon dissection, the skull of a human anatomical donor presented with a persistent metopic suture. Metopic sutures, or frontal sutures, most often fuse and obliterate within youth, approximately by the age of seven. If the suture persists, it is referred to as metopism. Metopic sutures can be associated with frontal sinus deformities and are considered a clinically significant presentation.

Poster 121
A 3D-Printed Forearm Trainer for the Practice of Ultrasound Guided Arterial and Venous Line Placement
David Resuehr, UAB, resuehr@uab.edu
Co-Authors: Mary Chambers, UAB SOM, chambme0@uab.edu, David Schartung, UAB SOM, david103@uab.edu, David Resuehr, UAB SOM, resuehr@uab.edu
As sonography further develops as a mainstay of everyday medicine, the use of sonographic trainers (i.e. phantoms) has become increasingly necessary. However, despite the frequency and technicality of ultrasound-guided procedures involving arterial and venous line placement, the benefit of such hands-on sonography simulation for medical professionals is often outweighed by cost. Our experiment utilizes 3D printing and ballistic gelatin to create a cost-effective, versatile, and realistic peripheral line simulator to cultivate real-time learning of arterial/venous arm anatomy, while providing practice for needle-driving ultrasound techniques at a fraction of the commercial price.

Poster 122
A Scalpel and a Scanner: Training the Next-Generation of Anatomists in 3D Modeling Technology
Jake Shearer, Modern Human Anatomy Program, University of Colorado Anschutz Medical Campus, jake.shearer@cuanschutz.edu
Co-Authors: Maureen Stabio, University of Colorado Anschutz Medical Campus, maureen.stabio@cuanschutz.edu, Ernesto Salcedo, University of Colorado Anschutz Medical Campus, ernesto.salcedo@cuanschutz.edu, Noah Leppek, University of Colorado Anschutz Medical Campus, noah.leppek@cuanschutz.edu, Chelsea Lohman, University of Colorado Anschutz Medical Campus, chelsea.lohmanbonfiglio@cuanschutz.edu
Sponsored by Touch of Life Technologies
The use of immersive real-time 3D technology in anatomy education is exploding. With advances in medical imaging, segmentation powered by machine learning, surface scanning, and 3D printing, modern anatomists must be cross-trained in both digital workflows and classical anatomy. However, most anatomy education training programs do not offer formalized training in 3D modeling. Therefore, in 2022, we piloted a technology-focused track, the Anatomical Imaging and Modeling (AIM) track, within the Modern Human Anatomy Master's Program at the University of Colorado. We discuss our framework for training in industry-standard software, fostering independent research skills, and report on student successes and experiences.
Poster 123
Investigation of lecture modalities in student performance in anatomy
Sarah Beam, The Ohio State University, beam.102@osu.edu
HAPS Conference Travel Award Winner
Co-Authors: Mary Ghiotti, The Ohio State University ghiotti.1@osu.edu, Kristin Stover, The Ohio State University, stover.353@osu.edu
The pandemic has been a catalyst for change in many courses. This study investigates how lecture modalities in a hybrid anatomy course affected student exam performance. Undergraduate human anatomy students were given the option to attend synchronous Zoom lectures or watch the recording later. Student exam scores were collected over the course of four exams and compared for statistical differences. Additionally, we compared didactic verbal lectures with active note-taking lectures and encouragement of active study techniques to see the effect on student exam performance. Student exam scores were collected over the course of seven semesters and compared for statistical differences.

Poster 124
Bridging the gap between 3D digital and traditional physical A&P lab models using smart tablet technology.
Luis Rosado, Worcester State University, lrosado@worcester.edu
A disadvantage A&P classrooms using 3D digital computer anatomical models experience is the disconnect between digital and physical models traditionally used. This project used iPads and physical models for A&P lab practical exam studying and preparations. We focused on the experiential learning component seen in both constructivist and ecological pedagogical approaches. Digital models labeled by students served as “answer keys” to the physical models and “Mock Practical” exam questions were created on the physical models. Students reported digital models, “helped them make connections”, “were a good reference”, and “they preferred using the iPads in combination with the physical models”.

Poster 125
Effect of Short Active Breaks & Exercises on the Attention, Content Retention and overall success of Students registered in Anatomy and Physiology Course.
Ben Ondimu, Harford Community College, bondimu@harford.edu
Are your students bored, asleep, and tuned off in lectures especially if classes run for 75 minutes or more? Try to increase their attention and success by allowing short active breaks and encourage them to do simple Exercises that last 2-3 minutes during the breaks after every 25-30 minutes of teaching. There is scholarly evidence suggesting that the attention span of most students is only 20-30 minutes. The purpose of this study is to examine the effect of short active breaks and Exercises on the attention, material retention and overall success of students registered in Anatomy and Physiology Course.

Poster 126
The Impact of Online Laboratories and Hybrid Laboratories on Examination Scores in an Undergraduate Anatomy Program During the COVID-19 Pandemic
Hwoi Min Oh, The Ohio State University, oh.591@osu.edu
Co-Authors: Christian Prada, The Ohio State University prada.4@osu.edu, Jeremy Grachan, The Ohio State University, grachan.1@buckeyemail.osu.edu, Jennifer Burgoon, The Ohio State University, jennifer.burgoon@osumc.edu, Claudia Mosley, The Ohio State University, claudia.mosley@osumc.edu
This study compared the impact of online laboratories and hybrid laboratories on examination scores in an undergraduate anatomy program during the COVID-19 pandemic. The hybrid laboratories included online activities and options to attend in-person prosection laboratories. Within the hybrid group, students who attended 63.6% or more total in-person laboratories had higher mean practical scores. Students who attended at least one in-person laboratory performed higher on image-based questions. Final course grades were significantly higher for the hybrid group than for online group. These results may have been affected by pandemic-related issues, such as mental health and financial issues.
Session 2: Thursday, May 25 from 2:15 pm – 3:15 pm

Poster 201
Impact of Integration of Neuroanatomy and Head Anatomy on student learning outcomes in a year 1 medical course
Rylee Samander, Burrell College of Osteopathic Medicine, Rylee.samander@burrell.edu
Co-Authors: Cindy Funk, Burrell College of Osteopathic Medicine, cfunk@burrell.edu, Kris Vaudrey, Burrell College of Osteopathic Medicine, kvaudrey@burrell.edu, Miriam Donohue, Rocky Vista University - Montana College of Osteopathic Medicine, mdonohue@rvu.edu
The OMS (Osteopathic Medical Student) 1 Nervous System final included non-integrated and integrated test questions (anatomy, neuroanatomy and integrated). Anonymous, aggregate exam data was analyzed utilizing one-way ANOVA and feedback was elicited from the course evaluation as a Likert scale and open-ended question. Over 90% of students reported integrated cases/self-assessments as having supported overall understanding of both subjects. No significant difference (p-value > 0.5) with regards to question difficulty, point by serial, and discrimination between anatomy, neuroanatomy and integrated questions was found. This study showed a beneficial impact from integration, without corresponding increase in exam question difficulty/decrease in exam performance.

Poster 202
Inconsistency in Neuroanatomy Textbooks of Osteopathic Medical Schools
Kris Vaudrey, Burrell College of Osteopathic Medicine, kvaudrey@burrell.edu
Co-Authors: Alayna Schwartz, Burrell College of Osteopathic Medicine, Alayna.schwartz@burrell.edu, Ashley Stiglich, Burrell College of Osteopathic Medicine, Ashley.stiglich@burrell.edu, Miriam Donohue, Rocky Vista University - Montana College of Osteopathic Medicine, mdonohue@rvu.edu
There is inconsistency in textbooks describing the upper motor neuron (UMN) pathway of the hypoglossal nerve (CN XII) in Osteopathic medical schools. Textbook lists from 39 osteopathic schools were evaluated for discrepancies in UMN innervation to the hypoglossal nucleus. A comprehensive analysis found four major patterns of UMN innervation of the hypoglossal nucleus described among the resources reviewed. The differences in teaching innervation to the hypoglossal nucleus demonstrates a need for recognition of these differences and standardization in neuroanatomy curriculum among Osteopathic medical curricula as well as evaluation of clinical relevance of these differences.

Poster 203
Variation of Upper Motor Neuron Pathways of the Hypoglossal Nerve (CN XII)
Kris Vaudrey, Burrell College of Osteopathic Medicine, kvaudrey@burrell.edu
Co-Authors: Ashley Stiglich, Burrell College of Osteopathic Medicine, Ashley.stiglich@burrell.edu, Alayna Schwartz, Burrell College of Osteopathic Medicine, Alayna.schwartz@burrell.edu, Miriam Donohue, Rocky Vista University - Montana College of Osteopathic Medicine, mdonohue@rvu.edu
Cranial Nerve XII (CN XII) innervates muscles of the tongue and upper motor neuron (UMN) fibers descend from the motor cortex to synapse in the hypoglossal nucleus. This UMN CN XII pathway is described four main ways: (1) all fibers descend contralaterally, (2) most descend bilaterally except those innervating genioglossus, which descend contralaterally, (3) most are contralateral while a few remain ipsilateral, and (4) all descend bilaterally. Damage to UMNs of CN XII is typically taught in Osteopathic medical curricula as resulting in contralateral tongue deviation. However, the four descriptions would result in varying pathologic presentations.

Poster 204
Student experiences and preferences after COVID-19 on professional healthcare program: a longitudinal study
Mabel Yin Chun Yau, Tung Wah College, mabelyau@twc.edu.hk
Co-Authors: Paula Hodgson, paula.hodgson@protonmail.com, Chi Ming Wong, The Hong Kong Polytechnic University, samyuen@twc.edu.hk, Sam Yuen, Tung Wah College, paklaitang@gmail.com, Pak Lai Tang, Caritas Medical Centre, Hong Kong, paklaitang@gmail.com
Students experienced a shift from fully campus-based to remote learning as COVID-19 cases broke out in 2020-2022. Despite regular class resumption, students expect blended learning after exposure to virtual learning. This survey was done among healthcare students from 2021 to 2022 with autonomous and anonymous participation. 1,586 responses were collected. Students preferred online classes for Anatomy and Physiology (AnP) and skewed to on-site attendance for other science subjects. Their preferences on the respective components of each course were differential. An overwhelming choice of on-site learning on laboratory skills was noted indicating hands-on practice is crucial for mastery in authentic settings.
Poster 205
Biomedical Engineering Students Investigate the Cardiovascular System in the Gross Anatomy Lab
Emily Bradshaw, University of Central Florida, Emily.Bradshaw@ucf.edu
HAPS Conference Travel Award Winner
Co-Authors: Alain Kassab, University of Central Florida alain.kassab@ucf.edu, Luigi Perotti, University of Central Florida, luigi.perotti@ucf.edu
Biomedical engineering (BME) students may be asked to understand blood pressure and cardiomyocyte function in the human body, yet typically have little exposure to the biological sciences or anatomy. To address this, we developed a series of labs where BME graduate students examined normal and diseased human hearts, examined cardiac hypertrophy, measured wall thickness and vessel diameters, and calculated Reynolds number. This project describes the labs and student opinions. Overall, students reported more satisfaction working with and examining human specimens than plastic models, particularly for those with pathologies. Future directions include providing more time for discussion and data interpretation.

Poster 206
Development of an Anatomy Self-Study Room for ANP Students
Jacqueline Carnegie, University of Ottawa, jcarnegi@uottawa.ca
Co-Authors: Abbey Dikaitis, University of Ottawa, adika046@uottawa.ca, Joanne Savory, University of Ottawa, Joanne.Savory@uottawa.ca
Students in large-enrolment A&P courses don’t have access to laboratory sessions to support anatomy learning. In collaboration with the Anatomy Division of the Faculty of Medicine, a room for self-directed anatomy learning was created in the library. Equipped with models, whiteboards, a computer plus projection screen, and bilingual charts and atlases, the 18-seat room admits students via access code during normal library hours. Room use was tracked using sign-in sheets and student feedback collected via surveys. Students reported that the room supported their anatomy learning and provided suggestions to expand its capabilities. Challenges and future directions will also be presented.

Poster 207
Skeletal System Coverage in Undergraduate Stand-alone Human Anatomy and A&P Courses: General trends
Valerie O’Loughlin, Indiana University, vdean@indiana.edu
Co-Authors: Asmita Aryal, Indiana University, aryala@iu.edu
Undergraduate anatomy and A&P courses vary in depth and breadth of the skeletal system coverage, yet little data has been collected about these differences. To address this data deficit, the authors developed a skeletal system coverage survey (presented at HAPS 2022) and received complete responses from 282 undergraduate anatomy & physiology courses from around the world. Here, we present the general data trends, including the most commonly identified bones for these courses, and the top 5 features required for selected bones (from our sample). Additional data comparisons between these two types of courses will be presented.

Poster 208
Skeletal System Coverage in Undergraduate A&P Courses, part 2: Comparisons between Stand-alone Human Anatomy and A&P Courses
Valerie O’Loughlin, Indiana University, vdean@indiana.edu
Co-Authors: Asmita Aryal, Indiana University, aryala@iu.edu
Undergraduate anatomy and A&P courses vary in depth and breadth of the skeletal system coverage, yet little data has been collected about these differences. To address this data deficit, the authors developed a skeletal system coverage survey (presented at HAPS 2022) and received complete responses from 124 anatomy and 158 A&P courses. While both types of courses were similarly likely to teach specific bones, anatomy courses were more likely to require identification of more specific bony features (e.g., costal facet on vertebra). Additional data comparisons between these two types of courses will be presented.
Poster 209
Skeletal System Coverage in Undergraduate Stand-alone Human Anatomy and A&P Courses, Part 3: Comparisons Between Lower-level and Upper-level Human Anatomy and A&P Courses
Asmita Aryal, Indiana University School of Medicine-Bloomington, aryala@iu.edu
Co-Authors: Valerie Dean O’Loughlin, Indiana University School of Medicine - Bloomington, vdean@indiana.edu
Undergraduate anatomy and A&P courses vary in depth and breadth of the skeletal system coverage, yet little data has been collected about these differences. To address this data deficit, the authors developed a skeletal system coverage survey (presented at HAPS 2022) and received 282 responses with 197 lower-level and 72 higher-level courses. While both types of courses were most likely to teach similar bones, the vertebra is the most required bone to identify in lower-level courses and the sternum in higher-level. Additional data comparisons between these two types of courses will be presented.

Poster 210
From Clinic to Classroom: Development of an Online Pathohistology Database
Soma Mukhopadhyay, Augusta University, soma.mukhopadhyay.08@gmail.com, smuk@hapsconnect.org
Co-Authors: Rachel Hopp, University of Louisvillerachel.hopp@louisville.edu, rhopp@hapsconnect.org, Deborah Merritt, University of Hawaii, dmerritt@hawaii.edu, dmerritt@hapsconnect.org, Judy Maloney, Marquette University, jmaloney1706@gmail.com, Hiranya Rowcowdhury, New Mexico State University, hroychow@hapsconnect.org, Yuli Pernia, San Jacinto College North, yuli.pernia@sjcd.edu, ypernia@hapsconnect.org, Sharada Gollapudi, San Jacinto College South, sharada.gollapudi@sjcd.edu, sgollapudi@hapsconnect.org, Kathleen Ahles, University of Texas, kathleen.ahles@uta.edu
The study of tissues, or histology, is one of the fundamental topics used in most of the undergraduate Anatomy and Physiology (A&P) curricula to prepare students who are planning to enter the field of medicine and/or an allied health profession. In the last decade, the use of digital histology has greatly increased, especially during COVID19-related lockdown time. Since 2010, HAPS Histology Challenge has provided anatomy faculty with novel tissue images to facilitate critical thinking in their A&P courses. Under the Curriculum and Instruction Committee initiative, a project is currently underway for repurposing the images to create a virtual database to be efficiently used for greater engagement and metacognition among A&P students.

Poster 211
Accommodations in the A&P Lab: It’s so much more than providing extended time
Abbey Breckling, University of Illinois at Chicago, abreck2@uic.edu
Co-Authors: Heather Ambruster, Southern Union State Community College, harmbruster@suscc.edu, James Clark, Los Medanos College, jclark@losmedanos.edu, Pat Clark, Indiana University Purdue University, patclark@iupui.edu, Jennifer Ellsworth, Moorpark College, Jenniferroseellsworth@gmail.com, Youlonda Fitzgerald, Texas Woman's University, patclark@iupui.edu, Rachel Hopp, University of Louisville, rachel.hopp@louisville.edu, Jenna Jarvis, State College of Florida, jarvisj@scf.edu, Jennifer Stokes, Southwestern University, stokesj@southwestern.edu, J. P. Swigart, Carle Illinois College of Medicine, swigart@illinois.edu, Diane Tice, SUNY Morrisville, ticedg@morrisville.edu, Margaret Weck, University of Health Sci. and Pharm. (ret.), mweck602@gmail.com
Over the past couple years, the HAPS Curriculum and Instruction Accommodations Subcommittee has been writing, reviewing, and vetting a handbook for HAPS members which entails suggestions for how to meet student accommodations in anatomy and physiology laboratory settings. This poster shares feedback from our Town Halls, past posters, workshops, and presents our progress on the handbook document. Our goal is to provide a space for reflections and discussions around accommodation successes or difficulties members may have.

Poster 212
Hawkeye Introductory Courses: A Collaborative Effort to Transform Undergraduate Introductory STEM Courses
Jennifer Rogers, University of Iowa, jen-rogers@uiowa.edu
Co-Authors: Ray Fagenbaum, The University of Iowa, ray-fagenbaum@uiowa.edu, Kelli Taeger, The University of Iowa, kelli-taeger@uiowa.edu, Stephanie Preschel, The University of Iowa, stephanie-preschel@uiowa.edu, Jamie Tanas, The University of Iowa, tanas-jamie@uiowa.edu
The aim of the Hawkeye Introductory Courses project was to support teaching and learning innovations in selected STEM gateway courses in Chemistry, Computer Science, Math, Statistics, and Health and Human Physiology. Methods: Departmental teams, in collaboration with university resources and funding, identified a variety of course-level strategies to enrich opportunities for student engagement. Results: Faculty survey results indicated that participation improved understanding of student performance and student success resources and programs, while also improving departmental coordination and benefited their own professional development. Conclusion: Support from university-wide resources, professional development, and cross-departmental collaboration facilitated student success in critical first-year courses.
Poster 213
Hawkeye Introductory Courses Project: Evaluating Withdrawal Patterns in a Large Lecture-Based Introductory Human Anatomy Course
Ray Fagenbaum, The University of Iowa, ray-fagenbaum@uiowa.edu
Co-Authors: Kelli Taeger, The University of Iowa, kelli-taeger@uiowa.edu, Jen Rogers, The University of Iowa, jen-rogers@uiowa.edu
One aim of the Hawkeye Introductory Courses Project was to enhance student persistence in introductory STEM courses.
Methods: Academic characteristics for students who withdrew from Human Anatomy were evaluated, along with survey results asking students to comment on reasons for withdrawal. Results: Approximately 10% of students withdrew with most withdraws around Week 11, coinciding with the timing of exam 3 of 5. Students that withdrew most commonly indicated poor performance or having fallen behind with content as primary reason for withdrawal. Conclusion: A better understanding of reasons for and timing of withdrawals may help instructors improve course delivery.

Poster 214
Hawkeye Introductory Courses Project: Improving Student Engagement in a Large Lecture-Based Introductory Human Anatomy Course
Kelli Taeger, University of Iowa, kelli-taeger@uiowa.edu
Co-Authors: Jennifer Rogers, University of Iowa, jen-rogers@uiowa.edu, Ray Fagenbaum, University of Iowa, ray-fagenbaum@uiowa.edu, Jamie Tanas, University of Iowa, tanas-jamie@uiowa.edu, Preschel Stephanie, University of Iowa, stephanie-preschel@uiowa.edu
Introduction: Changes were made to enhance learning in an introductory large-lecture course through incorporation of active learning activities in-class and out-of-class supplemental learning activities. Methods: In-class and out-of-class activities were introduced to the course. Students completed surveys regarding the use and helpfulness of these activities. Results: Students reported exam reviews, weekly low-stakes quizzes, supplemental worksheets, and interactive reviews midway through each unit to be the most helpful in-class activities. Access to anatomical models outside of class was also beneficial as evidenced by the number of check-outs. Conclusion: Changes to the course were well-received and favorably impacted student engagement.

Poster 215
Student Perspectives of the Case Study Approach to Teaching and Engagement
James McCaughern-Carucci, St. John's River State College, jamesmccaugherncarucci@sjrstate.edu
Co-Authors: Dana Smith, St. Johns River State College, DanaSmith@sjrstate.edu, Kim Van Vliet, St. Johns River State College, KimVanVliet@sjrstate.edu, Kerry Hull, Bishop's University, khull@hapsconnect.org, Kyla Ross, Georgia Tech, kross@hapsconnect.org, Suzanne Hood, Bishop's University, shood@ubishops.ca, Murray Jensen, University of Minnesota, mjsjensen@umn.edu
Case studies have been used in many fields of study; however, science and medicine rely heavily upon this teaching method precisely because of the ability of the case study to create a rich narrative of clinical evidence and foster critical thinking skills. A combination of case studies, collaborative learning and real-time polling resulted in a hybrid teaching strategy which was useful in my face-to-face and online synchronous anatomy & physiology courses. Students found the weekly case studies engaging, beneficial to their understanding of the course material and promoted community in the classroom which may translate to improved student success and resiliency.

Poster 216
Metacognitive awareness in Anatomy and Physiology for among mixed majors
Lecia Robinson, Tuskegee University, lrobinson@tuskegee.edu
Co-Authors: Suzanne Hood, Bishop University, shood@UBishops.ca
Metacognition, which is the awareness of one's own learning or thinking processes, has been shown to increase student achievement and learning. In this study we introduced exam wrappers into undergraduate A&P classes to increase student metacognition and to determine whether exam wrappers affected student anxiety, and exam performance. In the sample studied, there was not any significant difference in overall exam scores between the groups. However, student anxiety dropped significantly among those who used exam wrappers.
Poster 217
Progression of the Community College Anatomy and Physiology Education Research (CAPER) Project: An Update on Teaching Practices for Anatomy and Physiology
Chasity O’Malley, Wright State University Boonshoft School of Medicine, chasity.omalley@wright.edu
Co-Authors: Kathy Bell, Salt Lake Community College, kathryn.bell@slcc.edu, Charlene Cornell, University of Minnesota, cornw055@umn.edu, Melaney Farr, Salt Lake Community College, melaney.farr@slcc.edu, Ron Gerrits, Milwaukee School of Engineering, gerrits@msoe.edu, Suzanne Hood, Bishops University, shood@ubishops.ca, Kerry Hull, Bishops University, khull@ubishops.ca, Murray Jensen, University of Minnesota, msjensen@umn.edu, Vicky Rands, Salt Lake Community College, Vicky.Rands@slcc.edu, Dana Smith, St. Johns River State College, DanaSmith@sjrstate.edu
The Community College Anatomy and Physiology Education Research (CAPER) project aims to support community college faculty to supplement their courses with additional best practices and conduct an educational research study. Cohort 1 participants have completed classroom research projects, while cohort 2 participants have completed 2 professional development courses and are preparing to conduct a classroom-based research project. Data from participating students on learning and anxiety associated with the effects of various teaching interventions are also being recorded. Instructors have also been studied through a series of interviews aimed at assessing their approaches to education. This poster will highlight the overall CAPER project.

Poster 218
Case Study: Cervical radiculopathy with pedagogical application
David Bowden II, Wright State University, davidbowdenii@gmail.com
Co-Authors: Chasity O’Malley, Wright State University Boonshoft School of Medicine, chasity.omalley@wright.edu
Cervical radiculopathy is a common cause of neck pain, often occurring due to nerve root impingement. In order to fully understand the condition, it is important to have an understanding of the anatomical landmarks and the pathophysiology. This poster will examine a teaching case of a patient with cervical radiculopathy subsequent to a space occupying lesion. This case could be applied in an anatomy laboratory classroom, most appropriate for graduate level studies.

Poster 219
Analysis of coronary flow calculated by Artificial Intelligence and Machine Learning
Van Nguyen, Methodist Hospital, Merrillville IN, nvtuong0903@gmail.com
The current requirement for offline analyses of plaque anatomic/hemodynamic/biomechanical characteristics that are time consuming and require substantial technical and computational resources. Nevertheless, intense efforts are needed to enhance imaging and postprocessing systems and the application of artificial intelligence (AI) and machine learning (ML) permit more rapid and detailed assessment of these high-risk characteristics. Images of the coronary flow calculated by AI and ML will be presented.

Poster 220
Micro-Cavitation in Coronary Arteries
Kieu Thai, Methodist Hospital, Merrillville IN, thaikieungoc@gmail.com
Micro-cavitation happens due to vortex formation from Kelvin-Helmholtz instability. Once a vortex is formed, the angular velocity of the flow around the vortex increases exponentially, thus causing a negative pressure zone. This low pressure ruptures any bubble wandering in its territory (cavitation) and so injures the intima. Additionally, in the negative pressure zone, due to the pressure gradient, the blood will be pulled in more than the flow in the distal region. This results in reversed flow or delay anterograde flow. This is called dynamic obstruction resulting in chest pain while no lesion is detected on the angiogram.

Poster 221
Cardiac Cycle Puzzle
Juanita Jellyman, California State Polytechnic University Pomona, jkjellyman@cpp.edu
This poster will describe a learning activity that helps students relate the atrial state, ventricular state, states of atroventricular valves, and pulmonary and aortic valves to the different phases of the cardiac cycle.
Poster 222
**Usually you check blood pressure by the number, can you see the images of controlled and uncontrolled hypertension?**
Imran Mihas, Indiana University Bloomington, Mihasimran@gmail.com
This session will present the images of antegrade flow in systole and the reversed flow in late systole and diastole in the iliac artery. The reversed flow represents the extent of peripheral vascular resistance. In patient with uncontrolled systolic hypertension (HTN), the reversed flow is seen being stopped abruptly. With diastolic HTN, the reversed flow in the iliac artery is prominent and prolonged. If the diastolic BP is below 70mmHg, there is no reversed flow. Images of antegrade flow as result of systolic contraction of the left ventricle and retrograde flow representing the strength of the distal vascular resistance.

Poster 223
**Kevin-Helmholtz Instability in Coronary Artery**
Thinh Nguyen, Methodist Hospital, Merrillville IN, nguyen.thi.thinh.ped@gmail.com
The Kelvin–Helmholtz instability is a fluid instability that occurs when there is velocity shear in a single continuous fluid or a velocity difference across the interface between two fluids. The reason is because between two layers, there is always a surface tension. The amplitude has to be large enough to overcome the surface tension for the turbulence to occur, otherwise the surface tension will suppress the instability. In coronary artery, this phenomenon is seen frequently and is the nidus of the first plaque formation. Images of flow at the exit slope of the left circumflex artery will be presented.

Poster 224
**An open-source model for demonstrating changes in transpulmonary pressure during ventilation**
John Pattillo, Middle Georgia State University, john.pattillo@mga.edu
Students may find it difficult to comprehend the changes in pleural and alveolar pressures during ventilation. This project details the construction of a device to demonstrate these changes, and to measure and display them in real time. A standard “balloon in a bell jar” model is modified to incorporate pressure sensors. As the instructor moves the diaphragm, pressure data is sent to wirelessly to a small computer attached to the classroom audiovisual system. The instructor may also demonstrate pneumothorax. The model is designed to be inexpensive, easily constructed, and is compatible with a variety of audiovisual systems.

Poster 225
**Utilization of Social Media for Increased Engagement and Understanding in Anatomy and Physiology**
Shannon Kispert, Webster University, shannonkispert@webster.edu
Co-Authors: Sarah Schryver, Webster University, schryversj13@gmail.com
Increased engagement has shown to improve student success. One strategy to increase student engagement is utilizing social media in courses which focus on visual identification. This study investigated the use of academic social media to increase engagement. Results revealed that most students felt social media would be an effective supplement and increase engagement. Comparing user groups, students in social media utilization courses felt more strongly that it improved student engagement when compared to students in courses which did not. These students reported increased understanding of course material. Users described benefits such as easier access to information, increased enjoyment and comfort when studying.

Poster 226
**Analysis of assessment data to examine a correlation between Cumulative Block Practice Exam (BPE) usage and HAPS exam scores in ANAT-A215**
J.T. Cornelius, Indiana University School of Medicine - Bloomington, Jtcornel@iu.edu
*HAPS Conference Travel Award Winner*
Co-Authors: Valerie O'Loughlin, Indiana University School of Medicine - Bloomington, Vdean@iu.edu
The HAPS Anatomy Exam is offered as an optional cumulative final to our undergraduates each semester. To prepare for this exam, students used past formative assessments known as Block Practice Exams (BPEs). These BPEs were used throughout the semester for students to check their knowledge. BPEs could be completed an unlimited number of times and integrated with both lecture and lab content. Thus, we investigated the correlation between the BPE scores and performance on the HAPS exam. We hypothesized that frequent BPE usage would correspond with increased HAPS exam scores compared to students who did not utilize BPEs throughout the course.
Session 3: Friday, May 26 from 9:45 am – 10:45 am

Poster 301
Health Sciences Student Perceptions and Attitudes Regarding Proctorio E-Proctoring Versus Testing Center
Justin Burr, Weber State University, justinburr1@weber.edu
During the COVID-19 pandemic, faculty were forced to pivot toward online education. With the switch to online learning, e-proctoring became a popular choice to continue proctored exam assessments. With the resumption of in-person learning, faculty are faced with the question of continuing with e-proctoring alone, switching back to campus testing centers, or utilizing a combination of both modes. This study aims to understand student perceptions and attitudes regarding e-proctoring versus testing center use. 244 students responded to an 18-question survey. The results indicate that students felt less stress and anxiety and perceived improved performance using e-proctoring compared to testing centers.

Poster 302
Use of a Vocation Assignment in a Human Anatomy and Physiology Course
Sarah Lovern, Concordia University Wisconsin, sarah.lovern@cuw.edu
Concordia University explores vocation in many classes, so a vocation project was added to A&P II in the fall of 2019. This assignment allows students to evaluate how the course contributes to their future vocations and religious beliefs. This formative assignment has students write a fictional story, make a video, write a poem or song, draw a comic strip, or evaluate Bible verses. Giving the students autonomy in choosing their project method is intentional as it allows students to select some variation that they hopefully enjoy. Methodology, rubrics, student feedback, and examples will be shown on this poster.

Poster 303
Benefits of a hands-on summer research program in increasing high school students’ interest in science with a focus on Anatomy and Physiology
Donika Rakacolli, Edgewood College, drakacolli@edgewood.edu
Co-Authors: Rachael Lancor, Madison Country Day School, rlancor@madisoncountryday.org
We will present the structure and teaching materials of a summer research camp held in summer 2022, as a collaboration between the Madison Country Day School and Edgewood College biology faculty. In this program, students participated in hands-on research projects. The students learned the stress response in humans and zebrafish followed by experiments exploring the effect of acute stress on zebrafish behavior and white blood cells. The students also learned the steps of scientific inquiry, including primary literature search, data collections and analysis and scientific poster design. The impact of this summer camp on the participating students will be discussed.

Poster 304
Content Reinforcement of Cell and Membrane Transport between Physical Education and Arts and Science Students
Paul Chahal, MacEwan University, chahalp@macewan.ca
Co-Authors: Raj Narnaware, MacEwan University narnawarey@macewan.ca
The present study evaluates content reinforcement of cell membrane transport over eight weeks for Physical Education and Arts and Science physiology students. The highest retention for physical education students was in weeks 1 and 3, whereas for the Arts and Science students, it was the highest in weeks 2 and 3. Knowledge was comparatively higher for Physical Education students than for the Arts and Science students. Therefore, relatively more robust interventional strategies need to be implemented for Arts and Science students to improve knowledge retention.

Poster 305
Making Anatomy & Physiology Make Cents
Haneen Salhieh, Chamberlain College of Nursing, hsalhieh@chamberlain.edu
When it comes to learning anatomy and physiology, it is easy to be overwhelmed with all of the different structures and functions. What is something that can help? Money! Use of a reward system to earn “Instructor Bucks” has been seen to motivate students in course participation, exam performance, and overall comprehension. Through group-based activities, exam scores, or individual activities, students have the opportunity to earn fake “money” that can be redeemed for incentives like snacks, drinks, organ plushie toys, extra credit, etc. Let’s take a look at how different reward systems improve student retention and performance!
Poster 306
Institutional attitudes around the addition of cadaver anatomy to the curriculum of a new medical school.
Madeline Hansen, Burrell College of Osteopathic Medicine, madeline.hansen@burrell.edu
Co-Authors: Jon Jackson, Burrell College of Osteopathic Medicine, j.jackson@burrell.edu

After one and a half years of virtual anatomic instruction, Burrell added the use of cadavers to the instructional resources. At our start-up school, many of the staff and faculty weren't aware that cadavers would be stored and used in our relatively small location. How this adoption was perceived by the Burrell community was assessed through a survey of every employee and current student (at the time of the adoption). Our poster details aspects of the response and identifies patterns of the responses.

Poster 307
Open Educational Resources (OER) to Catalyze Student Investment in the Life Science Laboratory
Gillian Backus, Northern Virginia Community College, gbackus@nvcc.edu
Co-Authors: Paula Rodgers, Northern Virginia Community College, prodgers@nvcc.edu, Heidi Wangerin, Northern Virginia Community College, hwangerin@nvv.edu

Anatomy and Physiology lab manuals are expensive and often lack engaging stories. We followed HAPS guidelines to create an Open Educational Resources (OER) lab manual. Each lab includes a relevant Case Study. We will recount our journey, guide you through the lab format, and allow you to peruse the labs. We will share resources and lessons learned. This lab manual has strengthened our curriculum, encouraged critical thinking and independent work in our students, and significantly reduced the course cost. It is freely accessible on the web and through CANVAS and offers a pedagogically rigorous curriculum design that follows HAPS guidelines.

Poster 308
Evaluating the Quality of Medical School Canvas Pages, Pre-Pandemic Through Today
Trey Shupp, Indiana University - Bloomington, tshupp@iu.edu

Within higher education there is a reliance on learning management systems such as canvas. During the COVID-19 pandemic, many of these systems were leaned on more heavily and the organization of pages were changed to increase usability and functionality. Our research sought to evaluate canvas pages in undergraduate medical school courses pre-pandemic through today. We hypothesized that canvas pages increased in functionality as time progressed as a result of changes from the COVID-19 pandemic. Using a pre-made rubric, canvas pages within the course Human Structure in the Indiana University Medical School was evaluated from 2019 to 2022.

Poster 309
AnatomicalTerms.info (ATI): a free, wiki-like, reference-website dedicated to anatomical terminology
Anthony Weinhaus, University of Minnesota, weinh001@umn.edu

A reliable source of information for teachers and learners with proper anatomical terminology with short definitions, clinical terms, synonyms, and eponyms. For accuracy, the terminology is derived from the Terminologia Anatomica, and is organized by the Clinical Anatomical Terminology Committee of the American Association of Clinical Anatomists. It is a work in progress and welcomes all interested anatomists to contribute through a systematic data-entry program, which are reviewed by other contributors and editors. The poster describes the components of the ATI with the hopes that attendees will find the site useful in their teaching, but also contribute to its growth.

Poster 310
Review Days in Anatomy and Physiology
Timothy Bradshaw, Polk State College, tbradshaw@polk.edu

Engaging students in review sessions prior to exams may help them develop a deeper understanding of material and may increase academic performance. However, it is unclear if different types of review session are more effective or preferred by students. This study examined the effect of two different types of review sessions (open lab and game show competition) on student performance and preference in an introductory A&P course. Preliminary results indicate a marked preference for game show competition style review days.
Poster 311

**Muddiest Point Assignments to Normalize Help-Seeking**

Hilary Engebretson, Whatcom Community College, hengebre@whatcom.edu

Many learners experience anxiety and resist asking for help due to a variety of factors. This study sought to reduce student anxiety around help-seeking through repeated muddiest point reflections in which students ask for help on their most confusing course topics. No significant difference in the anxiety-caused ratings occurred from beginning to end of term. Nor did a significant difference exist between academic self-efficacy ratings from beginning to end of term. Affecting students’ perceptions of help-seeking is difficult and may require greater interventions over a longer time period.

Poster 312

**Use of cooperative quizzes on students' sense of belonging**

Amy Bauguess, Forsyth Technical Community College, abauguess@forsythtech.edu

Co-Authors: Chastity O'Malley, Wright State University, chastity.omalley@wright.edu, Suzanne Hood, Bishop's University, shood@UBishops.ca, Charlene Cromwell University of Minnesota, cornw055@umn.edu

Cooperative quizzes are a type of evidence-based instructional practice, where students take an individual quiz followed by a group quiz. This technique is used to improve students’ learning through peer work. Academic Belongingness is a students’ sense of being valued and respected as a community. This project examined the use of cooperative quizzes and/or the type of class (modality) on students’ sense of belonging. Students were given a survey at the start and end of the course to measure their sense of belonging. The results indicated that students believed that cooperative quizzes contributed to their sense of belonging.

Poster 313

**The Impact of Course Length and Delivery Method on Student and Faculty Perceptions of Combined Muddiest Point and Peer Instruction Activities in Community College Anatomy and Physiology Classes**

Anthony Edwards, Tarleton State University, aedwards@tarleton.edu

Co-Authors: Murray Jensen, University of Minnesota, mjensen@umn.edu, Ronald Gerrits, Milwaukee School of Engineering, gerrits@msoe.edu, Melaney Farr, Salt Lake Community College, melaney.farr@slcc.edu, Suzanne Hood, Bishop's University, shood@UBishops.ca, Chastity O’Malley, Wright State University, chastityomalley@gmail.com

Muddiest point and peer instruction are evidence-based instructional practices (EBIPs) that can be used to address student learning gaps. This study sought to determine the impact of course length (8-weeks or 16-weeks) and modality (face to face or online) on faculty and student perceptions of effectiveness of combined muddiest point and peer instruction activities in community college anatomy and physiology courses. This study focuses on survey responses at the end of the semester. This research is part of the Community College Anatomy and Physiology Research Project (CAPER) funded by National Science Foundation (Award #2111119).

Poster 314

**Using Cooperative Quizzes to Increase Student Performance, Academic Self-Efficacy, and Sense of Belonging in an In-Person and a Hybrid A&P I Class.**

Wendy Rappazzo, Harford Community College, wrappazzo@harford.edu

Co-Authors: Suzanne Hood, Bishops University, shood@ubishops.ca, Chasity O’Malley, Wright State University, Boonshoft School of Medicine, chastity.omalley@wright.edu, Murray Jensen University of Minnesota, msjensen@umn.edu, Kerry Hull, Bishops University, khull@ubishops.ca, Ron Gerrits, Milwaukee School of Engineering, gerrits@msoe.edu

Cooperative quizzes have been shown to improve students’ content knowledge and foster collaboration, while also lowering anxiety. This project examined whether cooperative quizzes increased student performance on unit exams and their effect on student academic self-efficacy, sense of belonging, and persistence in the course. Cooperative quizzes were implemented for one semester and student academic performance on topics related to the quizzes and exam scores were analyzed. Additionally, students were given a survey to measure academic self-efficacy and sense of belonging in the course before and after implementation of cooperative quizzes. This poster presents the results of the study indicating the effectiveness of cooperative quizzes.

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Poster 315
Community College Student Attitudes of Evidence-Based Instructional Practices
Brian Shmaefsky, Lone Star College - Kingwood, brian.r.shmaefsky@lonestar.edu
The research presented in this poster session is part of the NSF Funded (IUSE 2111119) HAPS Community College Anatomy and Physiology Educational Research Program (CAPER). In this study, community college students were surveyed about their apprehension levels and satisfaction levels with evidence-based instructional practices (EBIP). The study focused on cell biology, molecular biology, and toxicology content covered in health professions and human sciences classes. The results underline that certain EBIPs cause student anxiety and disconnect in certain populations of students. In these student populations, the EBIPs are counterproductive to learning. Suggestions are made to help faculty select optimal instructional strategies.

Poster 316
A Continued Look at A&P I Content Retention Trends Through the Pandemic Covid Slide
Youlonda FitzGerald, Texas Woman’s University, yfitzgerald@twu.edu,
Co-Authors: Karen V. Goodwin, Texas Woman’s University, kgoodwin2@twu.edu
This longitudinal perspective assesses whether university matriculation or method of instruction lead to differences in retention of core A&P I content observed during the pandemic, and whether these patterns are changing as society moves toward pre-pandemic patterns of social and classroom engagement. Previous data indicated a significant difference in retention between university of instruction (N=179, TWU, n=151, 6.12 correct; Other University, n=28, 5.29 correct, p=.021) while mode of instruction showed a non-significant difference (p=.913). Introduction of new data from the most recent cohort sheds light on retention trends observed over time.

Poster 317
Prevalence of nutritional supplement use and early indicators of renal disfunction among collegiate athletes.
Colton Koch, Southern Utah University, cbkoch2002@gmail.com
Co-Authors: Corbin Hampton, Southern Utah University, cheeto67@gmail.com, Dillon Petty, Southern Utah University, dillonpetty@gmail.com, Alexa Lord, Southern Utah University, alexanlord@gmail.com, Paul Pillitteri, Southern Utah University, pillitteri@suu.edu, Mary Tufto, Southern Utah University, tuftem@suu.edu
Collegiate athletes use a variety of nutritional supplements to benefit training and performance. Vigorous exercise combined with supplements may increase stress on kidneys, which can be measured with an albumin-to-creatinine ratio (ACR). Albumin, a natural protein in the blood, maintains osmotic pressure, and creatinine, a byproduct of muscle metabolism, are normally found in the urine at a ratio of 30 mg/g could suggest renal dysfunction. Participants take a survey about supplement use, lifestyle, while their urine will be tested for ACR. Data will then be analyzed to find possible correlations and improve athletes’ health.

Poster 318
Distinct population and single-neuron selectivity for executive and mnemonic processing in human dorsal posterior cingulate
Lyndsey Aponik Gremillion, Weber State University, lyndseygremillion@weber.edu
Posterior cingulate cortex (PCC) is an enigmatic region with poorly understood contributions to cognition. Human studies link PCC to episodic memory, while non-human primate findings emphasize executive processes. We hypothesized this difference reflects a functional division between dorsal and ventral PCC. To test this, we utilized human intracranial recordings of population and single-unit activity targeting dorsal PCC during an executive/episodic task. Dorsal PCC population responses were significantly enhanced for executive conditions. Single-unit recordings, however, revealed four functional types with unique executive or episodic response profiles. Our findings provide critical electrophysiological data from human PCC, furthering our understanding of PCC function.

Poster 319
Revisiting the origin of gluteus minimus
Bonny Ford, Department of Anatomy & Cell Biology, Burrell College of Osteopathic Medicine, bonny.ford@burrell.edu
Co-Authors: Ashley Stiglich, OMS-II, Burrell College of Osteopathic Medicine, ashley.stiglich@burrell.edu, Oscar Hernandez, OMS-II, Burrell College of Osteopathic Medicine, oscar.hernandez@burrell.edu, Nancy Minugh, Department of Anatomy & Cell Biology, Burrell College of Osteopathic Medicine, nminugh@burrell.edu
Gluteus minimus is consistently described in the literature as originating from the external aspect of the ilium between the anterior and inferior gluteal lines. However, careful dissection reveals an origin typically reaching the margins of the greater sciatic notch with muscle tissue and/or its investing fascia entering the pelvis. This little-known attribute of gluteus minimus is depicted in various editions of Pernkopf’s atlas, and reiterated by Beck, et al. (2000), but remains generally unrecognized. Current texts should document this endopelvic origin, which merits further investigation to clarify its potential functional and clinical significance.

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Poster 320
Impact of Content Reinforcement of Muscular and Skeletal Systems on Knowledge Retention in Nursing Students
Amber Zyla, MacEwan University, amber.zyla33@gmail.com
Co-Authors: Raj Narnaware, MacEwan University, narrnaware@macewan.ca, Melanie Neumeier, MacEwan University, neumeierm@macewan.ca, Sarah Cuschieri, University of Malta, sarah.cuschieri@um.edu.mt
Numerous studies have expressed concern over nursing students’ ability to retain the anatomical knowledge they gain in the first year to the subsequent years of nursing (Narnaware, Y. 2021). The present study assesses the impact of content reinforcement on the musculoskeletal systems over eight weeks. Results show that compared to week 1, repeating knowledge of the musculoskeletal systems resulted in organ- and week-specific retention over eight weeks of these systems. This study demonstrates that content reinforcement should be used as one of the interventional strategies to improve knowledge retention in nursing students.

Poster 321
How Does Gamification using Classroom Response System (CSR) Affect Test-Taking Anxiety in Human Anatomy Students in a Flipped Classroom?
Dalia Salloum, Salt Lake Community College, dalia.salloum@slcc.edu
Marieb, Hoehn, and Haynes Award for Diversity, Equity, and Inclusion Winner
Co-Authors: Suzanne Hood, Bishops University, shoom@ubishops.ca
The existing research on the effectiveness of the flipped classroom suggests that it is effective in increasing student performance in anatomy and physiology courses, as well as across various disciplines in higher education. It has been shown that the successes in the flipped classroom are attributed to active learning strategies that allow students to be engaged with their peers and instructors, reflect on their own thinking process, and deconstruct difficult concepts in the classroom. One active learning strategy that this research focuses on is the use of a live classroom response system (CSR), which allows students to use their smartphones, laptops, or tablets as the response device.

Poster 322
Tissue specimen revitalization and resuscitation with monophenol ethers.
Christina Baquera, Burrell College of Osteopathic Medicine, cbaquera@burrell.edu
Co-Authors: Jon Jackson, Burrell College of Osteopathic Medicine, jjackson@burrell.edu
Discovered in 1944 as a treatment for infections in war wounds, 2-phenoxyethanol (2-PE) has seen a number of utilizations across the continuum of the anatomic sciences in the eight decades following its first description. A number of HAPS members already utilize this compound as a component of their cadaver lab wetting solutions. If you aren’t using 2-PE both ON —and IN—your lab, you may be missing the chance to maintain valuable teaching specimens in great condition for longer periods of time. This poster will show you just how big a difference 2-PE can make with your teaching specimens.

Poster 323
Identify a Challenge and Create a Solution: Development of an Anatomy Color by Numbers App
Claire Farrell, Clemson University, cfarre@g.clemson.edu
Co-Authors: John Cummings, Clemson University, cumminj@clemson.edu
As a current undergraduate student who has both taken Anatomy and Physiology and also teaches a lab section of the course, I am very familiar with the struggles of finding a study method that is both engaging and effective. When I could not find exactly what I was looking for, I decided to create it: an anatomy color by numbers app. Anatomy coloring books have been a favorite study method for years, but they have their limitations. Over the last two years, I have worked to create a virtual solution to address these limitations.

Poster 324
Antibiotic Induced Microbiome Depletion (AIMD) in Mice and its Effect on Thyroid Hormone Levels, Corticosterone Levels, and Mandibular Alveolar Bone Height
Cinnamon VanPutte, Southern Illinois University School of Dental Medicine, cvanput@siue.edu
Co-Authors: Lucia Thompson, Southern Illinois University, lucthom@siue.edu, Cinnamon VanPutte, Southern Illinois University School of Dental Medicine, cvanput@siue.edu
The microbiome’s importance in homeostasis is not understood; however, evidence shows its involvement in metabolism, including thyroid function. Thyroid hormones, critical for growth, and metabolism, are linked to microbiome disruption. Mice received antibiotics in water for six weeks for microbiome depletion (AIMD). Blood and mandibles were collected for analysis. Thyroxine was lower in AIMD animals (n=4) than control animals. Alveolar bone height was reduced in experimental animals (n=6) compared to controls. An impediment to this approach is collectable blood volume. We developed and validated an ELISA to measure thyroid hormones and corticosterone. Here we describe our validation of this assay.

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Coverslip Restoration of Oxidized Histology Slides
Bob Duerst, UW-Eau Claire, duerstr@uwec.edu
Co-Authors: Amy Madlon, UW-Eau Claire, madlonae6725@uwec.edu
The purpose of this project was to compare methods of microscope coverslip restoration in oxidized histology slides. The coverslip removal methods investigated were: submersion in xylene, chilling in -80°C freezer, and liquid nitrogen administration via a liquid nitrogen gun. Gross and microscopic photos were taken before experimentation, after coverslip removal, and after a new coverslip was applied. The liquid nitrogen gun produced immediate, high-quality results. The -80°C freezer required more work and time, but the results were consistent. Xylene had the most variable results. An area of future research could analyze if restaining previously oxidized slides improves the quality.

Session 4: Friday, May 26 from 2:15 pm – 3:15 pm

A Metacognitive Approach to Remediation
Asha Eapen, University of Illinois at Chicago, ashasara@uic.edu
Co-Authors: Robert Druzinsky, University of Illinois at Chicago, druzinsk@uic.edu, Steven Miller, University of Illinois at Chicago, sfmiller@uic.edu, Alison F Doubleday, University of Illinois at Chicago, adouble@uic.edu
Remediation is a highly complex process involving learners, faculty, and societal factors. Challenges in remediation include faculty availability and interest, and the individualized nature of students' challenges. This poster outlines the reflection-based remediation format that was implemented to provide the opportunity to engage in reflection and to develop metacognitive skills. The overall goal of the activity was to help students understand their own mistakes, as well as develop a strategy for learning and studying for future exams. A secondary goal was to normalize the remediation process so that it was not viewed as punitive, but as an opportunity for learning.

Effective Learning Communities in Online Anatomy and Physiology
Rebecca Burt, Southeast Community College, rburt@southeast.edu
This poster presentation includes strategies for effective structuring of Anatomy & Physiology discussions, suggestions for constructing efficacious prompts, and approaches for building collaboration among students in the online course environment. The author will provide experience-based insight regarding discussions as effective, community-building learning tools for students in online Anatomy & Physiology. For further exploration of topics, a QR code and handout are included to provide attendees access to author-created accompanying digital resources.

Musculoskeletal disorders among Gardeners- A cross sectional study
Subhadip Nandy, Windsor University School of Medicine, subha38@hotmail.com
Gardeners are at increases risk of occupational hazards. Musculoskeletal disorders are common as they exposed to risk factors like unhealthy posture and lifting of heavy weight and need to be assessed to know the health status of the gardeners. this was a cross sectional study done on 80 gardeners. General information of the worker and work related history was enquired using Modified Nordic questionnaire. Anthropometric parameters were recorded. Examination of the gardeners was done. Analysis of Working Posture was done using OWAS method. Low back pain was the commonest musculoskeletal disorder in gardeners. It was followed thigh, ankle and neck pain. Thus gardeners are at increased risk of development of MSD. It may be linked uncomfortable gardening posture during their work.

Content Retention of Cell and Membrane Transport for Physical Education Students
Paul Chahal, MacEwan University, chahalp@macewan.ca
Co-Authors: Raj Narnaware, MacEwan University, narnawarey@macewan.ca
Human physiology is considered a foundational course in the Physical Education program. The objective of the present study was to evaluate content retention of cell and plasma membrane transport for first-year Physical Education University Transfer physiology students over eight weeks. Results show that the knowledge retention was observed to be week-specific, highest in weeks one and three and lower for other weeks. Therefore, content reinforcement can be used as an interventional strategy to improve long-term knowledge retention in Physical Education University Transfer students.
Poster 406
The Efficacy of Cadaver Dissection in Undergraduate Anatomy Education
Kebret Kebede, Nevada State College, kebret.kebede@nsc.edu
Co-Authors: Victor Trandalfir, Nevada State College, victor.trandalfir@students.nsc.edu
Cadaver training offers many benefits to both undergraduate and graduate students. Relying on cadavers as instructional instruments rather than using diagrams, models, photo images or slides, allows students to experience the uniqueness that exists from person to person. During the dissection process, we challenge the students to find the cause of death and the coexisting morbidities. Biology majors and Human Health sciences students (N=89) were surveyed in this study. Those who thought the cadaver experience was very important were 78, whereas those who think that it is not important were 4-Std Deviation 0.85. *

Poster 407
The Implementation of Structured Office Hours as a Central Component of Student Success in A&P courses
Catherine Kirn-Safran, Widener University, cbasafran@widener.edu
John Martin Second Timers Award Winner
Co-Authors: Taylor R. Wise, Widener University, trwise@widener.edu
The A&P two-semester sequence is perceived as hard to master, and higher-than-average D, F, and withdrawal grades often prevent pre-health majors from maintaining the GPA required to progress in the program of their choice. In this poster, a student who attended most regular office hours will share her experiences working with the instructor and peers to utilize office hours efficiently and improve performance on higher-order assessments. In addition, strategies on how students who attend office hours can become study group leaders who influence social factors such as student-instructor trust and classroom community sense of belonging will be presented.

Poster 408
Creating Multimedia Learning Presentations Using Backwards Design for Gross Anatomy
Laurel Moore, University of Illinois of Chicago, lmoore37@uic.edu
Co-Authors: Laurel Moore, University of Illinois at Chicago, lmoore37@uic.edu, Abbey Breckling, University of Illinois at Chicago, abreck2@uic.edu
This student led project created an interactive multimedia classroom exercise to increase student engagement and assessment scores. Using backwards design principles to accommodate different learning preferences, complex brachial plexus (BP) anatomy was transformed into a simple follow along lecture presentation. Students were encouraged to fill a printed template alongside the presentation. A survey was given before and after the exercise to analyze BP knowledge and student perceptions of the exercise. Despite a small sample size (n=21), this interactive lecture was positively received, resulted in significantly increased post survey scores, and will likely be used in future lectures.

Poster 409
Student performance and perceptions of anatomy and physiology across face-to-face, hybrid, and online teaching lab styles
Nicholas Pollock, University of Texas at Arlington, nicholas.pollock@uta.edu
There is a lack of research investigating advantages/disadvantages of hybrid, online, and face-to-face labs styles, something particularly glaring within biological sciences, including A&P. Attendance and grades were compared between face-to-face, hybrid, and online A&P labs and a survey was administered to compare student perceptions and experiences. Hybrid labs had many of the same advantages as online and face-to-face labs, yet few of the disadvantages. Hybrid students reported better experiences, greater satisfaction, and outperformed online students. However, face-to-face students outperformed hybrid students. These findings can inform how to implement, organize, and improve hybrid labs to maximize student learning, achievement, and enjoyment.

Poster 410
How much detail is taught in A&P labs
Ed Griff, University of Cincinnati, edwin.griff@uc.edu
A survey to estimate the amount of detail taught in the labs of introductory year-long A&P courses was administered to A&P lab instructors at 7 local colleges or universities. The survey asked specific questions on: tissues, cardiovascular, urinary, reproductive, and nervous systems. For example, the survey asked which of 7 blood vessels in the kidney were students assessed and how students were assessed on this content. The total number of structures students needed to know for lab exams varied from 80 to 143 and the possible questions (number of structures X assessment approaches) from 104 to 387.

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Poster 411

**Student Participation and Experience in Peer Supplemental Instruction for Anatomy and Physiology at a Minority Serving Institution**

Caroline Hanson, Georgia Gwinnett College, chanson@ggc.edu

*HAPS Conference Travel Award Winner*

Co-Authors: Karen Perell-Gerson, Georgia Gwinnett College, kperellg@ggc.edu, Joshua Webb, Georgia Gwinnett College, jwebb4@ggc.edu, Jerome Lee, Georgia Gwinnett College, jlee102@ggc.edu

Poster 411

Peer Supplemental Instruction (PSI) supports student academic success and provides service learning opportunities for junior/senior level students. A PSI program was developed for Anatomy/Physiology I (API) to offer practical activities on difficult topics. API students were surveyed to determine reasons for non-attendance and perceptions of assistance for those who attended. 94 students responded. 81% of responses cited time conflicts for non-attendance. Of the 29% of students who attended, as a result of PSI sessions, they were able to study more effectively (54%), had increased interest and skill level in course material (56%), and were becoming more independent learners (50%).

Poster 412

**Evidence-Based Instructional Practice (EBIP), Just-in-Time Teaching (JiTT) model**

Amanda Rosenzweig, Delgado Community College, arosen@dcc.edu

An Evidence-Based Instructional Practice (EBIP), Just-in-Time Teaching (JiTT) model, provides a strategy for a personalized education through active learning. JiTT pedagogy uses pre-instruction assignments designed to inform student's knowledge about content prior to class. The instructor uses pre-work results to guide the lesson plan. This allows the teacher to focus on areas the learners find difficult, and not topics students are comfortable with. Students took surveys to identify the perceived impact on content knowledge as a result of implementing prework and JiTT. The preliminary results support the published literature for JiTT as an effective EBIP. Supported through NSF DUE 2111119.

Poster 413

**Active Learning in a Pharmacology Course Promotes Concept Mastery**

Kimberly Jeckel, Colorado State University, kimberly.jeckel@colostate.edu

Pharmacology is an important component of pathophysiology and understanding disease treatments aids students in mastering the related physiological concepts. To provide students with additional methods for understanding course material, the addition of active learning in an undergraduate pharmacology course was implemented. The impact of class activities on student learning and attitudes was analyzed via survey. Students were asked to assess their learning, in relation to active learning, based on their retention and performance in summative assessments. Student perception of improved learning and mastery of pharmacological concepts, through participation in class activities, was supported by their course assessment and survey results.

Poster 414

**HyFlex Supporting Students Where They Are**

Amanda Rosenzweig, Delgado Community College, arosen@dcc.edu

HyFlex - what is it? why use it? Your child is sick. Your car breaks down. You are a veteran having a tough day. These are daily occurrences in the lives of our students. Missing class and falling behind adds stress. Importantly, these events create a domino effect that prevents achieving academic goals. Imagine you can accommodate students at these times? What if you could give them options for meeting class requirements through a hybrid flexible course design and delivery? Would you? Learn how Hyflex delivery mode gives students a choice of where and when to participate.

Poster 415

**Reflection after teaching a problem-based learning (PBL) interdisciplinary course using team-based practices**

Nalini Broadbelt, MCPHS University, nalini.broadbelt@mcphs.edu

Co-Authors: Michelle A. Young, MCPHS University, michelle.young@mcphs.edu, Nevila Jana, MCPHS University, nevila.jana@mcphs.edu, Kristen Petersen, MCPHS University, kristen.petersen@mcphs.edu, Katrina Van Dellen, MCPHS University, katrina.vandellen@mcphs.edu, Martha Gardiner, MCPHS University, martha.gardner@mcphs.edu

A problem-based interdisciplinary premed capstone course focused on Malaria was developed and taught to enhance authentic/real world learning. A total of six instructors participated on this project with specialization in biology, chemistry, and social science. We modeled and observed teamwork skills such as communication, collaborative decision making, problem solving, conflict resolution, respect, tolerance, reliability, planning and organization, engagement, information literacy, and presentation skills. The outcomes from both the instructor and students’ perspective on the successes and the improvements needed will be presented.
Poster 416

Fistula Discovery in Undergraduate Cadaver Dissection Course
Melissa Thompson, Louisiana State University, melissathompson@lsu.edu
HAPS Conference Travel Award Winner
Co-Authors: Meghan Jackson, University of Health Sciences and Pharmacy, Meghan.Jackson@uhsp.edu
Timeline of a student led discovery of a brachiocephalic arteriovenous fistula in undergraduate human cadaver dissection course. Continued student-led inquiry related to cardiovascular and renal systems and clinical procedures and outcomes for pathologies associated with these systems. Background information relative to brachiocephalic arteriovenous fistulas and vascular access for hemodialysis in patients and cadavers.

Poster 417

Effect of fidget spinners in the enhancement of cognitive skills in normal healthy individuals: an Interventional study
Yogesh Kumar, AIIMS Patna, dryogeshk@aiimspatna.org
Co-Authors: Ratandeep Biswas, AIIMS Patna, ratnadeepbis2404@gmail.com, Ruchi Rani, AIIMS Patna, ruchirani11@gmail.com
Those people who fidget may have deficits in fine motor control and cognition. Using Fidget spinners may improve both.
Methods: This study was performed on 30 MBBS students 17-25 years of age. After a baseline assessment of cognitive functions, a 3-week intervention with fidget spinners was done and a repeat assessment of functions was done. Results: Significant improvement in digit symbol matching, picture pairs, multiple object tracking, fast choice, and fast reaction tests is seen. Conclusion: Using fidget spinners may improve all cognitive domains.

Poster 418

Active Learning in Understanding Cell Membrane Transport
Jamie Dalton, Arkansas Tech University, rdalton1@atu.edu
In order to enhance student knowledge of diffusion, osmosis and active-transport across cell membranes, students participate in an activity where they take on the roles of a phospholipid bilayer, a membrane channel, a membrane transporter, water, a small nonpolar solute and a polar solute to simulate the movement of each substance across the membrane given a variety of electrochemical gradient scenarios, and other environmental changes. Students then break into groups to prepare posters or power point presentations to teach the rest of the class either diffusion, osmosis, primary-active transport or secondary-active transport.

Poster 419

Creation of Personal Case Study for an Anatomy & Physiology Course
Jinoh Jang, MCPHS Boston, m0419640@stu.mcphs.edu
Co-Authors: Michelle Young, MCPHS University, michelle.young@mcphs.edu, Nalini Broadbelt, MCPHS University, nalini.broadbelt@mcphs.edu
An educational case study of acne will be presented. Prevalence of acne is the first reason for this case study. Acne concerns most American adolescents. Secondly, severe acne can have a devastating effect on one's physical appearance, especially for teenagers who are developing self-awareness and caring more about their physical appearance. Thirdly, the case study is uniquely based on the author's personal experience with severe acne and its course of treatment. This case study will provide insight of acne development and its role of the integumentary system.

Poster 420

Creation of a Urinary Case Study for an Anatomy & Physiology Course
Ipsita Kadam, MCPHS University, m0448878@stu.mcphs.edu
Co-Authors: Adam Chan, MCPHS University, m0449007@stu.mcphs.edu, Michelle Young, MCPHS University, michelle.young@mcphs.edu, Nalini Broadbelt, MCPHS University, nalini.broadbelt@mcphs.edu
This case study was created for undergraduate Anatomy and Physiology class, which focuses on the kidneys and nephrolithiasis. This case follows a middle-aged female patient who is dealing with calcium oxalate stones due to an unhealthy lifestyle. It guides the audience through the case— from the initial symptoms all the way to the lifestyle changes made by the patient recommended by the healthcare provider. The study discusses the possible causes of kidney stones, the potential signs and symptoms which affect the normal functioning of the urinary system, the usage and interpretation of lab results, and various treatment options of kidney stones.

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**Poster 422**

**To dissect or virtual reality, that is the question**  
Carmen Carrion, Agnes Scott College, ccarrion@agnesscott.edu  
Co-Authors: Nathan Hutcheson, Agnes Scott College, nhutcheson@agnesscott.edu

In the last decade the STEM fields have migrated towards more active and interactive learning environments. Interestingly, with the advancement of digital technology more curriculum has moved towards Virtual Reality (VR). This pilot study explored whether students learn more effectively about anatomy and physiology (A&P) when mastering a module through a VR experience than more traditional experiences such as dissections. A total of 33 undergraduates, from a traditional women's college participated in this pilot study. Modules that were implemented through VR were associated with significantly higher assessment scores. Our findings demonstrated that VR can facilitate learning in A&P.

**Poster 424**

**Utilizing Diagram-Driven Digital Study Tools to Reinforce Anatomical Structure Comprehension**  
Jenna Arkelian, Clovis Unified School District, jennaarkelian@gmail.com

Memorization of anatomical structures requires extensive repetition of viewing and analyzing high-quality anatomical diagrams and visuals. In the age of technology, students are accustomed to utilizing phone applications and online platforms to consume and acquire information. Teachers can take advantage of this by utilizing online platforms to reinforce anatomical concepts that require graphics and visuals. Online platforms provide students with immediate feedback, allowing students to view their score, fix their mistakes, and learn the material instantaneously. These platforms allow educators to instantaneously view a variety of statistics such as student achievement scores, most missed questions, class averages, and student completion rates.

**Poster 425**

**Hypo-Hyperbaric Chamber Facility at Colorado State University**  
Ryan Maresh, Colorado State University, ryan.maresh@colostate.edu

The Colorado State University Hypo-Hyperbaric Chamber Facility (HHCF) allows for long-duration animal, human and equipment protocols. Dual-use capability allows continuous profiles from depths below sea level up to 35,000 feet. Its mission is to provide faculty and students, as well as external entities, the facilities to study the effects of altered pressure environments on a variety of physiological systems and equipment. The chamber is configurable to meet the needs of individual protocols. The proximity to the CSU Veterinary Teaching Hospital, numerous research centers, and other research CSU capabilities makes it a valuable resource for collaborative work.

**Poster 426**

**Ur-ine a “blooming” classroom!**  
Cathy Whiting, University of North Georgia, cathy.whiting@ung.edu  
Co-Authors: Juliza Agrego, University of North Georgia, jabre8149@ung.edu; Ben Carr, University of North Georgia, jbcarr1293@ung.edu; Ethan Cook, University of North Georgia, ecook9301@ung.edu; Emily Harris, University of North Georgia, elharr3935@ung.edu

Join us in this interactive workshop as we engage in a hands-on activity using inexpensive props such as beads, pipe cleaners, and bubble wrap to build a model of a renal corpuscle to explore the structure and function of the filtration membrane. As we build and discuss our model, we will demonstrate several simple techniques that you can use to transform a traditional lecture into a collaborative learning environment. Finally, we will outline a strategy for leveraging Bloom’s taxonomy to facilitate the development of higher-order cognitive skills as students dive deeper into renal physiology.