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ABSTRACTS – POSTER PRESENTATIONS

Anatomy Lab Makeovers: Creation of Multiuse Anatomical Resources
David L. Bolender1*, Todd M. Hoagland1†, Beth B. Krippendorf1*, and Philip N. Redlich2,3*; 1 Department of Cell Biology, Neurobiology and Anatomy, 2 Academic Affairs, and 3 Department of Surgery, Medical College of Wisconsin; Milwaukee, WI * Member of the MCW Society of Teaching Scholars

Introduction: Proper classroom design enhances teaching and learning. Curriculum change prompted construction of dedicated anatomy laboratories. One lab accommodates 215+ M1 students; the other accommodates smaller groups of faculty, residents or advanced anatomy students using embalmed specimens or fresh tissue.

Methods: Laboratory space was designed by a team of faculty, architects and contractors led by a project manager. Faculty visited other schools with newly constructed laboratories to identify features of well-designed spaces. Faculty compiled a list of room features that facilitate innovations in teaching anatomy. Dissection was reaffirmed as central to anatomical teaching, so proper ventilation and task lighting topped the list. Also included were natural lighting, incorporation of newer technologies, locker rooms, and abundant storage for models, specimens and equipment. Finally, the list included an area for in-class demonstrations and CME training with local and video viewing capabilities.

Results: Thorough pre-construction planning resulted in new laboratories that are well-designed for teaching anatomy. The openness of the large laboratory space facilitates student-faculty interaction. Natural lighting, excellent task lighting and good ventilation provide a more pleasant dissecting environment. Abundant white boards, separate classrooms for viewing anatomical models, and large monitors for viewing live or pre-recorded teaching materials enrich the laboratory experience by expanding the number of learning activities. Several biotech companies use the well-designed new laboratory to conduct CME training sessions for faculty and regional physicians. One company plans to hold a yearly workshop in the new facility.

Conclusion: Transition from seasonal teaching in a multipurpose space to a state-of-the-art dedicated anatomy laboratory greatly improved the quality of the teaching experience for faculty, the learning experience for students and flexibility for CME courses.

Level of First Author: Faculty
Topic Category: Anatomy Education
Poster Board # 1

Sources of Professional Socialization Among First Year Medical Students: A Three-year Study of Institutional, Individual, and Peer-group Influences
Todd M. Hoagland1, Mason A. Schmutz2, and William G. Pearson Jr.3; 1 Department of Cell Biology, Neurobiology and Anatomy, Medical College of Wisconsin; Milwaukee, WI; 2 Boston University School of Medicine; Boston, MA; 3 Department Cellular Biology and Anatomy, Medical College of Georgia; Augusta, GA
Purpose: The authors evaluated three sources of influence on professionalism attitudes of medical students during the first semester of medical school including the influence of individuality as indicated by gender, peer group as indicated by class membership, and institution as indicated by exposure to the medical curriculum.

Methods: The faculty administered the Penn State College of Medicine Survey of Professionalism measuring attitude domains of accountability, altruism, duty, excellence, integrity, and respect before and after the first semester of medical school in three consecutive entering classes (2009-2011) at the same institution. Individual student responses were tracked using anonymous identifiers. A repeated measures multivariate analysis of professionalism domains and indicators for individuality, peer-group, and institution was used to determine main and interaction effects. Where indicated, post hoc analysis including t tests with Bonferroni corrections and Cohen’s d determined differences by domain.

Results: Repeated measures MANOVA showed a significant main effect between gender and scales of professionalism attitudes ($F=6.27$, $p=.01$). Before the semester, significant gender differences were noted in the domains of duty and respect, whereas all statistical differences between genders were dissolved at the end of the semester. A significant main effect between rank-orderings of professionalism attitudes and class membership was found ($F=12.68$, $p=.000$), whereas the main effect of time representing the influence of the curriculum was less significant ($F=4.95$, $p=.027$).

Conclusions: The authors concluded that a medical school class functioning as a peer-group may exert a greater influence on professionalism attitudes than either student individuality or the medical school curriculum. The authors have no funding sources to disclose and the Institutional Review Board granted ethics approval for this study.

Level of First Author: Faculty

The Effects of Virtual Microscopy on Learner Performance: A Meta-analysis

Adam B. Wilson PhD\textsuperscript{1}, Melissa A. Taylor MS\textsuperscript{2}, Barbie A. Klein MS\textsuperscript{2}, Megan K. Sugrue BS\textsuperscript{2}, Elizabeth C. Whipple MLS\textsuperscript{3}, and James J. Brokaw PhD\textsuperscript{4}; \textsuperscript{1}Department of Surgery, Indiana University School of Medicine, Indianapolis, IN; \textsuperscript{2}Department of Anatomy & Cell Biology, Indiana University School of Medicine, Bloomington, IN; \textsuperscript{3}Ruth Lilly Medical Library, Indiana University School of Medicine, Indianapolis, IN; \textsuperscript{4}Department of Anatomy & Cell Biology, Indiana University School of Medicine, Indianapolis, IN

Background & Purpose For nearly two decades, a wealth of literature has been published describing the various capabilities, uses, and adaptations of virtual microscopy (VM). Many studies have investigated the effects and benefits of VM on student learning compared to optical microscopy (OM). As such, this study statistically aggregated the findings of multiple comparative studies through a meta-analysis to summarize and substantiate the pedagogical efficacy of teaching with VM.

Methods Teams of paired researchers relied on predefined eligibility criteria to screen the titles and abstracts of relevant VM studies that were retrieved from seven different databases. After two rounds of screening, numerical and thematic data were extracted from the eligible studies for analysis. A summary effect size and estimate of heterogeneity were calculated to understand the effects of VM on learner performance and the amount of variance between studies, respectively. Trends in student perceptions were also analyzed and reported. Results of the 725 records screened, 72 studies underwent full-text review. In total, 12 studies were viable for meta-analysis and all studies were reviewed to extract themes relating to learners’ perceptions of VM. The meta-analysis detected a significant yet small positive effect on learner performance ($SMD=0.28$, $[CI=0.09, 0.47]$, $p=0.003$), indicating that learners experience marked knowledge gains when exposed to VM over OM. Variation among studies was evident as high heterogeneity was reported. An analysis of trends in learner perceptions noted that respondents favored VM over OM by a large margin.

Conclusions Despite many individual studies reporting non-significant findings when comparing VM to OM, the enhanced power afforded by meta-analysis (which allows for the effects of interest to be investigated across
A Kinetic Model for Learning Gross Anatomy

Erica Malone, Michelle Pine D.V.M., Ph.D., Glenda Bingham Ph.D.; Department of Veterinary Integrative Biosciences, The College of Veterinary Medicine and Biomedical Sciences; Texas A&M Univ.; College Station, TX

Visual aids for teaching gross anatomy have commonly been used for identifying structures and understanding some spatial relationships. Thus far, however, these tools have been incapable of demonstrating movement. Using an interdisciplinary approach to creating models that demonstrate movement allows for more valuable tools for learning and teaching gross anatomy. In order to test this concept, an interactive kinetic model of the canine thoracic limb was created. Materials were tested for their ability to mimic anatomical structures such as bones, ligaments, tendons, and muscles. From these materials, a preliminary iteration of the model was constructed. Students enrolled in Biomedical Anatomy, at Texas A&M University, were allowed to interact with the model. The preliminary iteration of the model, while valuable in proving the capabilities of the design, also revealed weaknesses in material strength. A second iteration of the model was then constructed using new, more durable, materials. Students were again allowed to use the model for independent study and were asked to use it to complete an in-lab assignment. Upon completion of the course objectives covering the thoracic limb, the students were given the opportunity to provide feedback on the model via an anonymous questionnaire. Analysis showed that 66.9% of 133 students found the model helpful with concepts related to movement. Advancement of this research includes improvement to material durability and movement capabilities. Similar models for other species, such as equine and caprine, are also an area for expansion.

MCW Online Video Dissector

Douglas Pierce*, Philip Biggs†*, and Todd Hoagland†; †Cell Biology, Neurobiology & Anatomy, Medical College of Wisconsin; Milwaukee, WI *Contributed equally to this project.

Introduction: Using funding through class gifts established by alumni, we have created an online library of dissection videos to further aid MCW Clinical Human Anatomy (CHA) students in their work. Our goal is to help students better understand key structures, improve their dissections, dissect more efficiently, and prepare for exams. In addition, the video library can be used at satellite locations to assist remote anatomy faculty and homogenize the dissection experience MCW provides.

Methods: We dissected a male and female cadaver following the M1 dissection manual, taking instructional video footage at discrete points. The finished dissection videos have been uploaded to an Amazon S3 server where they can be accessed by students through an online portal we created. These videos are accessible through computer, tablet, or smartphone.

Results: Lab group efficacy data will be collected via survey and compared to previous years’ data. Additional objective indicators include website requests timestamped by the Amazon server, practical exam scores, and dissection grades.

Conclusion/Discussion: We hope that our project results in a very useful resource for students in the anatomy lab to achieve listed lab objectives, identify key structures, and improve the quality and efficacy of their work. We also hope to have provided a beneficial study aid to prepare students for the anatomy exams. Early subjective reports from faculty and students at MCW’s new satellite campus in Green Bay indicate that the video library has been immensely valuable in establishing the course.

Funding from MCW Class of 1980.
The Anatomy of E-Learning Tools: Does Software Usability Influence Learning Outcomes?
Sonya Van Nuland, Kem Rogers; Schulich School of Medicine and Dentistry, Western University, London, ON, Canada

Increasing class sizes and a reduction in laboratory hours have increased the popularity of commercial anatomy e-learning tools. It is critical to understand how the functionality of such tools can influence the mental effort required during the learning process, also known as cognitive load. Using dual-task methodology, we examined two anatomical e-learning tools to determine the effect of their design on cognitive load during two joint learning exercises (elbow and knee). ADAM Interactive is a simplistic, 2-dimensional tool that presents like a textbook and utilizes a sliding tab to dissect image layers, while Netters has a more complex 3-dimensional usability that allows structures to be rotated. We hypothesized that longer reaction times on a Stroop visual observation task would indicate a higher cognitive load imposed by the anatomy software, which would interfere with learning.

Undergraduate anatomy students from Western University, Canada (n=70) were assessed using a baseline anatomy knowledge test, Stroop task response times, and an anatomy post-test. Results showed that different software packages had no influence on reaction time or post-test outcomes (reaction times: 1518ms±356 and 1530ms±414; post-test scores: 7.71±2.01 and 7.77±2.01, for Netters and ADAM respectively, p>0.05). Post-test scores differed significantly based on which joint was studied (8.22±1.93 and 7.42±1.62 for elbow and knee respectively), however this was not impacted by the software itself. This suggests that a simple e-learning tool, such as ADAM, is as effective as more complicated tools, such as Netters. The results of this study could constructively inform software developers about future design considerations.

Level of First Author: Graduate/Medical Student
Topic Category: Anatomy Education
Poster Board # 6

Comparison of a Faculty-Taught and Student-Taught Ultrasound Course: Are Students Effective Teachers?
Joelle Gabet BS, Richmond Doxey BS, Ryan Funk BS, Michael Peyton BS, Erich Stauder BS, Caroline Pace MD; Medical College of Wisconsin; Milwaukee, WI

Objective: We propose that second-year medical students can competently perform a Focused Assessment with Sonography in Trauma (FAST) via a peer-taught course.

Methods: Student investigators received ultrasound (US) training under the direction of faculty. Two cohorts of second year medical students were recruited to complete an US curriculum that included online modules, a didactic session, hands-on sessions, and a simulator session, focusing on the anatomy and utility of the FAST. The first cohort was predominantly faculty-taught and the second cohort was student-taught. Students took a timed final exam that included performance of the FAST on a standardized patient (SP) and the simulator. To assess retention, both cohorts performed a FAST exam on a live SP six months later.

Results: There was no significant difference in final exam performance between the cohorts, including gain and depth adjustment and number of structures or abnormalities identified (p>0.05). There was no significant difference in time to completion between the cohorts (p>0.05). There was no difference in satisfaction or confidence between the cohorts (p>0.05). Students in the faculty taught cohort performed significantly better on structure identification and image adjustment at retention (p=.007).

Discussion: Peer teaching of US skills can serve as an effective way to reinforce anatomy and introduce valuable skills to students with minimal strain on faculty resources.

Level of First Author: Undergraduate Student
Topic Category: Anatomy Education
Poster Board # 7
Corneal Repair in Zebrafish
Pascal Lafontant, Julia Roell, Anderson Antoine, Olubusola Shifatu, Blair, Qi Jia; Biology Department, DePauw University; Greencastle, IN

Suboptimal corneal repair from trauma and corrective surgery can result in permanent visual impairment. We developed a new ocular injury model using wild-type and transgenic zebrafish, in order to study the cellular and molecular mechanisms of the corneal repair response. Using light, transmission and scanning electron microscopy, we demonstrate that the thermal ablation of the fish central corneal region results in the epithelium loss, collagen fiber disintegration and keratocytes necrosis in the corneal stroma. Response to this injury consisted first of a robust influx of heterophils in the wound borders in the tg(MPX-GFP) transgenic zebrafish. Wound closure was achieved by 24 hours with a multilayered and edematous epithelium displaying loose intercellular contacts. Stromal and epithelial inflammation persisted several days beyond wound closure. Interestingly in the initial wound periphery, heterophils were found migrating between the orthogonally oriented bundle of collagen, and in apposition to the stromal keratocytes, suggesting heterophil-keratocyte adhesive contacts may provide directional cues for inflammatory cells migration. The gross restoration of corneal tissue structure, the return of keratocytes, and the re-patterning of stromal collagen approaching that of uninjured cornea was observed by day 7. Our study reveals that a dynamic and complex injury response program is orchestrated in the zebrafish cornea upon injury. We demonstrate that zebrafish can be an important model for the investigations of repair and re-patterning mechanisms following corneal injury.

Level of First Author: Faculty
Topic Category: Cell & Tissue Biology
Poster Board # 8

Reliability and Validity of Accelerometry Methods used to Assess Zygapophyseal Joint Vibrations during Motion and Spinal Manipulation
Matthew Budavich¹, Gregory D. Cramer¹, Preetam Bora³, Terry Koo², Dana Madigan¹, and Kim Ross⁴; ¹National University of Health Sciences, Lombard, IL; ²New York Chiropractic College, Seneca Falls, NY; ³Vermeer Corp., Pella, IA; ⁴Canadian Memorial Chiropractic College, Toronto, Ontario, Canada

Novel accelerometry methods have been developed to assess and localize vibrations from zygapophyseal (Z) joint audible sounds (crepitus and cavitations) during normal lumbar motion and side-posture spinal manipulation (SM). This study assessed the reliability and validity of the methods. Methods: A lumbar spine was embedded in silicone in the prone position. Before pouring the silicone, tunnels were created from the posterior aspect of the Z joints to the surface. A specialized mechanical device was lowered into each tunnel and was used to strike the Z joints with a force of approximately 67 N. Ten accelerometers applied in a previously developed pattern were used to localize the specific origin of the joint vibrations. Each joint was struck on three different passes (n=30) while recordings from the accelerometers were made. The order of joint strikes was randomized twice for use in two observation sessions. Two observers blinded to the joint strikes, results of one another, and to their previous results, analyzed the oscilloscope recordings of the accelerometers on two separate occasions to identify the joint from which the vibrations originated. Intra- and inter-observer reliability and validity were calculated. Results: Observer 1 intraobserver reliability: 1.00, validity 1.00; Observer 2 intraobserver reliability: 1.00, validity 1.00; interobserver reliability 1.00. Conclusions: The methods as tested in a highly controlled environment were remarkably reliable and valid and should be further developed and refined for use in human subjects.

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Level of First Author: Graduate/Medical Student
Topic Category: Musculoskeletal
Poster Board # 9
Sacral Hiatus - a normally occurring gap at the lower end of the sacrum, exposing the vertebral canal, due to failure of the laminae of the last sacral segment to coalesce. It is closed by the sacrococcygeal ligament and provides cannular access to the sacral epidural space for administration of anesthetics / caudal nerve blocks.

Aim: Gender wise study to investigate the anatomical variations of sacral hiatus in South-China population with 175 dry sacral bones were used. Anatomical measurements were made with a digital divider-calibrated.

Parameters: 1. Shape of hiatus. 2. Level of apex of hiatus. 3. Level of base of hiatus. 4. Length of hiatus - measured from apex to midpoint of the base. 5. Antero posterior diameter of hiatus at the apex. 6. Transverse width of sacral hiatus at the base - measured between the inner aspect of inferior limit of sacral cornua.

Observations with Inverted U Shape, Inverted V, Dumbbell, Elongated, Irregualar, Agenesis shapes were observed.

This study on the variation in anatomical features of sacral hiatus and the dorsal wall of sacral canal is related with regard to its clinical application in caudal epidural anesthesia. The knowledge of sacral hiatus anatomy is imperative in its clinical situations requiring caudal epidural block for various diagnostic and therapeutic procedures of the lumbosacral spine to avoid failure and dural injury.