Case Western Reserve University – University Program Medical School

Block 7: Action Plan 2022-2023

Year 1 (July – May)

Becoming A Doctor	2 Weeks Anatomy Bootcamp	**The Human Blueprint**	**Food to Fuel**	**Homeostasis**
Block 1 (5 Weeks)		Block 2 (11 Weeks)	Block 3 (9 Weeks)	Block 4 (14 Weeks)
Population Health, Epidemiology, Biostatistics, Health Disparities		Endocrinology, Reproduction, Development, Genetics, Molecular Biology, Cancer Biology	Gastroenterology, Nutrition, Biochemistry	Cardiovascular, Pulmonary, Renal, Cell Physiology and Pharmacology
Field Experiences Assessment Week		Integrative Week Assessment Week	Assessment Week	Clinical Immersion Week Assessment Week
Structure (GARLA and "Systems and Scholarship") Foundations of Clinical Medicine (Tuesday Seminars, Communications, Physical Diagnosis, Patient Based Experiences)				

Year 2 (August- March)

Summer Break (10 weeks)	**Host Defense & Host Response**	**Cognition, Sensation & Movement**	**Step 1 Study (6-8 weeks)**
	Block 5 (13 Weeks)	Block 6 (14 Weeks)	
	Immunology, Microbiology, Hematology, Oncology, Infectious Diseases, Rheumatology, Dermatology	Neurology, Mind, Musculoskeletal	
	Assessment Week	Integrative Week Assessment Week	
	Structure (GARLA and "Systems and Scholarship") Foundations of Clinical Medicine (Tuesday Seminars, Communications, Physical Diagnosis, Patient Based Experiences)		

1. Course Description:

Block 7, or "Structure", is a longitudinal block that starts in Block 1 and continues through Block 6. The major components of Block 7 and the faculty leader(s) for each include: Gross Anatomy, Radiology and Living Anatomy or GARLA (Dr. Wish-Baratz), Histology/Histopathology or HP (Dr. Ziats). Block 7 integrates basic and clinical concepts of these disciplines and a thorough understanding of each will form the framework for the basic mechanisms that underlie health and disease. *The overall learning objective of this longitudinal block is to develop an understanding of macro-, micro-, and ultramicroscopic human structure, nomenclature, imaging techniques, basic physical examination skills related to the topic at hand and the respective functions of normal and diseased organs, tissues, and cells and to view these tissues directly and as accomplished in the clinical setting*. Many believe that all medical science flows from an instinctive appreciation of physiology and pathophysiology.

However, a sophisticated knowledge of anatomy/radiology, biochemistry, cell biology, and basic genetics are requisite for understanding normal physiology as well as pathophysiology. The knowledge of normal gross and microscopic anatomy, as well as imaging (radiology) of these organs and tissues is necessary for appreciation of the relationships between altered structure and disturbed function. Thus, Block 7 bridges normal and diseased, and begins to prepare students for the transition from classroom to ward. If a student conceptually masters the principles of anatomy/radiology, cell biology, histology, genetics, physiology, and pathology (at least), they will have mastered much of the basic science of medicine. This knowledge will be necessary to differentiate the variability (and artifacts) of normal tissues and organs from diseased ones.

Weekly Schedule: Typically, GARLA and HP alternate weeks. In Blocks 2, 3, and 4, the official class time in Block 7 is: HP, 10 - noon on Tuesdays; and GARLA, 10 - noon on either Tuesdays OR Thursdays. During the second year (Blocks 5 and 6), HP class time is: 8-10 a.m. on Tuesdays and GARLA class time is either 8-10 a.m. on Tuesdays OR Thursdays. In addition, faculty experts in Histology and Pathology are available from 8-10am on alternate Thursdays during year one for reviews, or content-derived sessions. Anatomy lectures are posted on canvas. This schedule varies slightly throughout the year, so it is necessary that students consult the weekly schedule on Canvas. (Note: attendance is not required at HP sessions on Thursday mornings, but students are responsible for content; attendance is required at all GARLA sessions.) Figure 1 is the regular schedule for structure (Block 7).

<table>
<tr><th></th><th>Monday</th><th>Tuesday</th><th>Wednesday</th><th>Thursday</th><th>Friday</th></tr>
<tr><td>8-9</td><td rowspan="2"></td><td rowspan="2">Structure M2s
Or
FCM M1s</td><td rowspan="2"></td><td rowspan="2">Structure M2s</td><td rowspan="2"></td></tr>
<tr><td>9-10</td></tr>
<tr><td>10-11</td><td></td><td rowspan="2">Structure M1s
Or
FCM M2s</td><td></td><td rowspan="2">Structure M1s</td><td></td></tr>
<tr><td>11-12</td><td></td><td></td><td></td><td></td></tr>
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Figure 1
Schedule of Block 7 within the WR2 Curriculum

Anatomy Boot Camp:
Prior to Block 2, a dissection boot camp sets the stage for GARLA. This two-week intensive

course takes place on Monday – Thursday either in the morning or in the afternoon. On the first Friday of the Boot Camp, there is a formative practical assessment in the morning and on the final Friday there is a summative practical exam in the morning and the donor memorial service in the afternoon. All dissection activities take place in-person. The 2022 memorial service took place at the Amasa Stone Chapel but was also recorded by CWRU MediaVision so that donor family members who were unable to attend could view the service remotely. First and second year medical students performed at the service that was officiated by Rev. Richard Israel and, as always, he did a masterful job. Boot Camp is very well received by the students.

Anatomy Bootcamp											
Group A (92)	8-8:50am	Dissection Orientation	Dissection Orientation	Dissection Orientation	Dissection Orientation	Formative Practical (Group 1 + 2)	Dissection Orientation	Dissection Orientation	Dissection Orientation	Dissection Orientation	Cumulative Summative Practical (Group 1 + 2)
	9-10:50am	Lab	Lab	Lab	Lab		Lab	Lab	Lab	Lab	
	11-11:50am	Peer Teaching	Peer Teaching	Peer Teaching	Peer Teaching		Peer Teaching	Peer Teaching	Peer Teaching	Peer Teaching	
		Lunch									
Group B (92)	1-1:50pm	Dissection Orientation	Dissection Orientation	Dissection Orientation	Dissection Orientation		Dissection Orientation	Dissection Orientation	Dissection Orientation	Dissection Orientation	Required Memorial Service at Amasa Stone Chapel
	2-3:50pm	Lab	Lab	Lab)	Lab		Lab	Lab	Lab	Lab	
	4-4:50pm	Peer Teaching	Peer Teaching	Peer Teaching	Peer Teaching		Peer Teaching	Peer Teaching	Peer Teaching	Peer Teaching	

Figure 2
Boot Camp Schedule (Class of 2025)

2. **Block Co-Leaders:**
   Nicholas Ziats, Susanne Wish-Baratz

3. **Design Team:**
   Nicholas Ziats, Susanne Wish-Baratz, Navid Faraji, Robert Jones, Greg Nemunaitis, Scott Simpson, Darin Croft, Andrew Crofton, Jay Costantini, Patti Quallich, Nivo Hanson (when needed), Kathy Dilliplane, Sally Baraka, and Rebecca Enterline.

4. **Block Goals: GARLA**

Competency and Definition	Educational Program Objective (EPO)	Block Goals Block 7	Recommended Changes
Knowledge for Practice Demonstrates knowledge of established and evolving biomedical, clinical, epidemiological, and social-behavioral	Demonstrates ability to apply knowledge base to clinical and research questions Demonstrates appropriate level of clinical and basic science knowledge to	-Develop a three-dimensional understanding of the structure of the human body. -Apply this knowledge during their clinical clerkships and, ultimately, in the practice of medicine.	No change recommended

sciences as well as the application of this knowledge to patient care	be an effective starting resident physician	-Understand the role of various radiological imaging modalities in the diagnosis and treatment follow-up of diseases. Develop a foundation for interpretation of radiological images.	
Knowledge for Practice Demonstrates knowledge of established and evolving biomedical, clinical, epidemiological, and social-behavioral sciences as well as the application of this knowledge to patient care	Demonstrates ability to apply knowledge base to clinical and research questions Demonstrates appropriate level of clinical and basic science knowledge to be an effective starting resident physician	Integrate the anatomy, imaging anatomy, pathophysiology, and pharmacologic treatment of the respiratory system with general homeostasis.	No change recommended
Competency and Definition	**Educational Program Objective (EPO)**	**Block Goals Block 7**	**Recommended Changes**
Common to all Blocks:			
Teamwork & Interprofessional Collaboration Demonstrates knowledge and skills to promote effective teamwork and collaboration with health care professionals across a variety of settings	Performs effectively as a member of a team	Develop and practice the knowledge and skills that promote effective teamwork across a variety of settings.	No change recommended
Professionalism Demonstrates commitment to high standards of ethical, respectful, compassionate, reliable, and responsible behaviors in all settings, and recognizes and addresses lapses in behavior	Commonly demonstrates compassion, respect, honesty, and ethical practices Meets obligations in a reliable and timely manner Recognizes and addresses lapses in behavior	Understand and practice the behaviors of an ethical, respectful, compassionate, reliable, and responsible physician.	No change recommended

Interpersonal & Communication Skills Demonstrates effective listening, written and oral communication skills with patients, peers, faculty and other health care professionals in the classroom, research, and patient care settings	Uses effective written and oral communication in clinical, research, and classroom settings Demonstrates effective communication with patients using a patient-centered approach Effectively communicates knowledge as well as uncertainties	Understand and demonstrate effective communication skills for learning and clinical practice environments.	No change recommended
Competency and Definition	**Educational Program Objective (EPO)**	**Block Goals Block 7**	**Recommended Changes**
Research & Scholarship Demonstrates knowledge and skills required to interpret, critically evaluate, and conduct research	Analyses and effectively critiques a broad range of research papers Demonstrates ability to generate a research hypothesis and formulate questions to test the hypothesis Demonstrates ability to initiate, complete and explain his/her research	Analyze, critique, and present research studies from the primary literature. Conduct research studies as feasible and appropriate.	No change recommended

4. **<u>Block Goals:</u> HISTOPATHOLOGY**

Competency and Definition	Educational Program Objective (EPO)	Block Goals Block 7	Recommended Changes
Knowledge for Practice Demonstrates knowledge of established and evolving biomedical, clinical, epidemiological, and social-behavioral sciences as well as the application of this knowledge to patient care	Demonstrates ability to apply knowledge base to clinical and research questions Demonstrates appropriate level of clinical and basic science knowledge to be an effective starting resident physician	Develop a three-dimensional understanding of the structure of the human body. Apply this knowledge during their clinical clerkships and, ultimately, in the practice of medicine. Understand the role of various radiological imaging modalities in the diagnosis and treatment follow-up of diseases. Develop a foundation for interpretation of radiological images.	No change recommended
Knowledge for Practice Demonstrates knowledge of established and evolving biomedical, clinical, epidemiological, and social-behavioral sciences as well as the application of this knowledge to patient care	Demonstrates ability to apply knowledge base to clinical and research questions Demonstrates appropriate level of clinical and basic science knowledge to be an effective starting resident physician	Be able to compare and contrast normal histology of organs and tissues to diseased organs and tissue. Be able to evaluate organ and tissue histology/histopathology using virtual microscopy.	Added new VM images system called PathPresenter on January 1, 2022. All Assessments and Lectures and Reviews revised to new system and formatting. New system introduced in July of 2023, Elentra, do all over again for Assessments
Knowledge for Practice Demonstrates knowledge of established and evolving biomedical, clinical, epidemiological, and social-behavioral sciences as well as the application of this knowledge to patient care	Demonstrates ability to apply knowledge base to clinical and research questions Demonstrates appropriate level of clinical and basic science knowledge to be an effective starting resident physician	Be able to compare and contrast normal physiology versus pathophysiology of organ systems. Understand a) the role of the kidney in maintaining homeostasis, b) the interaction of the kidneys with other organ systems, and c) the pathophysiology of the major categories of renal disease and the pharmacologic agents used to treat them.	**No change recommended**

		Understand a) normal cardiovascular physiology and cell function and b) how cardiovascular diseases & pharmacologic therapies alter normal cardiac physiology and function at both the organ and cellular levels.	
Knowledge for Practice Demonstrates knowledge of established and evolving biomedical, clinical, epidemiological, and social-behavioral sciences as well as the application of this knowledge to patient care	Demonstrates ability to apply knowledge base to clinical and research questions Demonstrates appropriate level of clinical and basic science knowledge to be an effective starting resident physician	Integrate the anatomy, imaging anatomy, pathophysiology, and pharmacologic treatment of the respiratory system with general homeostasis.	**No change recommended**
Common to all Blocks:			
Teamwork & Interprofessional Collaboration Demonstrates knowledge and skills to promote effective teamwork and collaboration with health care professionals across a variety of settings	Performs effectively as a member of a team	Develop and practice the knowledge and skills that promote effective teamwork across a variety of settings.	**No change recommended**
Professionalism Demonstrates commitment to high standards of ethical, respectful, compassionate, reliable, and responsible behaviors in all settings, and recognizes and addresses lapses in behavior	Commonly demonstrates compassion, respect, honesty, and ethical practices Meets obligations in a reliable and timely manner Recognizes and addresses lapses in behavior	Understand and practice the behaviors of an ethical, respectful, compassionate, reliable, and responsible physician.	**No change recommended**

Interpersonal & Communication Skills Demonstrates effective listening, written and oral communication skills with patients, peers, faculty and other health care professionals in the classroom, research, and patient care settings	Uses effective written and oral communication in clinical, research, and classroom settings Demonstrates effective communication with patients using a patient-centered approach Effectively communicates knowledge as well as uncertainties	Understand and demonstrate effective communication skills for learning and clinical practice environments.	**No change recommended**

5. **In the grid below, please list the specific course changes you made this year based on last year's report**.

What changes were made 2022-2023?	How did the changes work?	How will you follow-up on these changes next year 2023-2024?
Block 1 GARLA: Based on student feedback, GARLA piloted a new format for Block 1. SCME reps as well as an M1 and M2 worked with SWB to completely rewrite/rearrange the facilitator guides as well as the practicums and modules. We piloted this as a Quality Improvement Study. Kelli Qua assisted us in all stages of the project and Dr. Ever Mkonyi from Medical Education Research and Evaluation (MERE) is assisting us in the evaluation process.	First-year students and second-year peer facilitators were surveyed. Some also participated in focus groups. We have not completely evaluated the data, but it seems that student feedback was mixed.	We intend to thoroughly evaluate the data and attempt to make decisions/changes in next year's curriculum based on student/ peer facilitator feedback.
Blocks 1-6 GARLA: All material was reviewed and updated for Elentra All lab guides were edited to fit a homogeneous template.	Reviewing all of the posts that had been on Canvas was worthwhile. However, the learning objectives become alphabetized in Elentra which took them out of a logical order. All lab guides are now a similar format.	We will ensure that the learning objectives are presented as a single objective with subsections so that they remain in a logical sequence. If lab guides are updated, they will maintain the same general format.

What changes were made 2022-2023?	How did the changes work?	How will you follow-up on these changes next year 2023-2024?
Boot Camp: Scrubs: Cintas laundering was replaced by Aramak. During boot camp, there were still days with scrubs distribution issues. Aramak had been hired to remedy these problems. They had committed to overcoming the logistical hurdle of the medical student demand during boot camp by increasing the turnaround to two deliveries each week and filling in the shortfall with disposable scrubs. We also asked that students order a specific size (in advance of matriculating) and encouraged them to commit to taking only that size.	There were still complaints and shortages that were compensated for with disposable scrubs. Another issue was that students were "messy." There were days when David Peck found "scrubs and hangers laying everywhere." We will have to find a solution for this since cleaning up the student lounge each day is not part of the ARO arrangement. Because they are in close proximity to the space David's team has done some monitoring of the situation.	David Peck, Director of Support Services, will continue to work towards a solution that will inevitably include disposable scrubs. The support staff in the Anatomy department (Kelly and Sally) are working on a plan so that once the new anatomy space is complete there will be better space to monitor scrubs distribution and collection.
Block 6 HoloAnatomy: The structure lists were integrated into the lab guides and the formatting was homogenized to match other blocks. We also added some "quiz yourself" structures at the end (I think last year was the first for that). For this year, Darin will try to do some brief additional recordings for students (details still TBD) **Radiology** we shifted from a lecture format to a more case-based format, with the lecture slides presented as background material.	Students seemed to appreciate the changes. For radiology, the changes were well-received, but it would be better with more facilitators.	Depending on student feedback, adaptations will be made. Radiology, Jay plans to get one or more residents to assist this year.
Block 6 Living Anatomy (LA): This was the first in-person year for a couple of our sessions (since we had a COVID relapse in early 2021). For this year, we are changing nearly all of the sessions to some degree, partly because we are changing the order of the first three GARLA sessions to try to "front load" more of the neuroanatomy and to put the head/neck anatomy into a more logical sequence. GARLA 6.1 LA will stay the same, with neuro residents facilitating CN exams with students.	The first in-person sessions both went well.	TBD

GARLA 6.2 will have students reviewing basicranial skull anatomy with Anatomy faculty and TAs in small groups using real skulls. (There is no good way to do basicranium in living patients.) GARLA 6.3 will be ophthalmology as it was before, but we will have residents practicing fundoscopic exams and other PD skills with students (previously it was more didactic, but the faculty member who did that left UH, so the timing was good for a change). GARLA 6.4 will be otoscopic exam PD skills with two ENT faculty (we purchased otoscopes that students can use). GARLA 6.5 will be oral exam and demonstration of voice and swallow with two ENT faculty.		
Block 6: Due to changes in the MD calendar, the Structure Exam will be moved	TBD	TBD
Block 6 Neuroanatomy: Plans were completed for a neuroanatomy gross brain dissection day.	A neuroanatomy brain dissection day was approved for the 2023-2024 academic year.	We will begin this mandatory neuroanatomy laboratory with gross brain specimens in Week 1 of Block 6, 2023.
Blocks 2-6 GARLA: HoloLens practical exams continued to be administered remotely. GARLAQs continued to be administered in-person. Policies were put in place to ensure that students would be prepared and independent in setting up and using the technology at the time of the remote practical exams. Kathy Dilliplane and her colleagues from the Office of Assessment in OCA created Standard Operating Procedures for Test Administration using HoloLens (Appendix A). Students in Blocks 2, 5 and 6 were required to participate in remote practice practical exams. The goal was for students to practice in the space where they take their exams. (Blocks 3 and 4 were optional.)	By requiring the practice practicals, no students (in blocks 2 and 5) had anchoring problems (although some students had other problems such as lenses that weren't charged or mechanical difficulties that weren't the students' responsibility).	We will monitor the situation and make adaptations as needed. We will also continue requiring practice practicals in Blocks 2, 5 and 6 and will see if we need to add required practice practical exams in Blocks 3 and 4.

Blocks 2-6 GARLA: A policy was put in place to provide students with a practical exam on campus on the day of the exam in cases where students miss 10 or more questions due to unpreventable technical issues.	8 students came in during Block 2 and one student during Block 5	We will continue to follow this protocol moving forward.
Block 4 Living Anatomy: Dr. Jones felt that for some first-year students, 2D echocardiograms were difficult to understand because they had trouble mentally converting the ultrasound images into the 3D images they were accustomed to. To help with this, we formed a team and received a Think{box] Faculty Fellowship grant to produce 3D printed heart models of the various cardiac sections viewed on ultrasound. We introduced the models into the Block 4 Living Anatomy cardiac sessions as a pilot study where half the class received the 3D printed hearts and the other half received digital 3D PDF templates of the same cardiac sections.	Students preferred the 3D printed models, but their learning retention (quantitative performance) was not different from the PDF control group on a delayed posttest.	We will provide all students with both the 3D printed hearts and PDF templates in the future.

6. In the grid below, please list the specific course changes you made this year based on last year's report.

What changes were made 2022-2023?	**How did the changes work?**	**How will you follow-up on these changes next year 2023-2024?**
Histopathology: Blocks 1-6, reviews were still done by Zoom, lecture were done in-person	Zoom seems to work for reviews although attendance is low, average is 5-10 students as year progressed	Will continue with same faculty, some faculty have moved so replacements have been made in Blocks 3
Histopathology: New VM imaging system called PathPresenter	Changes acceptable but system has issues with UH system	PathPresenter system is more robust so more public slides to be used
Donor Memorial Service: The 2023 memorial service took place in person at the Amasa Stone Chapel. It was also recorded by CWRU MediaVision so that donor family members who were unable to attend could view the service remotely.	Several donor family members who could not attend the service in person were grateful for the opportunity they had to view the service remotely.	We will continue to record the service in 2024.
GARLA Blocks 2-6: All GARLA lab guides were updated and include summary	The M2s have consistently indicated that this is the format	Unless we have clear feedback indicating that a change is

questions following many of the air taps. Per student feedback, HoloAnatomy now begins with a brief overview that is followed independent small group work. Faculty circulates to answer questions.	they prefer. The M1s appear to be equivocal.	needed, we will continue using the current format.
Block 5 Living Anatomy: Greg Nemunaitis (PM&R CCF) instructed in all Block 5 Living Anatomy sessions and brought 8 residents to each session. He reduced the number of physical exam tests that were covered.	Sessions were well received.	Dr. Nemunaitis will continue teaching the most important clinical exams during Block 5. (Ultrasound is being covered in Block 8.)
Dr. Jay Costantini (CCF) continued to provide all radiology in Block 6 GARLA. He did not use MRI Master.	Dr. Costantini had planned to use "MRI Master" but ended up not doing so in 2022-2023. Instead, he used PowerPoints as the class atlas. He has determined that "MRI Master" would be a good supplement but that his custom PowerPoints are preferable because they are "complete and organized to the course which make navigation of the anatomy easier…All the neuroanatomy and Head and Neck anatomy are T2 only weighting and much of the pathology we review is evaluated with CT."	Dr. Costantini will ask his TAs for their feedback (one M4 and 2 radiology residents). He will adjust as needed.

6. **What changes do you anticipate making to the Block next year (AY 2023-2024)?**

- Evaluate changes made in Block 1 and determine how to proceed
- Implement gross brain dissection day in Block 6
- In Block 4 Living Anatomy, we will provide all students with 3D printed hearts and the 3D PDFs
- For HP, additional slides to add or replace

7. **What successful, innovative components of your block are best practices that you would like to share with the other Blocks?**

- Think{box] Faculty Fellowship grant
    - There are a multitude of ways that 3D printing can be used to communicate difficult concepts visually, and all faculty members have the opportunity to take advantage of the resources at Think{box] to do so.
- For HP, we have been able to correlate Histopathology within the context of the blocks as well as IQ cases, students have commented that this is important in feedback and EOB feedback. Clinical Immersion Histopathology Gross session in Block 4 was well received,

attendance was mandatory, note: attendance to all other Histopathology sessions are not mandatory

8. **What specific changes (lectures, TBL, IQ cases, other) do you plan to make to the course next year?**

Changes anticipated for next year	Reason for changes (evidence)
Possible changes in the format of Block 1 GARLA	Students were unhappy with the original format.
Histopathology-	None anticipated, although new Elentra system projected for July 2023

9. **Please review your Block objectives. Have you added or deleted major concept areas to your Block?**

No

10. **Did formative and summative assessment in the Block support achievement of block objectives?**

Yes

What specific changes do you plan to make to the course next year?

Changes anticipated for next year	Reason for changes (evidence)
Block 2 Living Anatomy: Gladys Stefanek, a Clinical Nurse Specialist from the Breast Center at UH will be stepping down from running the Living Anatomy Breast session in Block 2.	Mollie Marcus a PA from CCF overlapped with Gladys this year and will take over in the 2024-5 academic year.
B4 Living Anatomy: All students will be exposed to 3D printed hearts (as well as 3D PDFs) in all of the Block 4 cardiac sessions.	Dr. Jones felt that for some first-year students, 2D echocardiograms were difficult to understand because they had trouble mentally converting the ultrasound images into the 3D images they were accustomed to.
Histopathology	Minor changes with lectures/reviews with new faculty. Will need to update assessments based on new faculty

11. **Describe how faculty teaching quality was reviewed for your block. What faculty development opportunity was offered in response to student feedback?**

Faculty teaching quality was assessed via student feedback at the end of each block. Students appreciate small group teaching with residents for Living Anatomy and Radiology. Students prefer small group independent learning instead of a more formal lecture format in HoloAnatomy. Lab guides were rewritten per student feedback. Students appreciate access to teaching assistants during Boot Camp.

Histopathology: Histopathology Faculty evaluations at mid- and end -of block, also at feedback sessions. Faculty evaluations reviewed by Block leader and discussed with individual faculty

members. Note: very low level of input from students, most often zero evaluations or one to two evaluations. Feedback sessions indicated only minor concerns from students.

12. Response to PEAC Report

No new recommendations from PEAC were received for GARLA or HP

13. Scholarly Accomplishments

Publications:

1. Kurian, M., Tomlinson, B., Martin, J.M. Wish-Baratz, S. (2022) Incorporation of Virtual Reality in Bone Marrow Biopsy Training: A New Frontier of Learning. *Blood* 2022; 140 (Supplement 1): 13061–13062. doi: https://doi.org/10.1182/blood-2022-170187.
2. O'Neill, S.*, Galbraith, G., Enterline, R.*, Wish-Baratz, S. Superimposed Mixed Reality Anatomy: A Bridge Between the Virtual and Physical. Accepted for publication, Medical Science Educator, February 27, 2023.
3. Winter, E.P.*, Sammarco, J.*, Hua, V.,* Martinez, O.M.,* Xiao, T.,* Wish-Baratz, S. "Anatomy Camp: A Medical Student- Medical Student-Run Outreach Program. Accepted for publication, Medical Science Educator, November 2023

Presentations:

1. "Invited Speaker American Society of Neuroradiology "ASNR23" 61st Annual Meeting. Chicago, Ill. 04/ 2023.
2. Galbraith, G., Potter, K., Linebach, J., Wish-Baratz, S. "Pilot use of Mixed Reality Holographic Anatomy in Dance Anatomy/Kinesiology." Oral Presentation, 2022 International Association for Dance Medicine & Science (IADMS) conference, Limerick, Ireland, 10/2022.
3. Xiao,T., Crofton, A. Sathishkumar, B., Enterline, R., Wish-Baratz, S. "Novel Application of a Mixed-Reality Platform for Learning Neuroanatomy." Oral Presentation, Congress of Neurological Surgeons (CNS), Washington, DC. 09/2023.
4. Sarnaik, K., Ramasamy, V., Jones, R., Wish-Baratz, S. "Utilization of 3D-printed Technologies to Assist Anatomic and Clinical Understanding of Cardiac Sonography in Medical Students." Oral Abstract, 8th World Congress on Ultrasound in Medical Education, Detroit, MI. 09/23.
5. Galbraith, G., Potter, K., O'Neill, S., Wish-Baratz, S. "Using Augmented Reality Holographic Anatomy in Dance Screening Education." 45-minute Interactive Workshop Session, Columbus, OH. 10/23.

Grant Support

1. 2022 Think[box] Faculty Fellowship (TFF) Case Western Reserve University. Project "Utilization of 3D-Printed Heart Models to Supplement Medical Student Understanding of Anatomy," Susanne Wish-Baratz, PI. $8,700.
2. 2022 Steven Garverick Innovation Incentive Program. Project "Develop a HoloLens training Module for implanting paraspinal stimulating electrodes that restore trunk muscle function after paralysis," Susanne Wish-Baratz, collaborator $10K + HoloAnatomy

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We could not have realized this curriculum without the devotion of the GARLA design team and anatomy faculty and staff including: Navid Faraji, Darin Croft, Scott Simpson, Andy Crofton, Bryan Singelyn, Rebecca Enterline, Sally Baraka, Bob Jones, Anastasia Rowland-Seymour, and

Lisa Navracruz, Navid Faraji, Greg Nemunaitis, Jay Costantini, Kyle Scarberry, Gladys Stefanek, Mollie Marcus, Stacie Jhaveri and all of the M4s, residents and attending physicians who assisted them during GARLA.

We thank Patti Quallich for all her efforts and patience to make Block 7 a success. We also thank Nivo Hanson for her assistance with Block 7. Special thanks to Minoo Darvish who worked to figure out the scheduling for this extremely complex curriculum.

Many thanks to Kathy Dilliplane who has been invaluable in their support and assistance during the exam process. Rebecca Enterline, Sally Baraka, and the anatomy teaching assistants for the enormous effort they put forth during the many exam procedures (i.e., set-up, administration, and grading).

We are grateful for the help of all members of UTech and particularly Victor Guinto, Diana Nguyen, and Paul Salzgeber. We could not run the course or exams without them.

We also want to thank the team at the Sim Center (Daniel, Andrea, Drew, Howard, Karen, Christie) for their support around ultrasound and Jean Seneff for providing the space required at the old SOM and HEC.

Thank you to Kunaal Sarnaik and Vishnushankar Viraliyur Ramasamy for taking responsibility for 3D printing the hearts and preparing the PDFs.

Finally, we want to thank our SCME representative Nate Cowan, who worked with his class to guide us and assist us in improving the curriculum and supported us when we needed student input.

Appendix 1

Standardized Operating Procedures for Test Administration using HoloLens (6/6/2023)

Test administration should provide equal opportunities for all students to demonstrate their knowledge and skills, take the test in any form, at any time, and from any location. Test security is a major consideration in test administration to minimize threats of construct-irrelevant variance to the validity of test score interpretations due to systematic or random error. Administration practices protect the security of the test and help to maintain the meaning and integrity of each test score for each item. The designated chief proctor along with supporting staff (e.g., IT support staff, anatomy teaching associate) manage the proctoring.

While the staff members offer technical assistance throughout the test administration, it is the sole responsibility of the students to ensure that their webcam, microphone, laptop, off-campus WiFi connection, and HoloLens are all functioning correctly. The specific practices for test administration are as follows:

- The Office of Assessment from OCA takes the responsibility of centrally coordinating testing dates, schedules, and staffing. Every effort is made to arrange these elements as early as possible, with special attention given to those who require test accommodations. The following schedule will be used for AY23-24:
    - 8:00 - 9:00: morning Group 1
    - 9:30 - 11:00: students requiring 1.5x time
    - 1:00 - 3:00: student requiring 2x time
    - 3:30 - 4:30: afternoon Group 2
- Utech provides on-site technical support during the designated time frame.
- To minimize random errors during test administration and ensure familiarity with HoloLens, students are required to participate in training sessions during Block 2 and Block 5 within the scheduled time. Students are also recommended to attend training sessions in other blocks.
- Students who have continuous issues during the HoloLens exams will be required to take training sessions to minimize random errors during the test administration.
- Students who have not demonstrated proficiency in operating their HoloLens or have not taken adequate steps to ensure their technological equipment is in good working order may be required to take their exam under alternate testing conditions or on a different date.
- Failure to adequately prepare for the technological aspect of the exam will be considered a lapse in professionalism and handled accordingly.
- In cases where students miss 10 or more questions due to unpreventable technical issues, an additional test administration will be offered on campus within the same day.
- Due to resource constraints, the number of students permitted to take the exam on campus simultaneously is limited to no more than 5.
- The Office of Assessment takes measures to ensure test security throughout the administration process. It is essential to strictly adhere to testing instructions, time limits, and guidelines pertaining to test materials and equipment.