7th International Conference of the Association of Biochemistry Educators (ABE)

Westward Look
Wyndham Grand Resort & Spa
Tucson, AZ
May 5th - 9th, 2019

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Agenda

Sunday, May 5th

8:00 am – Noon **ABE Board Pre-Conference Business Meeting.....Mesa Room**

Noon – 1:00 pm **ABE Board Lunch**

3:00 – 6:00 pm **Registration Desk Open.....Sonoran Foyer**

6:00 – 7:30 pm **Welcome Reception with Taco Bar .....Sonoran Rooftop**

7:30 – 8:00 pm **Welcome to ABE 2019**

Greetings and Introductions
- Susan Cline, PhD – ABE President

Nominations for ABE Board Openings and Election Process
- David Franklin, PhD – ABE Nominating Committee Chair

Nominating Committee Members
Robert Bateman, PhD
Selina Noramly, PhD

Note: There are six Member-at-Large Board positions to be filled by the membership. Nominations may be submitted by email to the Nominating Committee Chair until Monday, May 6th at 1:00 pm. Nominated members should provide an approximately 200-word biography and a photograph to be used on the ballot.
David Franklin, PhD franklin@tulane.edu

Voting will open at 8:00 am on Tuesday, May 7th and will close at 10:30 am on Wednesday, May 8th. All ABE members, who have paid 2019 dues, are invited to participate in voting for the new Board members regardless of meeting attendance.

Newly elected members will be announced on Wednesday at the beginning of the afternoon session, and officers will be chosen at the first meeting of the new Board on Wednesday afternoon.

Monday, May 6th

7:00 – 8:00 am **Continental Breakfast.....Sonoran Patio**

ABE Business Meeting (*All ABE members, bring your breakfast*)….Javelina Room

7:30 – 7:50 am **State of the ABE Address**
• Susan Cline, PhD – ABE President

7:50 – 8:00 am **ABE Finance Report**
• Sage Arbor, PhD – ABE Treasurer

Plenary Session I
Teaching and Learning Concepts and Strategies…….……Javelina Room

Co-Chairs: Susan Cline, PhD – Mercer University School of Medicine
Jana Simmons, PhD – Michigan State University College of Human Medicine

8:00 – 9:00 am **Using Self-Regulated Learning Theory to Assess and Remediate Struggling Learners**
Plenary Speaker **(S-01)**

• Mary Andrews, MD, MPH, FACP – Uniformed Services University

9:00 – 10:30 am **Why Does This Learner Perform Poorly on Tests? Using Self-Regulated Learning Theory to Diagnose the Problem and Implement Solutions.**
Workshop **(S-02)**
• Mary Andrews, MD, MPH, FACP – Uniformed Services University

10:30 – 10:45 am **Break**

10:45 am – Noon **Aligning the Metabolic Map with the Developmental Stage of the Learner: Navigating Towards a More Clinically Useful Metabolic Map**.
Panel discussion **(S-03)**
• Tracy Fulton, PhD – University of California San Francisco
• Tina Cowan, PhD – Stanford University
• Janet Lindsley, PhD – University of Utah
• Debra Regier, MD, PhD – Children's National Medical Center

Noon – 1:00 pm **Lunch.....Sonoran Patio**

Breakout Session I

Co-Chairs: Eric Niederhoffer, PhD – Southern Illinois University School of Medicine
Sage Arbor, PhD – Marian University College of Osteopathic Medicine

1:00 – 2:30 pm

A. Use of Analogies to Integrate Basic and Clinical Science
Workshop **(S-04) .....Javelina Room**
- Tracy Fulton, PhD – University of California San Francisco
- Susan Cline, PhD – Mercer University
- Michael Dell, MD – Case Western Reserve University
- James Nixon, MD – University of Minnesota

B. Use of Power Apps to Enhance and Complement Traditional Medical School Content Delivery
Workshop **(S-05) .....Coyote Room**
- Paul Chastain, PhD – University of Illinois

2:30 – 2:45 pm **Break**

Breakout Session II

Co-Chairs: Emine Abali, PhD – City University of New York School of Medicine
Susan Viselli, PhD – Midwestern Univ, Chicago College of Osteopathic Medicine

2:45 – 4:15 pm

A. The Rubik's Cube of Fitting Biochemistry into Integrated Medical Curricula
Workshop **(S-06) ……Javelina Room**
- Kristie Bridges, PhD – West Virginia School of Osteopathic Medicine
- Joseph Fontes, PhD – University of Kansas
- David Franklin, PhD – Tulane University
- Selina Noramly, PhD – University of Virginia
- Peter Ronner, PhD – Jefferson, Sidney Kimmel Medical College

B. What do Pharmacy Students Need to Know about Biochemistry?
Panel discussion **(S-07) ……..Coyote Room**
- Kevin Kearney PhD – Massachusetts College of Pharmacy
- Danielle Cruthirds, PhD – Samford University
- Melany Puglisi, PhD – Chicago State University
- Esther Black, PhD – University of Kentucky
- Pramod Mahajan, PhD – Drake University

Breakout Session III
Education Discussion Groups

4:15 – 5:00 pm

A. What Role Does Biochemistry Content and Concepts Play in Critical Thinking and Clinical Practice?
Education discussion group **(S-08) ……..Coyote Room**
- Eric Niederhoffer, PhD – Southern Illinois University

B. The Influence of Student Motivation and Learning Strategies on How They Perceive the Benefit of Active Learning Sessions.

Education discussion group **(S-09) ……. Javelina Room**

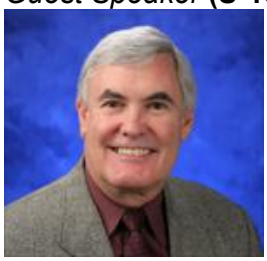
- Martha Faner, PhD – Michigan State University College of Osteopathic Medicine
- Ah Ra Cho, PhD – University of Arizona College of Medicine
- Carol Wilkins, PhD – Michigan State University College of Osteopathic Medicine

5:00 pm **Explore Tucson! Dinner on Your Own**

Tuesday May 07

7:00 – 8:00 am **Continental Breakfast..... Sonoran Patio (ABE Special Interest Group Tables)**

8:00 – 8:30 am **Association of Medical Graduate Departments of Biochemistry Presidential Address**
Guest Speaker **(S-10) …….....Javelina Room**



• James Broach, PhD – Pennsylvania State University
President, Association of Medical and Graduate Departments of Biochemistry (AMGDB)

Plenary Session II
Educational Research and Scholarship……..…… Javelina Room

Chair: Danielle Cruthirds, PhD – Samford University McWhorter School of Pharmacy

8:30 – 9:30 am **Designing Qualitative Research Studies**
Plenary Speaker **(S-11)**

• Janet Hafler, EdD - Yale University

9:30 – 10:30 am **Impact of the Pathways of Human Metabolism Map on Students' Perceptions of Learning Biochemistry: Experiences across Various Schools.**
Panel discussion **(S-12)**
- Zeynep Gromley, PhD – Lincoln Memorial University
- Emine Abali, PhD – City University of New York
- Douglas Spicer, PhD – University of New England
- Tina Cowan, PhD – Stanford University
- Tracy Fulton, PhD – University of California San Francisco

10:30 – 10:45 am **Break**

10:45 – 11:55 am **ABE Question Bank Review**
Workshop **(S-13)**
- Sage Arbor, PhD – Marian University College of Osteopathic Medicine

- Judith Binstock, PhD– Touro College of Osteopathic Medicine
- Zeynep Gromley, PhD – Lincoln Memorial University
- Pasquale Manzerra, PhD – University of South Dakota
- Douglas Spicer, PhD – University of New England

11:55 am **Group Photograph (all meeting attendees).....Sonoran Patio**

Noon – 1:00 pm **Lunch .....Sonoran Patio**

Breakout Session IV

Co-chairs: Robert Bateman, PhD – William Carey Univ College of Osteopathic Medicine
Joseph Fontes, PhD – University of Kansas Medical Center

1:00 – 2:30 pm **A. Introduction to Designing Qualitative Research Studies: A Hands-on Workshop.**
Workshop **(S-14) ..... Javelina Room**
- Janet Hafler, EdD – Yale University

1:00 – 2:30 pm **B. Advance Organizers for Biochemistry: Conceptual Frameworks That Help Students to Actively Construct Their Knowledge**
Workshop **(S-15) ..... Coyote Room**
- Janet Lindsley, PhD – University of Utah
- Emine Abali, PhD – City University of New York

2:30 – 8:00 pm **Free Afternoon to Enjoy Tucson and Dinner on Your Own!**

8:00 – 8:15 pm **ScholarRx: Rx Bricks**
Sponsored Presentation .....**Javelina Room**
- Steve Mirande, *Director of Academic Solutions*

8:15 – 8:20 pm **Travel Award Presentations**
- Susan Cline, PhD – ABE President

8:20 – 10:00 pm **Poster Session .....Javelina & Quail Rooms**
Refreshments Available (sponsored by ScholarRx)

P-01 – Arbor	P-09 – Franklin
P-02 – Arbor	P-10 – Goldsmith
P-03 – Bradbury	P-11 – Maxwell
P-04 – Chastain	P-12 – Noramly
P-05 – Deevska	P-13 – Ritchie
P-06 – Ellis	P-14 – Rusinol
P-07 – Faner	P-15 – Sandhu & Clifton
P-08 – Fong	P-16 – Severance

P-17 – Seyfang

P-18 – Viselli

P-19 – Yatherajam

P-20 – Yodh

P-21 – Diaz-Cruz

P-22 – Mallela

P-23 – Bangeranye

Wednesday, May 08

7:00 – 8:00 am **Continental Breakfast..... Sonoran Patio**
(ABE Special Interest Group Tables)

Plenary Session III
Integration of Concepts in Teaching and Learning…..... Javelina Room

Chair: Karen Symes, PhD – Boston University School of Medicine

8:00 – 9:00 am **The Power of Education: Lessons Learned from Teaching about Genetic Metabolic Diseases**
Plenary Speaker **(S-16)**

• Mark Korson, MD – VMP Genetics, LLP

9:00 – 10:30 am **Putting the Human Back in Biochemistry**
Workshop **(S-17)**
• Mark Korson, MD – VMP Genetics, LLP

10:30 – 10:45 am **Break**

10:45 am – Noon **Biochemical Genetics without the Zebras**
Workshop **(S-18)**
Clive Slaughter, PhD – Augusta University-University of Georgia Medical Partnership

Noon – 1:00 pm **Lunch ..... Sonoran Patio**

1:00 pm **Announcement of the Newly Elected Board Members**
David Franklin, Nominating Committee Chair**…….Javelina Room**

Plenary Session IV
Professional Development…...……... Javelina Room

Chair: Janet Lindsley, PhD – University of Utah School of Medicine

1:00 – 2:30 pm **Transform Your Best Educational Resources into Educational Scholarship**
Workshop **(S-19)**
- Rick Sabina, PhD – Oakland University
- Emine Abali, PhD – City University of New York
- Jana Simmons, PhD – Michigan State Univeristy College of Human Medicine

2:30 – 2:45 pm **Break**

2:45 – 4:15 pm **Evolution of Basic Science Teachers to Educators: Professional Identity, Educator Roles, and the Assessment of Excellence**
Workshop **(S-20)**
- Neil Osheroff, PhD – Vanderbilt University
- Kim Dahlman, PhD – Vanderbilt University
- Tracy Fulton, PhD – University of California San Francisco

Breakout Session V

Chair: Peter Rubenstein, PhD – University of Iowa School of Medicine

4:15 – 5:00 pm **A. Invited Short Talks (Part I) …….. Javelina Room**
Associated numbers correspond to the poster abstract.

4:15 – 4:30 pm **Improving Exam Scores Through Student Authored Formative Assessment: A Pilot Study (P-15)**
- Amina Sadik, PhD – Touro University, Nevada

4:30 – 4:45 pm **Therapeutic Enzymes Design Lab for Integration of Biochemistry and Engineering at Carle Illinois College of Medicine (P-20)**
- Jaya Yodh, PhD – Carle Illinois College of Medicine

4:45 – 5:00 pm **Positive Student Outcomes from Taking a Flipped Classroom Approach to Teaching Biochemistry in a Completely Online Setting (P-19)**
- Gayatri Yatherajam, PhD – Western Governors University

4:15 – 5:00 pm **B. ABE Board Meeting.....TBD**
Current and newly elected Board members must attend.

5:00 – 7:00 pm **Pre-Dinner Break**

7:00 – 10:00 pm **Closing Reception, Dinner & Square Dance! .....Trail's End**
Come prepared for dancing lessons!

- Susan Cline, PhD – ABE President, 2017 – 2019
- Jana Simmons, PhD – ABE President, 2019 – 2021

Thursday, May 09

7:00 – 8:00 am **Continental Breakfast..... Sonoran Patio (ABE Special Interest Group Tables)**

Plenary Session V
Invited Short Talks (Part II) ..... Javelina Room

Co-Chairs: Jana Simmons, PhD – Michigan State University College of Human Medicine
Susan Cline, PhD – Mercer University School of Medicine

Associated numbers correspond to the poster abstract.

8:00 – 8:15 am **Interpretation of Genetics Reports as a Means of Incorporating Instruction on Scientific Method into the Medical Curriculum (P-06)**
• Steven Ellis, PhD – University of Louisville School of Medicine

8:15 – 8:30 am **Teaching Preclinical Medical Students to Find, Critically Assess, and Present Clinically Related Basic Science Literature (P-11)**
• Steve Maxwell, PhD – Texas A&M Health Science Center

8:30 – 8:45 am **Addressing an LCME Citation on Biochemistry: Our Institution's Approach (P-08)**
• Sheri Fong, MD, PhD – John A. Burns School of Medicine

8:45 – 9:00 am **Shared Medical School Biochemistry Lectures Via Google Slides (P-02)**
• Sage Arbor, PhD – Marian University College of Osteopathic Medicine

9:00 – 9:15 am **Using Biochemistry to Educate Students on the Causal Link Between Social Epigenetics and Health Disparities (P-21)**
• Edgar Diaz-Cruz, PhD – Belmont University College of Pharmacy

9:15 – 9:30 am **A Curriculum Map of Where, When, and How Medical Biochemistry Is Taught (P-09)**
• David Franklin, PhD – Tulane University School of Medicine

9:30 – 9:40 am **Closing Remarks & Adjournment**
• Jana Simmons, PhD – ABE President, 2019 – 2021

SESSION ABSTRACTS

S-01
USING SELF-REGULATED LEARNING THEORY TO ASSESS AND REMEDIATE STRUGGLING LEARNERS

Mary Andrews, MD, MPH
Uniformed Services University

Medical educators need novel methods for assessing and remediating struggling medical learners. Self-regulated learning theory provides a framework for identifying and categorizing performance deficits and has been used to evaluate and improve performance across an array of disciplines, including athletic performance and primary through postsecondary education. Self-regulated learning or SRL can be understood as a cyclic, triphasic process of forethought, performance, and self-reflection that is centered around an academic or clinical task. SRL skills can be measured by several methodologies, one of which is called SRL microanalysis. SRL microanalysis consists of a structured interview that targets different SRL subprocesses before, during, and after the learner engages in the task of interest. Relying on the power of direct observation coupled with targeted questions, the faculty member can uncover the learner's performance deficit, classify that deficit in terms of a particular SRL skill, and use the SRL framework to design a remediation plan.

S-02
WHY DOES YOUR LEARNER PERFORM POORLY ON TESTS? A METHOD TO DIAGNOSE THE PROBLEM AND IMPLEMENT SOLUTIONS.

Mary Andrews, MD, MPH
Uniformed Services University

BACKGROUND:
Performance on multiple choice tests of medical knowledge is critical to professional success and trainees who underperform on tests require considerable time and effort to remediate. Our session will describe a method for using self-regulated learning theory to identify and remediate the learner's test-taking problem(s).

OBJECTIVES:
At the end of this workshop, participants will be able to:

- Identify reasons why learners underperform on standardized tests.
- Understand how self-regulated learning theory and script theory can help in identifying and remediating test-taking deficiencies.
- Demonstrate a standardized method for assessing and remediating struggling test-takers.

FORMAT/METHODS:
Test performance is critical to professional success and trainees who underperform on tests require considerable time and effort to remediate. Our session will describe a method for using self-regulated learning theory to identify and remediate the learner's test-taking problem(s). First, we will explore reasons for poor test performance and introduce self-regulated learning theory as the use of self-generated feedback to optimize the strategic pursuit of goals. We will then introduce the method for diagnosing and remediating struggling test takers, which is a form of self-regulated learning microanalytic assessment and training. This method assesses self-regulatory processes such as strategic planning, self-monitoring, causal attributions, and adaptive inferences during the academic task of answering a test-question. Using a think-aloud exercise and Question Review Form, faculty will be taught to classify the learner's problem as one or more of the following: lack of script recognition, lack of script specificity, premature closure/anchoring bias, underconfidence, causal attribution problems, adaptive interference problems, and isolated learning deficits. Lastly, attendees will view video portrayals of learners, diagnose them using this method, and develop learner-centered remediation plans. Attendees will also have the opportunity to practice the method on each other via role-play and will leave with a handout describing the method, a step-by-step method of implementation, and suggested courses of action based on specific learner problems.

PRODUCTS/MATERIALS:
Participants will leave with a handout describing step-by-step implementation of this method, links to YouTube videos depicting different struggling learners, and the experience of having used the method during role play.

LEARNER ASSESSMENT:
Participants will be able to apply this method of test-taking assessment and remediation to learners at their own institutions who struggle on tests.

S-03
ALIGNING THE METABOLIC MAP WITH THE DEVELOPMENTAL STAGE OF THE LEARNER: NAVIGATING TOWARDS A MORE CLINICALLY USEFUL METABOLIC MAP

Tracy Fulton[1], Tina Cowan[2], Janet Lindsley[3] and Debra Regier[4]
[1]University of California San Francisco, [2]Stanford University, [3]University of Utah and [4]Children's National Medical Center

BACKGROUND:
The Pathways of Human Metabolism (PHM) map, created by medical educators at Stanford and updated with input from ABE members, is a tool for learning and assessment designed to support a shift away from rote memorization towards clinically relevant problem-solving. Since the PHM map was approved by the ABE Executive Committee in 2016, the number of institutions that have implemented the map has grown. The NBME has assessed the possibility of including the map in USMLE step exams. Implementation challenges include technologic and pedagogic issues with navigating such a complex resource. Clinicians have observed that the map reflects how a biochemist thinks about metabolism as opposed to how a clinician thinks about metabolism, suggesting opportunities to create alternative versions of the map appropriate for different developmental stages of learners. National AAMC Graduation Questionnaire results for the last several years suggest students do not perceive biochemistry teaching as effective preparation for clinical learning. A group at Stanford is moving forward to create a more interactive map with layers representing varyingly complex levels of detail. The time is right to assess whether a less complex and/or more clinically oriented map could be of use in order to increase the map's acceptance and utilization either on step exams, in a clinical setting, or both.

OBJECTIVES:
At the end of this workshop, participants will be able to:

- Describe the status of the PHM efforts with the NBME/USMLE.
- Discuss clinicians' perspectives on how biochemistry is used in the clinical setting.
- Describe current efforts to produce an interactive map.
- Identify modifications to the map that could increase utility for high stakes exams, in the clinical setting, or both.

FORMAT/METHODS:
5' Introductions, context, goals
5' Updates from NBME Metabolic Map Item Writing Committee (spring 2018)
5' Do students really need basic science understanding in the clinical setting?
5' Next stops in navigating with the map
15' Breakout discussions – Audience breaks into smaller groups, moderated by a presenter, to discuss possible next steps, and identify features in an interactive map that could be beneficial to learners / stakeholders at different time points (in classroom vs exams vs in clinic)
15' Group re-gathers for report out – conclusions of mini discussions reported
10' Presenters wrap up and identify next steps

PRODUCTS/MATERIALS:
Participants will leave with copies of the current map, and possibly with prototypes of some of the new ideas.

LEARNER ASSESSMENT:

Participants will return to their home institutions with informed understanding of methods that could better incorporate biochemistry into clinical years of medical training. Participants will have had input on how the map could be updated to support students' application of biochemistry knowledge in clinical settings, improvement of longterm retention, and will be poised to look for opportunities to test these efforts with their own students.

S-04

USE OF ANALOGIES TO INTEGRATE BASIC AND CLINICAL SCIENCE

Tracy Fulton[1], Susan Cline[2], Michael Dell[3], and James Nixon[4]
[1]University of California San Francisco, [2]Mercer University, [3]Case Western Reserve University and [4]University of Minnesota

BACKGROUND:

The idea of "transfer," from cognitive psychology, refers to using knowledge acquired in one context to solve a new dissimilar problem in another context. A consistent finding from studies to date is that transfer is, in fact, more difficult that we might think. Typically, students who have learned a concept in one problem context will only have a 10-30% success rate in applying the concept to solve a new problem. This problem is familiar in medical education, particularly when considering the difficulty in helping students understand how to apply foundational science concepts to clinical scenarios. The educational literature has identified practical strategies to improve transfer, including use of everyday analogies in teaching, which involves linking a more abstract concept to something that is known and well-understood. Many educators naturally use analogies already in their teaching, but may not have given thought to how to purposefully use this powerful tool to ensure not only learning of important biochemistry concepts, but the ability to apply those concepts to new (esp. clinical) scenarios. This workshop will focus on helping educators 'stretch' to create analogies that truly facilitate transfer and ultimately support cognitive integration.

OBJECTIVES:

At the end of this workshop, participants will be able to:

- Provide rationale for and evidence that supports utilizing analogies in teaching.
- Critique analogies used in teaching using a provided set of criteria.
- Create and improve analogies that support concept-based learning and transfer in biochemistry.

FORMAT/METHODS:

Time will be allotted as follows:
10' – Welcome, introductions, and context
10' – Mini didactic on improving transfer by creating analogies: evidence and approach
20' – Activity 1: Teams of participants critique a set of sample analogies based on provided criteria.
20' – Activity 2: Same teams of participants will generate a new analogy that meets criteria.
20' – Presentations
10' – Discussion and wrap up

PRODUCTS/MATERIALS:

Participants will leave with worksheets that will enable them to create analogies on their own and/or teach others at their institutions to do so.

LEARNER ASSESSMENT:

The goal is for learners in the workshop to come away with new analogies to use in their teaching or improvements to their own useful analogies in order to better support transfer.

S-05
CHANNELING A CLINICIAN: DESIGN AND CONSTRUCTION OF CLINICAL SCENARIOS FOR TEACHING AND ASSESSMENT

Paul Chastain II
University of Illinois College of Medicine, Rockford

BACKGROUND:

The University of Illinois at Chicago College of Medicine has developed a new medical school curriculum that allows medical students to be able to apply and integrate medical knowledge with clinical skills during each step of their development. As part of this endeavor, we have developed a PowerApp (App) that allows students to integrate their medical and biochemical knowledge with their clinical skills to "predict" how patients with different metabolic disorders would present in an Emergency Room. Within the App, the students are asked to choose a biochemical "adventure" (from a series of potential biochemical adventures) that they would like to go on (sugar metabolism disorder adventure, vitamin deficiency adventure, glycogen storage disorder adventure, etc.). Each adventure helps them understand complex and complicated biochemical disorders in a manner that empowers them, encourages them to integrate material from different biochemical topics and across the curriculum as a whole, and motivates them to go beyond just memorizing the material.

Each adventure starts with a brief overview of the pathway of interests as well as links to videos and online medical, genetics, and biochemical resources that enables them to have all the information they need at hand. Next students are told an enzyme in this pathway is dysfunctional and the students have to use their biochemical and medical knowledge to predict how elements within various health status panels (basic metabolic panel (lactate, glucose, alanine, ketone bodies, ammonia, pyruvate), complete blood count (to determine anemia), peripheral blood smears, etc.) change in a person with this disorder. Next, the students have to decide how a person would present as a consequence of this metabolic defect (i.e., a person with hypoglycemia may have dizziness, extreme hunger, headache, confusion, an inability to concentrate, sweating, shaking, blurred vision). Finally, the team presses submit, and the answer along with a corresponding explanation is revealed to them. If any team would like further clarification, the facilitator then uses a metabolic map along with relevant powerpoint slides to help address any misunderstandings the students may have and to highlight why a deficiency in a specific enzyme in one pathway can cause issues with other pathways.

Next students are given a series of clinical presentations associated with defects in various pathways, and the teams have to determine which pathway/enzyme is defective and to defend how information within the vignette supports their answer. After entering the evidence, the team presses submit, and the answer along with a corresponding explanation is revealed to them. Once again, if a team would like further clarification, the facilitator then displays the vignette and helps the students identify key elements within the scenario that allows them to determine which pathway is most likely affected and then which enzyme is mostly dysfunctional. After class, the students continue to have access to the app to use as a study aid for future quizzes, tests, and board exams.

OBJECTIVES:

At the end of this workshop, participants will be able to:

- Assess Powerapps as a tool for curriculum enhancement.
- Devise a plan for powerapp usage for their course.

FORMAT/METHODS:

Participants will log into a PowerApp, go through one of our biochemistry adventures, and then use that adventure to guide their development of a PowerApp biochemistry adventure.

S-06
THE RUBIK'S CUBE OF FITTING BIOCHEMISTRY INTO INTEGRATED MEDICAL CURRICULA

Kristie Bridges[1], Joe Fontes[2], David Franklin[3], Selina Noramly[4] and Peter Ronner[5]
[1]West Virginia School of Osteopathic Medicine, [2]University of Kansas, [3]Tulane University, [4]University of Virginia and [5]Jefferson, Sidney Kimmel Medical College

BACKGROUND:
Many allopathic and osteopathic medical schools have recently revised (or are in the process of revising) their curricula, thereby integrating biochemistry more tightly with clinical science. Biochemistry instructors are thus challenged to parcel their discipline into blocks of teaching that have a clinical focus, often by organ and or patient presentation. This process is difficult in and of itself, and it also creates challenges including tracking biochemistry content, assuring depth of coverage, and advising non-biochemistry faculty on the delivery of biochemistry content. Past ABE conferences featured discussions of what topics to teach and how best to teach in a student-friendly manner, but they did not yet comprehensively address the more recent problem of designing a biochemistry thread for an integrated medical curriculum.

OBJECTIVES:
At the start of the workshop, to report briefly on a pre-conference survey of ABE members on how they fit biochemistry topics into their integrated medical curriculum, how they track biochemistry content, how they created innovative connections, where they failed, and what issues still remain to be addressed.

At the start of the workshop, to have 2-3 presenters from different institutions report briefly on an innovative way of integrating a biochemistry topic into a clinical context.

During the workshop, to share additional instances of success among the conference attendees, as well as discuss strategies for innovation in building and tracking biochemistry content in integrated curricula.

At the end of the workshop, participants will be able to outline approaches to building biochemistry content into an integrated, clinically-oriented medical curriculum.

At the end of the workshop, participants will be able to outline approaches to tracking and evaluating longitudinal biochemistry content in an integrated, clinically-oriented medical curriculum.

After the workshop, meeting participants will be able to use a map of membership-wide common associations of biochemistry topics with clinical topics to help them design or revise an integrated curriculum at their home institution.

FORMAT/METHODS:
A questionnaire will be delivered to meeting attendees prior to the start of the meeting. Answers will be collated and presented at the start of the workshop. Topics covered in the questionnaire will include: how faculty fit biochemistry topics into their integrated medical curriculum, how they track biochemistry content, how they created innovative connections, where they have failed, and what issues still remain to be addressed.

Two or three presenters will be chosen to showcase some innovations on how they have

integrated a biochemistry topic in a clinical context during a learning session. They will touch on some of the following topics:

1. Pre-class planning activities needed for a successful integrated learning session, e.g., selection of learning objectives, administrative structures (committees, job descriptions), faculty interactions (e.g., curriculum planning meetings or retreats)
2. In-class delivery (TBL, PBL, patient interviews, weekly schedules showing placement of biochemistry material, recorded lecture content, website materials)
3. Assessments (how assessment questions are written, exam composition, review of test-items. student performance analysis on internal and external exams re biochemistry content, how students are notified re their performance on biochemistry items, are there minimum competencies required in disciplines, how is remediation handled)
4. Technology (how is everything tracked via software, what kinds of databases, how transparent is this process to the students - do they get a biochemistry performance readout)
5. Evaluations (how is everything reviewed after delivery to students - student evaluations, faculty peer evaluations, curriculum committee reviews/reports, monthly course director and/or discipline leader meetings, etc.).

We then plan to form small groups that are diverse and range from participants who are part of a mature integrated curriculum that features biochemistry prominently to participants who are in the process of shifting to an integrated curriculum (3-5 individuals per small group).

1. Some groups will spend time discussing and developing strategies for bringing biochemistry content to a learning activity (case presentation, PBL, flipped classroom session) the focus of which is not biochemistry.
2. Other small groups will develop strategies for tracking biochemistry content that is parsed out into different learning activities, not all of which are taught by biochemistry faculty.
3. Small group assignments could be chosen from a provided list of ideas but may also be created by the participants. All groups will have worksheets with generalized questions to help guide their discussion.

The large group discussion will be structured to address the small group report-out as well as the topics listed for the chosen presenters previously.

Presenters will either collate the small group discussion worksheets and summarize the results or solicit volunteers from the small groups to provide the written summaries. An electronic copy of the workshop results will be provided to the attendees post-meeting.

Timeline:
1. Introduction 5 min
2. Presentation survey results 10 min
3. Presentation by session leaders 15 min
4. Discussion in small groups 30 minutes
5. Report back and general large group discussion 30 minutes

Describe the methods used to deliver the session and succinctly describe the schedule of activities. Include details such as the size of groups for small group work and the need for resources, such as flip charts and markers.

PRODUCTS/MATERIALS:

Meeting participants will have access to the survey results and thus be able to compare their biochemistry curriculum to those of other member institutions.

LEARNER ASSESSMENT:

Meeting attendees will hopefully derive inspiration for innovation from others as so often happened during past ABE conferences.

S-07
WHAT DO PHARMACY STUDENTS NEED TO KNOW ABOUT BIOCHEMISTRY?

Kevin Kearney[1], Danielle Cruthirds[2], Melany Puglisi[3], Esther Black[4], and Pramod Mahajan[5]
[1]Massachusetts College of Pharmacy, [2]Samford University, [3]Chicago State University, [4]University of Kentucky and [5]Drake University

BACKGROUND:
As part of a 2017 ABE Conference workshop, pharmacy educators described the results of a pilot study aimed at determining what biochemistry (defined by 131 learning objectives) advanced pharmacy students used during their clinical rotations. The results were based on interviews with 26 students at 4 schools of pharmacy. Since then, additional interviews were conducted, bringing the total number of interviews to 70, at 7 schools of pharmacy. A detailed analysis of the results was completed, and a manuscript about the study is in preparation.
At the 2019 ABE Conference, the presenters will summarize the findings of the study, offer some initial suggestions for refining the Pharmacy-Biochemistry learning objectives, and invite input from the audience about what should be included and why.

OBJECTIVES:
Provide 3-4 objectives for the workshop, preferably using action verbs that demonstrate higher-level learning (refer to Bloom's taxonomy).

- By the end of this session, participants will be able to describe what elements of biochemistry a sample of pharmacy students reported using in advanced clinical practice rotations. (Knowledge/ Comprehension)
- By the end of the session, participants will have worked together to refine a relevant list of Biochemistry learning objectives for Pharmacy students. (Synthesis)
- By the end of this session, participants will be able to better connect the biochemistry they teach with what students need to know for clinical practice. (Application)

FORMAT/METHODS:
The results of the above-mentioned study will be presented at the beginning of the session. Participants will then discuss what can be learned from the students' responses: What knowledge of biochemistry do students retain and use in clinical practice? What does this tell us about what biochemistry is important for pharmacy students (and pharmacists)? What can we do to better connect the biochemistry we teach with what pharmacists need to understand in order to competently provide pharmaceutical care? The session will be very interactive, involving all participants in the discussion.

PRODUCTS/MATERIALS:
Each participant will receive a copy of the report about the interviews with advanced pharmacy students. They will also receive a list of the learning objectives reviewed during the interviews, with space for making notes about possible revisions to the list, and ideas for connecting knowledge to practice.

LEARNER ASSESSMENT:
The list referred to in the previous section, prepared/modified during the session, should be a useful guide for participants as they prepare or update their Biochemistry courses.

S-08
WHAT ROLE DOES BIOCHEMISTRY CONTENT AND CONCEPTS PLAY IN CRITICAL THINKING AND CLINICAL PRACTICE?

Eric Niederhoffer
Southern Illinois University School of Medicine

BACKGROUND:

Dental, medical, and pharmacy educators discussed and formulated learning objectives for the education of pre-healthcare professionals during the beginnings of this organization (ABCD to ABE). In 2012, the following publication appeared to challenge the way Biochemistry was taught: Fulton, Tracy B., Ronner, Peter & Lindsley, JE. "Medical Biochemistry in the Era of Competencies: Is it Time for the Krebs Cycle to go?" (2012) Med Sci Educ 22:29-32. However, important questions remain as to the absolute importance of Biochemistry content and concepts for practicing health care professions (clinical practice). An argument can be made that actual content and concepts are less important to clinical practice (figuring out what is right or wrong with the patient and what best to do) and more important in developing critical thinking ability and skills. There have been few literature reports related to the importance of Biochemistry in health care education; see Van Winkle LJ, Cornell S, Fjortoft N, Bjork BC, Chandar N, Green JM, La Salle S, Viselli SM, Burdick P, & Lynch SM. “Critical thinking and reflection exercises in a biochemistry course to improve prospective health professions students' attitudes toward physician-pharmacist collaboration.” (2013) Am J Pharm Educ. 77(8):169.; Jensen KT, Knutstad U, Fawcett TN. “The challenge of the biosciences in nurse education: A literature review.” (2018) J Clin Nurs. 27(9-10):1793-1802.; Yan Q, Ma L, Zhu L, Zhang W. “Learning effectiveness and satisfaction of international medical students: Introducing a Hybrid-PBL curriculum in biochemistry.” (2017) Biochem Mol Biol Educ. 45(4):336-342.; Kumar S, Jena L, Vagha J. “Need assessment of enhancing the weightage of applied biochemistry in the undergraduate curriculum at MGIMS, sevagram.” (2016) Biochem Mol Biol Educ. 44(3):230-40.; and Alam A. “How do medical students in their clinical years perceive basic sciences courses at King Saud University?” (2011) Ann Saudi Med. 31(1):58-61. No definitive studies are available concerning what practicing physicians think and actually use on a daily basis.

OBJECTIVES:

At the end of this EDGrS, participants will be able to:

- differentiate between content and concepts,
- appreciate the importance of critical thinking skills,
- identify learning objectives important to clinical practice (generalists versus specialist),
- develop effective learning approaches to bolster critical thinking skills fundamental to applying Biochemistry.

FORMAT/METHODS:

This EDGrS will be introduced with the assertion that because we have no clear assessment tool for a licensed practicing physician, competency in Biochemistry is limited to the score achieved on USMLE Step 1. There will be a brief discussion of the steps required by medical students and residents for progress towards independent practice followed by an open discussion concerning the real and perceived impact of Biochemistry content and concepts on the practice of medicine.

Issues for discussion include:

- What are important content and concepts involving Biochemistry at the various stages of medical training?

- How do we best evaluate competency in Biochemistry at the various stages of medical training?
- Are we using our time effectively to meet these training demands?
- Will shifts in the medical education process short-circuit the learning (analysis and synthesis) process of medical students?

PRODUCTS/MATERIALS:

Each participant will refined their knowledge of the pertinent medical education literature in the context of NBME/USMLE licensing process, including links to NBME/USMLE materials, and begin an analysis and evaluation (and possibly, creation) of new approaches to developing highly effective critical thinking skills.

LEARNER ASSESSMENT:

Participants will be able to utilize the discussions for self-reflection of their individual curricular objectives along with a more global view of the role of Biochemistry in the maturation of critical thinking skills important to clinical practice.

S-09

THE INFLUENCE OF STUDENT MOTIVATION AND LEARNING STRATEGIES ON HOW THEY PERCEIVE THE BENEFIT OF ACTIVE LEARNING SESSIONS.

[1]Martha Faner, [2]Ah Ra Cho, and [1]Carol Wilkins
[1]Michigan State University College of Osteopathic Medicine and [2]University of Arizona College of Medicine

BACKGROUND:

At Michigan State University College of Osteopathic Medicine (MSU COM), the biochemistry faculty has developed many active learning sessions throughout the pre-clerkship curriculum. The student feedback received regarding these sessions seems to take on the bipolar themes of "love it" or "hate it". We wanted to know the characteristics of a student that would put them into one category versus the other. To help us to gain insight on this question, a survey was administered to assess an individual student's perception of an active learning session on hyperammonemia as well as that student's motivation for learning and learning strategy in general. In this session, the results of the survey will be shared and we will facilitate a group discussion on the experience of colleagues at other institutions. As a community of biochemistry educators, understanding the student characteristics that allow them to benefit from active learning sessions or not is important. This understanding will allow us to modify the design of these sessions to be more effective with a greater number of learners.

OBJECTIVES:

At the end of this discussion group, participants will be able to:

- understand how the motivation and learning strategies of a learner affect the way they perceive the benefit of active learning sessions.
- relate their experiences of which type of learners find active learning sessions to be effective with those at other colleges.
- describe ideas to broaden the value of active learning sessions to a larger group of students.

FORMAT/METHODS:

Results of the survey conducted at MSU COM to assess the medical students' perceptions of an active learning session on hyperammonemia will be presented. This survey includes their motivations for learning in general and the learning strategies that they employ throughout the MSU COM curriculum. The remainder of the session will be a group discussion to hear the experiences at other colleges. The culmination of the discussion will include a variety of strategies to make active learning sessions appeal more broadly to all learners.

PRODUCTS/MATERIALS:

Each participant will receive a list of strategies generated by the group on how to make active learning sessions more broadly appeal to all learners.

LEARNER ASSESSMENT:

Learners will be able to analyze their own student's motivations and learning strategies. They will be able to think about how those motivations and strategies might influence the dynamic of active learning sessions in their college's curriculum. They will be able to apply the ideas and strategies discussed during the session in their active learning sessions to widen the positive impact amongst a diverse group of students.

S-10
AMGDB PRESIDENTIAL ADDRESS

James Broach, Ph.D.
Pennsylvania State University

The Association of Medical and Graduate Departments of Biochemistry (AMGDB), founded in 1969, represents Departments of Biochemistry and Molecular Biology at graduate and medical schools in North America, including the 50 United States and Puerto Rico, Canada, Mexico and the Caribbean. The AMGDB is concerned with issues related to fundamental and biomedical science, health research, science policy and education. We work with and support the teaching mission of the Association of Biochemistry Educators. This presentation will serve as an update on issues of importance within the AMGDB and on possibilities for AMGDB collaboration with ABE.

S-11
DESIGNING QUALITATIVE RESEARCH STUDIES

Janet P. Hafler, Ed.D.
Yale University

BACKGROUND:
Although qualitative research has been around for a long time, it has only recently begun to gain acceptance and respect as a scientific method of gathering important data. Still, its inherent logic is not generally understood and in this talk I will explore how its methods can effectively be applied to education research. What I find exciting is how we are able to gain a rich and deep understanding of the socially constructed nature and the situational constraints related to our research question. How social experience is created and given meaning is at the heart of qualitative research. I will discuss how qualitative research generates questions about process by which different events contribute to an outcome while quantitative research tends to generate questions regarding the contribution of the different variables to the outcome being studied. I will also address the steps of selecting a sample and choosing the appropriate data collection strategy. This talk is intended as an introduction to the topic, therefore, strategies for data analysis will not be addressed. Importantly, the use of the data for education is key and will be explored.

OBJECTIVES:
The participants will be able to:

- Describe the characteristics of qualitative research methods.
- Align their research question with a qualitative research design.
- Explore how to select a sample and collect data.

S-12

IMPACT OF THE PATHWAYS OF HUMAN METABOLISM MAP ON STUDENTS' PERCEPTIONS OF LEARNING BIOCHEMISTRY: EXPERIENCES ACROSS VARIOUS SCHOOLS

Zeynep Gromley[1], Emine Abali[2], Douglas Spicer[3], Tina Cowan[4], and Tracy Fulton[5]
[1]Lincoln Memorial University, [2]City University of New York, [3]University of New England, [4]Stanford University, and [5]University of California San Francisco

BACKGROUND:

The educational research literature suggests that a deep understanding of basic science leads to greater diagnostic accuracy (1) and fosters retention and the transfer of clinical knowledge (2,3). Furthermore, expert physicians make extensive use of basic science knowledge when encountering a difficult case (4). However, learning and retention of basic science has been challenging in medical education. In one study, biochemistry was identified as the least well-retained basic science topic in undergraduate medical education, as measured by repeated questions on NBME exams (5). The Pathways of Human Metabolism Map was developed to promote active learning, to emphasize critical thinking and to move away from rote memorization.

Since the introduction of the Pathways of Human Metabolism Map to the members of the Association of Biochemistry Educators, many schools have implemented it in various capacities to support student learning. The aim of this session is to explore the approaches used at a variety of medical schools and the student perceptions about these approaches.

OBJECTIVES:

At the end of this workshop, participants will be able to:

- Describe methods for implementing the metabolic map to support student learning.
- Evaluate the results from several schools regarding students' perspectives toward using the metabolic map.
- Discuss the benefits and challenges of using the metabolic map as a learning tool for teaching and assessment.

FORMAT/METHODS:

The panel discussion will focus on students' perceptions and methods for using the metabolic map**.** The approaches and data from several schools will be presented. Then the panelists will facilitate discussion among the attendees to share their experiences with the metabolic map and to discuss how can we improve educational outcomes and the effectiveness of the metabolic map for shifting students' focus to critical thinking rather than rote memorization.

20': Panelists will briefly present their goals and methods for using the metabolic map followed by discussion.
20': Panelists will briefly present the results of student surveys followed by discussion.
20': Discussion of other means of incorporating the metabolic map and measuring outcomes in medical education and addressing questions generated by attendees.

PRODUCTS/MATERIALS:

Each participant will have access to the survey questionnaires used to measure student attitude and perception and will have the opportunity to initiate a collaboration to do similar studies.

LEARNER ASSESSMENT:

Participants will be able bring evidence back to their institutions about the use of the metabolic map which may help them to a) improve its usage in their curriculum or b) incorporate it into their curriculum.

REFERENCES:

1. Woods NN, Brooks LR, Norman GR: The value of basic science in clinical diagnosis: creating coherence among signs and symptoms. *Med Educ* 2005, 39(1):107-112.
2. Norman G: Research in clinical reasoning: past history and current trends. *Med Educ* 2005, 39(4):418-427.
3. Woods NN, Neville AJ, Levinson AJ, Howey EH, Oczkowski WJ, Norman GR: The value of basic science in clinical diagnosis. *Acad Med* 2006, 81(10 Suppl):S124-127.
4. Geoffrey R. Norman, Alan D. Trott, Brooks LR, Smith EKM: Cognitive differences in clinical reasoning related to postgraduate training. 1994, 6(2):114–120.
5. Ling Y, Swanson DB, Holtzman K, Bucak SD: Retention of basic science information by senior medical students. *Acad Med* 2008, 83(10 Suppl):S82-85.

S-13
ABE QUESTION BANK REVIEW

Sage Arbor[1], Judith Binstock[2], Zeynep Gromley[3], Pasquale Manzerra[4], and Douglas Spicer[5]
[1]Marian University, [2]Touro College of Osteopathic Medicine, [3]Lincoln Memorial University, [4]University of South Dakota, and [5]University of New England

BACKGROUND:
Sixty-one ABE members volunteered in 2016 to work to develop a shared secure biochemistry test bank (Niederhoffer 2017). Biochemistry content was classified into 9 megaThemes with 68 nested themes using the megaThemes and themes defined by ABE (Fulton 2012). Each megaTheme was assigned to a leader who worked with multiple ABE members to developed and vet biochemistry test bank of 163 questions (abeQbank version 1.0) for its members. A Google form was created for faculty to input questions in a unified format with a required stem, answers rationale, attached image flag, megaTheme and theme, as well as an optional learning objective, title and notes. In 2017, the questions written by the ABE faculty was reviewed during a workshop. This year, not only we will review the question that are not vetted, but write new board style questions to increase the number of questions in the bank. This will help with the release of the (abeQbank version 2.0) that will be disseminated to the ABE members.

Niederhoffer EC, Cline SD, Osheroff N, Simmons JM, Diekman AB, Franklin DS, et al. Teaching Biochemistry and Genetics to Students of Dentistry, Medicine, and Pharmacy 6th International Conference of the Association of Biochemistry Educators (ABE) Clearwater Beach, FL, USA, May 7–11, 2017. Med Sci Educ. 2017 Dec;27(4):855–9.

Fulton TB, Ronner P, Lindsley JE. Medical Biochemistry in the Era of Competencies: Is it Time for the Krebs Cycle to go? MedSciEduc. 2012 Mar 1;22(1):29–32.

OBJECTIVES:
At the end of this workshop, participants will be able to:
- Explain how to write an effective USMLE style question
- Tag questions that are already written before the meeting that are/ are not written according to USMLE Step-1 style.
- Rewrite those question according to the item templates
- Write USMLE style question for the topic discussed.

FORMAT/METHODS:

Time Allotted: 15 minutes	Provide an update about the ABE QBank project. Review the USMLE guidelines for Basic Science Item Writing
Time Allotted: 5 minutes	Divide attendees into small groups
Time Allotted: 35 minutes	Rewrite problematic questions according to item templates/ Write new questions
Time Allotted: 5 minutes	Questions and answers

PRODUCTS/MATERIALS:
Workshop participants will receive after the meeting a copy of the question developed during the session.

LEARNER ASSESSMENT:
Session participants will be able to write better board questions that conform to USMLE guidelines for Basic Science Item Writing.

S-14
INTRODUCTION TO DESIGNING QUALITATIVE RESEARCH STUDIES: A HANDS-ON WORKSHOP

Janet P. Hafler, Ed.D.
Yale University

BACKGROUND:
This workshop will explore how to design effective qualitative research studies. Participants will have the opportunity to align their research question with an appropriate method of data collection and explore how to select a sample and collect data.

We will review the methods used to collect qualitative data, including data from observations, document studies, survey/questionnaires and interviews. We will examine qualitative research questions, which can relate to teaching, admission processes, program development, curriculum, evaluation or leadership and other important educational topics.

OBJECTIVES:
At the end of this workshop, participants will be able to:

- Generate research questions appropriate for qualitative studies and choose the effective sampling and data collection methods for the question.
- Demonstrate applied knowledge of some common methods for collection of qualitative data including the appropriate selection, use, and standards for rigor of these methods.
- Demonstrate applied knowledge of approaches to achieve scholarly rigor in the design of qualitative studies and collection of qualitative data.

PRODUCTS / MATERIALS:
Each participant will be able to identify an educational research question appropriate for a qualitative research design study.

LEARNER ASSESSMENT:
Participants will be able to apply how to assess their teaching, curriculum and assessment of their students using qualitative research methods.

S-15
ADVANCE ORGANIZERS FOR BIOCHEMISTRY: CONCEPTUAL FRAMEWORKS THAT HELP STUDENTS TO ACTIVELY CONSTRUCT THEIR KNOWLEDGE

Janet Lindsley[1] and Emine Abali[2]
[1]University of Utah and [2] City University of New York

BACKGROUND:
In the 1960s David Ausubel proposed that teachers could more effectively help students learn by first providing an intellectual scaffold for them to appropriately structure ideas and facts. He called this introductory framework an Advance Organizer. Its purpose is to explain, integrate and interrelate the material in the learning task with previously learned material. Advance Organizers help to increase the stability and clarity of students' cognitive structures, allowing the students to acquire, organize and retain more information. By contrast, if students have weak cognitive structures, they are forced to learn by rote memorization. Like many constructivists, Ausubel believed that the most important thing a student brings to a learning situation is what s/he already knows. He argued that students more actively learn from presented information (lectures or readings) if we explicitly teach them to look for organizing ideas, reconcile information with them and eventually to generate organizers of their own. Advance Organizers not only help students learn the facts and concepts in a field, but also transmit the system professionals use to structure their understanding and analyze problems.

OBJECTIVES:
At the end of this workshop, participants will be able to:

- Explain the function of Advance Organizers in teaching and learning.
- Critique an Advance Organizer adapted to introduce the Pathways of Human Metabolism map.
- Brainstorm Advance Organizer ideas for other areas of biochemistry.

FORMAT/METHODS:
5 min: Introduction to Advance Organizers and their purpose.
5 min: The presenters will share how they have been using an Advance Organizer to teach metabolism.
10 min: Large group facilitated discussion: Based on exploration of the metabolism Advance Organizer, the participants will critique the metabolism Advance Organizer, identifying its strengths and opportunities for improvement
20 min: Individual/small group work: Using these desirable attributes, develop another Advance Organizers that might be helpful in the teaching/learning of Biochemistry
20 min: Large group facilitated discussion: List ideas generated for new biochemistry Advance Organizers; wrap-up; take pictures of worksheets from willing participants.

PRODUCTS/MATERIALS:
Participants will receive a printed copy of a metabolism Advance Organizer used by the presenters in their teaching; a worksheet for 1. identifying strengths/opportunities, 2. listing desirable attributes of Advance Organizers and 3. Listing/drawing brainstorm ideas for new Advance Organizers; and contact information of the presenters for those interested in continuing the discussion.

LEARNER ASSESSMENT:
Participants should leave with:

- A metabolism Advance Organizer and knowledge about how to use it in their teaching.

- An understanding of what constitutes an effective Advance Organizer.
- Ideas about other biochemistry Advance Organizers to consider using.
- Contact information of colleagues who are interested in continuing to collaborate on this topic.

S-16
THE POWER OF EDUCATION: LESSONS LEARNED FROM TEACHING ABOUT GENETIC METABOLIC DISEASE

Mark Korson, M.D.
VMP Genetics, LLC

INTRODUCTION:
You are biochemistry educators. I am a biochemical or metabolic geneticist. Although we originate from different perspectives, our disciplines are tightly connected because biochemical genetics is the direct clinical application of biochemistry. Show me a biochemical pathway, and I will introduce you to someone who lives with a defect in that pathway! I have experimented in teaching the medical community, and I will share what has worked and what has not; there are lessons to be learned here!

I will focus on patient-teaching which used to play a vital role in medicine but then fell away when technological advances in teaching arrived. Fortunately, it is making a comeback. Involving patients in the teaching process offers much more to students and trainees than just information about a disease. It showcases the whole patient, that there is a human story here connected to the chemicals and the symptoms, and this serves to improve retention of important information. Indeed, story-telling, when done well, can be a far more powerful and effective teaching process than didactic teaching.

I will end the session by reviewing a range of resources that can be used to enhance the teaching of biochemistry.

S-17
PUTTING THE HUMAN BACK INTO BIOCHEMISTRY: LET PATIENTS AND CASE STUDIES DO THE TEACHING

Mark Korson, M.D.
VMP Genetics, LLC

BACKGROUND:
This workshop will examine different ways of teaching the biochemistry of the inborn errors of metabolism by:

1. Highlighting the impact of the metabolic derangement on physiology
2. Supporting the students to use the biochemistry to:
    a. Construct the phenotype
    b. Determine a diagnostic approach
    c. Conjure logical treatments

OBJECTIVES:
At the end of this workshop, participants will be able to:

- Deconstruct a genetic metabolic disease into biochemistry-relevant sections – clinical phenotype, biochemical phenotype, diagnostic profile, and therapeutic options.
- Utilizing patient cases as the base structure, and providing necessary clinical and physiologic information, build problem sets that require utilizing the biochemistry.
- Apply a variety of teaching formats to the problem sets that acknowledge different learning styles.

FORMAT/METHODS:
The speaker will move the audience forward through the learning and the cases, employing a mix of active and passive styles, small (pairs) and large group learning, and using an audience response system.

PRODUCTS/MATERIALS:
Participants will receive a printed copy of a metabolism Advance Organizer used by the presenters in their teaching; a worksheet for 1. identifying strengths/opportunities, 2. listing desirable attributes of Advance Organizers and 3. Listing/drawing brainstorm ideas for new Advance Organizers; and contact information of the presenters for those interested in continuing the discussion.

LEARNER ASSESSMENT:
The emphasis in the workshop on patient cases will keep the subject matter clinical and practical but relevant to biochemistry. Furthermore, in acknowledging that people learn in different ways, the teaching formats will employ active/interactive and passive styles, as well as individual and group learning, with the intention of mixing up the presentations so that the teaching remains “unpredictable” and therefore more exciting for the student.

S-18
BIOCHEMICAL GENETICS WITHOUT THE ZEBRAS

Clive Slaughter
Augusta University-University of Georgia Medical Partnership

BACKGROUND:
Genetics is frequently learned early in pre-clerkship training. It emphasizes Mendelian patterns of categorical inheritance as distinct from patterns of quantitative or polygenic heredity, it is often applied to conditions infrequently encountered in primary care, and it is incompletely integrated with clinical decision-making. These circumstances impede students' application of their genetical knowledge for solving clinical problems in the clerkship years and beyond. In students' minds the field of genetics becomes populated with "zebras," conditions to be memorized, with the expectation that they'll be encountered merely within the confines of the zoo paddock/board exam. This session will address issues of application by providing information and participatory experience to strengthen connections between biochemical/molecular aspects of heredity and primary care of patients.

OBJECTIVES:
At the end of this workshop, participants will be able to:

- Deploy pedagogy for facile linkage between Mendelian (categorical) characters and quantitative characters, and for explaining the nature of interactions between genetic factors in determining penetrance, expressivity and disease risk
- Develop effective study cases based on common presenting conditions that highlight the clinical utility of genetical knowledge in diagnosis and/or management of patients' conditions.

FORMAT/METHODS:
The session is designed to be 90 min in duration, and will consist of 3 sections:

1. Description by the presenter of the nature of the challenge encountered in contextualizing genetics for clinical practice in primary care, along with a worked example of compiling a study case.
2. Small-group compilation of a study case (to be developed by each group on the basis of a common presenting condition selected from a set of 6 or more alternatives to be supplied during the session). Groups will be instructed to respond to the following questions:
    - What findings from history and physical exam (to be designed by the group), if present, would most strongly suggest that a genetic etiology should be considered?
    - What clinical studies should be performed to test the genetic etiology?
    - How does knowledge of the genetic basis of the syndrome help in management of the patient's condition? (Note: Not the patient's family, but the patient him/herself)
3. Wrap-up, with groups describing their thinking, and presenter highlighting generally applicable points.

For the purposes of small-group discussion, participants should be seated around tables in groups of 6-8 persons from the beginning of the session. After discussion in small-groups (Part 2), roving microphones should be supplied to assist groups in describing their work to the whole assembly (Part 3). Their descriptions should be sound-recorded.

PRODUCTS/MATERIALS:
Based on the sound recording, a written summary of cases and small-group thinking will be

prepared by the presenter and disseminated following the session, along with slides describing essential pedagogy for genetic concepts most relevant to primary care.

LEARNER ASSESSMENT:

Learners will be provided a new structure upon which to build pre-clerkship genetics teaching, along with newly formulated pedagogy for explaining essential concepts and will gain experience in constructing study cases based upon common presenting conditions for use in their teaching.

S-19
MedEdPORTAL: TRANSFORM YOUR BEST EDUCATIONAL RESOURCES INTO EDUCATIONAL SCHOLARSHIP

Richard Sabina [1], Emine Abali [2], and Jana Simmons [3]
[1]Oakland University, [2]City University of New York, and [3] Michigan State University College of Human Medicine

BACKGROUND:
The ABE is uniquely positioned to make significant contributions to the dissemination of high-quality, peer-reviewed educational resources in Medical Biochemistry & Medical Genetics and integrated curricula including these disciplines. MedEdPORTAL is the most utilized, cited and influential destination for health education resources and has recently has been selected for inclusion in MEDLINE, the premier bibliographic database of the U.S. National Library of Medicine. MedEdPORTAL submissions now require an Educational Summary Report (ESR), which has a traditional publication structure. This workshop is designed to provide hands-on experience with evaluating and improving a working draft of an ABE-member ESR prior to MedEdPORTAL submission.

OBJECTIVES:
1. Review a working draft of an ABE-member ESR according to Glassick's six scholarship criteria.
2. Discriminate between its higher order and lower order educational objectives.
3. Conduct a literature search for related educational resources.
4. Determine what educational niche this ABE-member resource would fill.
5. Evaluate avenues for demonstrating effectiveness of the resource.
6. Reflect on what the author feels has worked and what could be improved (limitations).
7. Develop a remaining "to-do" list to enable a submission to MedEdPORTAL.

Advance Preparation: Working ESR drafts will be solicited from ABE members ahead of the conference and one will be selected for use in the workshop. Facilitators will offer in-conference consultations for all authors of submitted ESR drafts. Other participants will be asked to identify their "best teaching/learning resource" and bring related materials to the conference for one-on-one consultations. All registrants will receive selected MedEdPORTAL resources to review ahead of the conference.

FORMAT/METHODS:
Teams will be formed (10 minutes) and each will be provided a handout to frame their review of one assigned component of the selected ESR (25 minutes). Teams will report back on their findings for discussion in a large group format (45 minutes), followed by facilitator wrap-up (10 minutes).

PRODUCTS/MATERIALS:
1. Participants will leave with an enhanced understanding of current MedEdPORTAL submission standards, which should enable them to better author or review a MedEdPORTAL submission.
2. Participants will be provided with an opportunity to consult with a MedEdPORTAL Associate Editor, Faculty Mentor, or Author during designated meals at the conference.

S-20
EVOLUTION OF BASIC SCIENCE TEACHERS TO EDUCATORS: PROFESSIONAL IDENTITY, EDUCATOR ROLES, AND THE ASSESSMENT OF EXCELLENCE

Neil Osheroff[1], Kimberly Dahlman[1], and Tracy Fulton[2]
[1]Vanderbilt University and [2]University of California San Francisco

BACKGROUND:
The development of professional school curricula that include highly integrated courses and active learning educational methodologies has significantly impacted the career paths of many biochemists and other basic scientists. Over the past decade, there has been a seismic shift away from the traditional basic science teacher, whose skills were often limited to the role of lecturer or course organizer, to a professional educator with a more complex repertoire of abilities. Nevertheless, the "gold standard" for defining educational excellence at many institutions remains student evaluation of teaching sessions, with little regard to other valuable educator accomplishments. The goal of this workshop is to identify the skills that should be expected of a "modern" basic science educator and how they should be assessed. This information will be used to help participants identify their educator strengths and opportunities for improvement.

OBJECTIVES:
At the end of this workshop, participants will be able to:

- Describe one's own professional identity.
- Define the different roles of the basic science educator.
- Describe best practices and potential milestones to assess areas of educator excellence.
- Identify one's own educator strengths and opportunities and plans for improvement.

FORMAT/METHODS:
We will utilize a mixture of peer-to-peer, lecture, and small group activities to deliver the 90-minute session. The session will leverage worksheets and PowerPoint slides. The details are as follows:

Time	Activity	Strategy	Facilitator	Materials Needed
15 min	Session introduction	Lecture (10 min) and word clouds on professional identity- 15 years ago vs. now (5 min)	Kim Dahlman	PowerPoint Slides and cell phones/tablets/laptops
20 min	Areas of Educator Excellence	Group discussion and lecture	Neil Osheroff	PowerPoint Slides
20 min	Defining best practices for identifying and assessing educator excellence	Small group activity (10 min) and report-out (10 min)	Neil Osheroff (facilitator)	Worksheet and pens
30 min	Self-identification of educator strengths and areas of and plans for	Individual activity (10 min), peer-to-peer sharing (10 min), and report out (10 min)	Tracy Fulton (facilitator)	Worksheet and pens

	improvement			
5 min	Summary and Take-homes	Lecture	Tracy Fulton	PowerPoint Slides

PRODUCTS/MATERIALS:

The participants will develop personal worksheets that highlight their own educator strengths, areas of improvement, and next-steps. Participants can take these worksheets home and leverage them as an agent for change.

LEARNER ASSESSMENT:

Modern educational modalities require educators to have excellence in areas that extend well beyond that of information provider. Participants in this workshop will self-identify educational strengths and opportunities and strategies for improvement. By implementing these strategies, participants will improve their skills as educators.

POSTER ABSTRACTS

P-01

DEVELOPMENT AND VALIDATION OF A SHARED SECURE BIOCHEMISTRY TESTBANK FOR MEDICAL, DENTAL, AND PHARMACY SCHOOLS

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[1]Marian University College of Osteopathic Medicine, [2]Touro College of Osteopathic Medicine – Harlem, NY, [3]Touro College of Osteopathic Medicine – Middletown, NY, and [4]City University of New York

PURPOSE:

The purpose of this project was to develop a testbank of biochemistry questions based on objectives developed by the Association of Biochemistry Educators (ABE) and written by its members from multiple allopathic and osteopathic medical schools. The goal of this test bank was to (1) avail faculty of questions that can assess students' biochemistry knowledge and its clinical application; (2) make biochemistry faculty aware of the types of questions used for evaluation of students' biochemistry knowledge in various medical schools in order to help eliminate inherent biases in each of the individual biochemistry curricula.

METHODS:

A shared secure biochemistry test bank was created by 43 ABE faculty across the United States and Caribbean representing 34 medical schools. The testbank contained 163 questions, almost all with clinical vignettes. Questions were fairly evenly spread and classified into 9 biochemistry topics with subcategory classification as well based on objectives previously established by the ABE. Four schools then administered these questions as a formative assessment to 123 second year medical students prior to their Step 1/Level 1 board exam. All questions contained rationales describing why the correct answers were correct, and why the incorrect answers were wrong. A survey was given to students after the exam to gather data on how useful they felt the review was.

RESULTS:

Questions performed similarly across schools. Five questions were dropped due to poor metrics or questionable distractors requiring a rewrite. Questions had acceptable performance metrics, averaging over 0.2 in both discrimination index (DI) and in point-biserial (PBS). Students reported that the assessment was very helpful, scoring it 8 out of 10 in usefulness.

CONCLUSIONS:

This test bank represents the first attempt by the ABE to create a standardized set of questions on a national level. In the future, the expanded test bank could help to analyze which teaching methodologies (e.g. integrated/discipline based, flipped classrooms, small groups, etc.) are most effective for teaching specific biochemistry topics as different institutions deliver the same exam questions. Although this shared question bank will continue to be expanded, it already represents a free resource, which can be used for summative and formative testing of curriculum as well as for high stakes board preparation.

P-02

SHARED MEDICAL SCHOOL BIOCHEMISTRY LECTURES VIA GOOGLE SLIDES

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PURPOSE:

The creation of medical school content is mostly created redundantly at each school despite ubiquitous online tools, which allow for shared and even collaborative content.

METHODS:

An online system based on Google sheets and Google slides was created which lists all the biochemistry knowledge usually conveyed during the first two years of medical school. Each slide can have an embedded audio talking through the content creating a self-contained module of knowledge. Content is labeled to describe if the slidedeck is done or in progress, all images are free of copyright protection, slides have voice overs, online notes are available, content duration in minutes, when content was last updated, and lastly an optional large field describing the content covered.

RESULTS:

There are currently 98 hours of biochem content listed. In the last year, three faculty members contributed 19 hours covering 19% of required content.

CONCLUSIONS:

A key benefit of this platform is the ability to edit individual slides online collaboratively and dynamically. For example, as pharmaceutical interventions change a single slide can be modified and the entire “lecture” is then up to date. This content could be used in a flipped classroom setting, as additional curated content for student study purposes, or collaboratively between schools to allow faculty members to dedicate more time to increasing the quality of fewer lectures. The list of content (to use or contribute to) can be found at http://bit.ly/biochem-medLecs.

P-03

FROM THE BASIC CONCEPT OF pH TO COMPLEX ACID-BASE DISORDERS IN TWO HOURS USING SELF-DIRECTED LEARNING

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PURPOSE:

Self-directed learning (SDL) can aid in the development of life-long learning skills. Implementation of SDL is new to many, and methods used and topic chosen may affect successful implementation. As many students struggle with acid-base concepts, a session on basic concepts and clinical relevance was designed and presented. The session and the outcomes are described.

METHODS:

The session was adapted from the system developed at Albert Einstein College of Medicine. A basic scientist and clinician each developed 3 learning objectives for their respective areas. Students were provided with objectives in advance and assigned to work in groups. Students were to find resources to learn the material and be prepared to work with it during the session. In the session student groups answered basic science questions or performed calculations in front of the class. Later in the session clinical cases were presented which groups were asked to expand upon. If answers were incomplete, a second group was chosen to add information. After the session they had 24 hours to submit their learning resources documents. Each submission was reviewed and feedback was given.

RESULTS:

The session was attended by the entire class and all groups participated. Students worked through both the basic and clinical problems presented, though completeness of answers varied. The students remained engaged throughout. All groups submitted resource documents on time and received feedback on their choice and evaluation of sources. Exam performance on the material was satisfactory.

CONCLUSIONS:

Combining basic and clinical information in SDL format is possible and likely desirable. Students can complete an SDL task if given appropriate instruction on expectations. Student choice of resource material varies widely as does their evaluation of its utility. Material presented appeared to be learned based on exam results, so the exercise was deemed successful as a first effort.

P-04

USE OF POWERAPP TO ENHANCE AND COMPLEMENT TRADITIONAL MEDICAL SCHOOL CONTENT DELIVERY

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University of Illinois, College of Medicine at Rockford

PURPOSE:

We have developed an App that allows students (either alone or in teams; self-guided or guided) to integrate their medical and biochemical knowledge with their clinical skills to "predict" how patients with different metabolic disorders would present in an Emergency Room.

METHODS:

Within the App, the students are asked to choose a biochemical "adventure" that they would like to go on. Each adventure helps them understand complex and complicated biochemical disorders in a manner that empowers them, encourages them to integrate material from different biochemical topics and across the curriculum as a whole, and motivates them to go beyond just memorizing the material.

Each adventure starts with a brief overview of the pathway of interest as well as links to relevant resources that enables them to have all the information they need in hand. Students are told an enzyme in this pathway is dysfunctional and the students have to use their biochemical and medical knowledge to predict how elements within various health status panels change in a person with this disorder. Next, the students have to decide how a person would present as a consequence of this metabolic defect. After they press submit, the answer along with a corresponding explanation is revealed to them.

Next students are given a series of clinical presentations associated with defects in various pathways, and the teams have to determine which pathway/enzyme is defective and to defend how information within the vignette supports their answer. After entering the evidence, the team presses submit, and the answer along with a corresponding explanation is revealed to them.

RESULTS:

Around 70% of the students rated the PowerApp adventures as excellent or good use of their time (the remainder thought it was a fair use of their time).

CONCLUSIONS:

We have found that students tend to use the App in groups and like to go on biochemistry adventures together. While most feedback has been extremely positive, most students would like even more clinical vignette examples. The value of the App modules/format is that students can continue using the App after class as a study aid.

P-05
INCORPORATING BIOCHEMISTRY AND GENETICS INTO AN INTEGRATED ORGAN SYSTEM CURRICULUM: WHEN, WHERE AND HOW?

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Idaho College of Osteopathic Medicine

PURPOSE:
The ICOM curriculum in years 1 and 2 is designed to be highly integrated, providing both a strong foundation in the fundamental principles of biomedical science and an early exposure to clinical knowledge and skills. Our systems-based curriculum integrates medically-relevant concepts of human biochemistry and metabolism, molecular biology and genetics with other basic science and clinical disciplines. Herein we present an overview of when, where and how we interweave essential biochemical topics into system-based courses.

METHODS:
The preclinical organ system-based portion of the curriculum at ICOM spans the first four semesters (92 weeks), including an initial 7-week foundations course focusing on fundamental biomedical concepts followed by a series of 2-to-7-week system-based courses (blood-lymph-immune, cardiovascular, musculoskeletal, neurosensory and respiratory in year 1 and endocrine, gastrointestinal, integumentary, mental health, renal and reproductive in year 2). Basic principles of molecular biology, human genetics and the design of metabolism are introduced during the foundations course, whereas more in-depth discussions of topics related to human health and disease are targeted to each organ system course. Teaching modalities include a mixture of live/video-recorded didactic lectures along with alternative learning activities, which may include small-group problem-based learning (PBL), team-based learning (TBL) and case studies, as well as other modalities designed to promote active learning, retention and better integration of the material.

RESULTS:
Since ICOM is a new school (our inaugural class matriculated in August 2018), our analysis of the success of this approach in teaching medical biochemistry and genetics is incomplete. A possible concern with presenting biochemistry over a series of multidisciplinary system-based courses is a lack of continuity and the potential of masking student deficiencies. Thus, regular feedback and ongoing efforts to monitor students' learning and understanding of biochemistry concepts and how they apply to human health will be essential.

CONCLUSIONS:
Among lessons learned thus far are the importance of providing students with adequate learning time and reinforcing exposure to complex biochemical concepts using different teaching methods in order to allow them to build a solid foundational understanding of biomedical principles.

P-06

INTERPRETATION OF GENETICS REPORTS AS A MEANS OF INCORPORATING INSTRUCTION ON SCIENTIFIC METHOD INTO THE MEDICAL CURRICULUM

S. R. Ellis
University of Louisville

PURPOSE:

Identifying strategies to fulfill LCME standard 7, element 3. LCME Standard 7.3 states that the faculty of a medical school ensure that the medical curriculum includes instruction in the scientific method (including hands-on or simulated exercises in which medical students collect or use data to test and/or verify hypotheses or address questions about biomedical phenomena) and in the basic scientific and ethical principles of clinical and translational research (including the ways in which such research is conducted, evaluated, explained to patients, and applied to patient care). We have used the interpretation of genetic reports as a strategy to fulfill this standard.

METHODS:

The strategy involves a disease characterized by locus heterogeneity with as many as 80 genes that when subject to loss of function mutations may give rise to the disease. The scientific problem presented to students is a genetics report describing a missense mutation in one of these genes and the challenge of attempting to determine if this mutation is the pathogenic lesion in the patient. Students are given a real genetics report reporting on a novel missense mutation, which has classified as a probable pathogenic lesion although they cannot rule out that it is a benign polymorphism. Students are asked to create a hypothesis regarding the potential pathogenicity of the mutation based the initial genetics report and their own analysis of the mutational change. The students then go through a more detailed analysis of the mutational change employing their knowledge of protein structure and additional data requested by students. Students are asked to reevaluate their hypotheses at different stages of the exercise as the data unfold, including making a final decision as to pathogenicity.

RESULTS:

Current data reveal that students are willing to revise their hypotheses as they interpret the available data.

CONCLUSIONS:

We feel that this type of exercise meets the spirit of LCME standard 7.3 and also allows students to recognize that ambiguity is frequently encountered in health care and that applying scientific method and appropriate resources can help guide decision making when faced with uncertainties.

P-07

THE INFLUENCE OF STUDENT MOTIVATION AND LEARNING STRATEGIES ON HOW THEY PERCEIVE THE BENEFIT OF ACTIVE LEARNING SESSIONS

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[1]Michigan State University College of Osteopathic Medicine and [2]University of Arizona College of Medicine

PURPOSE:

At Michigan State University College of Osteopathic Medicine, the biochemistry faculty have developed many active learning sessions throughout the pre-clerkship curriculum. The purpose of this study is to understand the characteristics, motivations and learning strategies of medical students that prefer active learning sessions and perceive them to be beneficial, and those of students that do not. This understanding will allow us to modify the design of these sessions to be more effective with a greater number of learners.

METHODS:

A survey was administered to assess an individual student's perception of an active learning session on hyperammonemia as well as that student's motivation for learning and their learning strategies in general. A combination of Google Survey and scantron sheets were used for the anonymous administration of the survey to study subjects. The survey was voluntarily completed by 131 students. The survey was based on the Motivated Strategies for Learning Questionnaire and included questions regarding overall student motivations for learning as well as learning strategies that they employed throughout their education in medical school. This project entails developing a model to describe the correlation between student characteristics and how they perceive the benefit of active learning sessions. The survey data will be analyzed and compared to our model. Based on our findings, the model will be revised for communication to other educators.

RESULTS:

We predict that students who prefer and perceive active learning sessions to be beneficial will share a common set of characteristics, learning strategies and study motivations that are distinct from those of students who do not prefer this style of learning. We will present the results of the survey conducted to assess those variables and a model that describes their relationships.

CONCLUSIONS:

As a community of biochemistry educators, understanding student characteristics, motivations and learning strategies that allow them to benefit from active learning sessions will help us in the development of future curriculum material. We hope that this data can be extrapolated to measures of student success in the biomedical sciences in the pre-clerkship years of medical education.

P-08

ADDRESSING A LCME CITATION ON BIOCHEMISTRY: OUR INSTITUTION'S APPROACH

S.F.T. Fong and D.H. Sakai
John A. Burns School of Medicine

PURPOSE:

The John A. Burns School of Medicine (JABSOM) received a Liaison Committee on Medical Education (LCME) citation for Element 7.1 (biomedical, behavioral, social sciences) at its 2017 site visit. Students were dissatisfied with their preparation for clinical clerkships in the areas of immunology, biochemistry and microbiology. In the Association of American Medical Colleges Graduation Questionnaire (AAMC GQ), ratings for biochemistry on this item were 41.0-47.5% for 2015-2017. To address this citation, we pursued five initiatives to address student perception, faculty development and content relevance, develop new curricular activities and monitor effectiveness.

METHODS:

The JABSOM classes of 2017, 2018 and 2019 were engaged to understand student perception. Faculty development included grand rounds on millennial learners and active learning methods, direct observation of teaching, and review of NBME subject exams. Content relevance was determined through ratings by clerkship directors leading to construction of a longitudinal content map. All the above guided the development of new educational content in the MS1 class. Students were monitored for response to the new content.

RESULTS:

JABSOM students felt biochemistry was less relevant to clerkships and lectures had too much information, unclear clinical relevance and needed step-by-step pathways with more interactivity, the latter two of which were addressed by faculty development initiatives. The content map with topics, clerkship director ratings, location in curriculum and teaching method were used to identify gaps and develop new curricular activities. Videos that reviewed normal biochemical pathways step-by-step were created using a white board app as pre-lecture material. Decompression of lecture content allowed more dedicated time for clinical consequences of biochemical aberrations, and reviewing board-type questions. Surveys showed ~85% of upperclassmen agreed/strongly agreed that they would have been better prepared for clerkship with the changes. Biochemistry rating on AAMC GQ 2018 increased to 78.0%.

CONCLUSIONS:

JABSOM successfully developed and implemented initiatives that improved instruction and clinical relevance of the biochemistry curriculum. These initiatives are being expanded to all basic sciences in a three-year cycle. Our LCME status report submitted August 2018 was determined to be Satisfactory with a Need for Monitoring as expected to determine the long-term sustainability of the changes.

P-09

A CURRICULUM MAP OF WHERE, WHEN, AND HOW MEDICAL BIOCHEMISTRY IS TAUGHT.

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Tulane University School of Medicine

PURPOSE:

Integration and active-learning modalities have become important buzz words when a school is designing, or redesigning, their curriculum. The manner in which Biochemistry is presented in a curriculum can vary greatly from school to school. Biochemistry topics may be placed in system-based or symptoms-based curricula. There may be integration of biochemistry with other basic science courses within the same year (horizontal). Integration may occur between basic science and clinical science years (vertical). Teaching methodology can vary between lectures, team-, case-, or problem-based learning, just-in-time-teaching, or other active learning modalities. In this study, we mapped how biochemistry is taught in different curricula, including where in the curricula biochemistry topics are placed, when this occurs between basic and clinical science years, and which are the more commonly used teaching modalities.

METHODS:

Using an online survey, we asked biochemistry faculty from schools of medicine (allopathic and osteopathic), dentistry and pharmacy questions about where biochemistry topics fit in their curriculum, the manner in which these topics are integrated, and the teaching modalities used.

RESULTS:

The survey has provided information for where, when and how biochemistry is taught in different types of schools and curricula. Over 45 faculty members have responded to the poll so far. The vast majority teaches biochemistry in an integrated curriculum that uses various forms of active learning modalities. Most integration is horizontal, and less so vertical. We will present the results regarding where, when and how biochemistry topics are taught in different forms of curricula, at different types of schools.

CONCLUSIONS:

Data collection in the survey is still ongoing, so the analysis and mapping are in progress. The results will be tabulated to provide a working map for biochemistry curricular design. This may be useful for schools that are in the process of moving from a non-integrated to an integrated curriculum, or redesigning an already integrated curriculum. Knowing where topics can be placed within the curriculum, how topics can align in horizontal vs. vertical integration, and the teaching modalities used, will be beneficial for any future curricular design projects.

P-10
HAVING ACCESS TO VIDEO LECTURES ALTERS FIRST-YEAR MEDICAL STUDENT STUDY PATTERNS

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University of South Carolina School of Medicine

PURPOSE:
Instructors may be hesitant to make recordings of in-class lectures routinely available due to a desire to force students to engage the material before, during, and after lecture. However, alterations to the class meeting schedule due to weather cancellations or instructor travel may necessitate the provision of narrated lectures. A total of six lectures in the second block of the first-year biochemistry course were converted from traditional class meetings to video files. The aim of this study was to see if the provision of recorded lectures would cause students to put off material and “fall behind” the posted class schedule.

METHODS:
Select powerpoint files were converted to smart MP4 files, packaged into a standalone player (similar to what a student would see on YouTube), and made available to the students in conjunction with the plain powerpoint files via Blackboard, the campus learning management system. Access logs were downloaded from the Blackboard server to determine when students first opened either the regular powerpoint file or voice-annotated recording. This date could then be compared to the posted schedule to quantify how much a student was “ahead” or “behind” when accessing either file.

RESULTS:
Though there was variation from student to student, the average date of access showed that the class as a whole fell behind when videos were made available. For the first block of the semester, students were, on average, looking at powerpoint files a little more than 1 day ahead of the posted schedule. For the second block, when videos were available, the class fell an average of 3.1 days behind. Surprisingly, the students who performed the worst on the second block exam were the least behind. Instead, it was the C-students who had an almost 5 days swing (from being ahead to being behind) between the first and second blocks

CONCLUSIONS:
Though students may prefer video recordings of lecture for convenience, their availability can, in fact, lead to declines in student performance because the impetus to keep up has been removed.

P-11

TEACHING PRECLINICAL MEDICAL STUDENTS TO FIND, CRITICALLY ASSESS, AND PRESENT CLINICALLY RELATED BASIC SCIENCE LITERATURE

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Texas A&M University College of Medicine.

PURPOSE:
Understanding advances in basic science research is increasingly important for physicians. Our course—Medical Student Grand Rounds (MSGR)—trains first-year medical students to find, critically assess, and present primary basic research articles about self-selected, medically relevant topics. METHODS. With mentoring and grading from research-oriented faculty members, students completed the following 8 milestones culminating in oral presentations: 1) fundamental training about how to search research literature databases; 2) choosing a disease-related topic with those searching skills; 3) attending faculty presentations at translational research-oriented grand rounds; 4) outlining the significance and background of a self-selected, disease-related topic; 5) outlining a research topic that was derived from recent, mechanistic research literature of the disease-related topic; 6) learning to prepare and give an oral presentation; 7) writing a presentation abstract; and 8) presenting at Grand Rounds Day with emphasis on the primary research literature of the research topic.

METHODS:
With mentoring and grading from research-oriented faculty members, students completed the following 8 milestones culminating in oral presentations: 1) fundamental training about how to search research literature databases; 2) choosing a disease-related topic with those searching skills; 3) attending faculty presentations at translational research-oriented grand rounds; 4) outlining the significance and background of a self-selected, disease-related topic; 5) outlining a research topic that was derived from recent, mechanistic research literature of the disease-related topic; 6) learning to prepare and give an oral presentation; 7) writing a presentation abstract; and 8) presenting at Grand Rounds Day with emphasis on the primary research literature of the research topic.

RESULTS:
Faculty grading of specific milestones and student self-evaluations indicated increased proficiency in interpreting primary basic research articles, preparing and delivering presentations, understanding links among basic and translational research and clinical applications, and self-directed learning that connects basic science research with clinical contexts.

CONCLUSIONS: Mentoring helps students develop skills to synthesize ideas from basic research literature. Milestones reduce procrastination and provide a multi-stage path to presenting focused research topics. Variability in grading across mentors is a challenge for the course. *Lessons Learned*: Providing students with the opportunity to choose their own topics, a feature of self-directed learning, enhanced motivation and enthusiasm for the learning activities. Including a prominent faculty mentoring component allowed students to learn from experts in their chosen areas. The series of milestones equipped students for the increasingly complex tasks of the course and kept students on track to prepare and deliver their presentations. Monitoring feedback and grades from mentors to students helped identify mentors whose feedback or grading was too superficial or stringent, leading to more equitable mentoring experiences for all students. Recruiting physicians and physician-scientists to

describe the value of MSGR improved students' motivation for the course by demonstrating the clinical relevance of the skills taught in the course.

P-12

INSTRUCTIONAL STRATEGIES TO INCORPORATE DRAWING INTO THE TEACHING OF BIOCHEMISTRY AND PHYSIOLOGY

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University of Virginia School of Medicine

PURPOSE:

Despite the instructional benefits of drawing, recent literature review has highlighted a need to investigate strategies to effectively integrate drawing into teaching. Following four years of experimenting with different strategies of incorporating drawing into the teaching of biochemical pathways, we looked at the undergraduate medical students' perception of and experience with learning biochemistry and physiology via drawing.

METHODS:

A series of biochemistry curricular sessions incorporating drawing was offered in the first pre-clerkship course. These taught biochemistry pathways through instructor-led drawing and varied in approach including using drawing as a review vs. preview of lecture material, giving a stand-alone drawing session vs. integrating drawing with Powerpoint lecturing, and providing live vs. pre-recorded demonstrations. Afterwards, all 156 learners were invited to provide feedback on these sessions.

RESULTS:

Detailed outcomes from the theme analysis of student responses will be presented. Among the 124 students who had compared learning through drawing as a preview, integrated review, vs. stand-alone review, 123 found drawing helpful. Realizing that "nothing operates in isolation," learners appreciated getting "a big picture" to "integrate all the metabolism pathways." Specifically, students acquired "a road map" in the preview to orient their subsequent learning and tested their comprehension through the reviews. Interestingly, acquisition of conceptual understanding was perceived both as a prerequisite for and outcome from learning related information through visualization. Such perception contributed to mixed perceptions about how drawing/mapping should be integrated with lecturing. Among the 127 students who had indicated their preference of drawing individually, with peers, or following instructor demonstration, 103 (81%) preferred instructor demonstration when learning new materials or more complex pathways. Learners explained their rationales of preference, discussed how they had integrated drawing into their self-study, and offered suggestions to further benefit from instructor demonstration.

CONCLUSIONS:

We are currently conducting the teaching of physiology and biochemistry with the same cohort of learners. We plan to explore the instructor-led drawing sessions vs. peer-led group drawing in class problem sessions. Collection of additional data will be completed in April, and findings will be shared at the conference.

P-13
A STRATEGY TO INCREASE LIVE LECTURE ATTENDANCE AND ENGAGEMENT

R.P. Ritchie, C.A. Wilkins and M.A. Faner
Michigan State University College of Osteopathic Medicine

PURPOSE:
Class attendance offers opportunities for interactions with faculty and fellow students and for peer-to-peer teaching and learning, both of which foster inter-personal/communication skill development. At Michigan State University College of Osteopathic Medicine, we (Biochemistry course) have tested the use of i>clicker™ questions that contributed points toward course grade as an incentive for class attendance and engagement.

METHODS:
Students had the opportunity to earn 3 points (2.4% of total course grade) by attending class and participating in clicker sessions. Each clicker session started with a “checking the date” question followed by 2-4 “scientific content questions.” To earn a point, a student had to answer at least one of the "scientific content questions" correctly. The Biochemistry course contained 17 lecture days and 15 of these contained a clicker session. At the end of the course, the faculty selected three dates (based on a combination of highest average score and attendance) that counted for one point for a total of 3 possible points.

RESULTS:
In the four years since we implemented this clicker experiment, lecture attendance (~87%) was higher than in previous years (~10%). Quite strikingly, on the day that there was a clicker session, the number of students accessing the live-streaming and on-demand lecture library was lower not only for the Biochemistry course but also in other courses (Physiology, Genetics) as well. The number of students accessing the online lecture library for the other courses increased substantially when there was no Biochemistry clicker session.

CONCLUSIONS:
Using clicker participation to earn points as an incentive, we have been able to increase class attendance not only in Biochemistry but also in allied science courses as well. Attendance and engagement during class appear to be effective in comprehension of content, as evidenced by the lower number of students accessing the online lecture library.

P-14
IMPLEMENTING TEAM-BASED LEARNING IN A FLIPPED CLASSROOM

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Quillen College of Medicine, East Tennessee State University

PURPOSE:
Team-Based Learning (TBL) and Flipped Classroom (FC) are well-characterized and highly interactive pedagogies that have been used for some time in K12 and higher education. Their use in medical education and in Medical Biochemistry has become more common in recent years, as medical education strives to become more interactive and less dependent on traditional lectures for content delivery.

RESULTS:
In the past 10 years, we have made extensive use of FC in our course in Cellular and Molecular Medicine. More recently, we combined the two methodologies into daily TBL sessions on content delivered using in-house made videos and e-learning modules. The poster will describe how TBL and FC were modified to fit our course. The value added of a FC-TBL pedagogy in an integrated medical curriculum is also described.

CONCLUSIONS:
The daily TBL sessions in this medical biochemistry course have been highly valued by students and faculty. Student performance has been on par with the previously used pedagogies.

P-15
IMPROVING EXAM SCORES THROUGH STUDENT AUTHORED FORMATIVE ASSESSMENT
A PILOT STUDY

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PURPOSE:
To explore the impact of PeerWise, an online platform that enables students to write and answer MCQs, on retention of content measured by examination scores. The impact of PeerWise on examination scores was assessed relative to 1) discipline studied, 2) academic performance group, and 3) type of participation (writing and/or answering questions).

METHODS:
Students from the Medical Health Sciences Master's (MHS18) program at Touro University Nevada voluntarily participated in this project. Five MHS18 students introduced PeerWise to their cohort, and explained the basics of question writing. Lecture content from four disciplines – biochemistry, physiology, genetics, and microbiology – was divided amongst student groups, for which they were advised to write and answer questions prior to each summative assessment. For analysis purposes, students were sub-divided into performance levels (high, medium, and low) based on their grade-point average. Data were analyzed using linear mixed effects models implemented in R statistical software.

RESULTS:
Over 80% of the students in the class authored questions and/or submitted answers. Data analysis revealed an improvement in exam scores with answering questions on PeerWise, with results varying among both discipline and performance level of the student ($p=0.0005$). Medium performing students showed the greatest improvement in exam scores through submitting answers in PeerWise in genetics (slope= 0.0185, 95% CI=0.0079,0.0291) and physiology (slope= 0.0154, 95% CI=0.0042,0.0266).

CONCLUSION:
Per focus group evaluation, students found PeerWise most helpful with courses in which there was minimal formative assessment. However, the small sample size and participation was not uniform across disciplines, limiting quantitative conclusions. Low performing students participated the least in two of the four disciplines analyzed.

As per prior literature and results of this pilot study, students should be encouraged to use PeerWise to write and answer questions, particularly in courses with minimal formative assessment. This study is ongoing, with the MHS18 research students of this study now having matriculated into the DO22 program. These OMS1 students are now monitoring PeerWise use amongst the MHS19 cohort, with plans of also implementing PeerWise amongst the DO program. Minor modifications have been made with methodology, with specifically using learning objectives to author questions.

P-16

OVERCOMING HURDLES TO LEARNING BIOCHEMISTRY IN A FOUNDATIONAL BIOMEDICAL MEDICAL SCHOOL COURSE

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PURPOSE:

It is no secret that learning biochemistry is difficult. Learning biochemistry in medical school is even more difficult. Yet, a physician's understanding of biochemistry determines his or her ability as a healthcare provider to skillfully treat patients. We have identified a number of hurdles that our students face in their attempt to learn biochemistry in a medical context. Some of the hurdles are universal for all students that study biochemistry, while some are challenges that are unique to LUCOM students.

METHODS:

We attempted to address many of the concerns listed above by critically evaluating what and how we were teaching. We provided several "ancillary" resources for each lecture, which included providing an associated reading from the course biochemistry text, clearly defining words that were familiar to us but not to the students, providing an outline for each lecture and referring to the outline before we covered a new topic was covered in that learning activity, introducing the big picture of each lecture before pathways and details. Finally, the text used for organ names and macromolecules was color-coded to help students organize material and make connections.

RESULTS:

We think that these efforts were, in some part, directly responsible for the number of failures in the first course for the first-year students being reduced from 7 in 2017 to 3 in 2018. We are interested in seeing how this approach affects performance of students in biochemistry items on national board exams that are taken after the completion of their second year in medical school.

CONCLUSION:

We have more work to do. Fifty-one students (out of 168 students) earned a course grade below 80%. Although several other disciplines are taught in this Foundations course, it is imperative that we continue to refine our biochemistry instruction to further reduce the number of failures, strengthen all students' understanding of biochemistry, and teach students sound learning principles that they can apply to other subjects and in other courses.

P-17
USE OF A CUSTOMIZED NBME STEP 1 SUBJECT EXAM FOR COURSE ASSESSMENT IN THE PRE-CLERKSHIP CURRICULUM

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PURPOSE:
At the beginning of an organ-system based medical school curriculum, most students are not familiar with standardized board exam-type questions that would prepare them for their USMLE Step 1 exam after the second year. Hence the purpose was to introduce medical students from their first course in the curriculum to Step 1 questions and to use performance on these questions as part of the course assessment.

METHODS:
A customized NBME Step 1 subject exam was assembled from retired USMLE Step 1 questions that were within the scope of the lecture material covered in this first course of the medical school curriculum. This NBME final exam counted 20% of the final course grade. Individual scores of the NBME exam were subsequently z-scored to an 85% mean with a standard deviation of 7.5% and students had to reach a passline of 70% (mean – 2SD) in order to pass this exam.

RESULTS:
When first introducing this additional NBME subject exam in our basic science curriculum for academic year 2014-15 students performed at 7% below the national average for these NBME questions. This class performance has continuously improved to currently 3% above the national average for the NBME subject exam. Part of this improvement was due to an increased use of Step 1-type practice questions throughout the lectures and as exam preparation in this course.

CONCLUSIONS:
The addition of a customized NBME subject exam to the basic science curriculum from the first course in the curriculum prepares medical students from the beginning of their medical school curriculum for their first board exams.

P-18
AN ACTIVE LEARNING, TEAM-BASED APPROACH TO EMPHASIZE THE BIOCHEMICAL BASIS OF THROMBOPHILIA AND ITS TREATMENT

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PURPOSE:
We developed 2 cases focused on patients with thrombophilia in order to emphasize and review the biochemical basis for thrombosis and its treatment.

METHODS:
The first case described a previously-healthy man who experienced pulmonary embolism, originally diagnosed as myocardial infarction. The second case described a previously-healthy female who experienced deep venous thrombosis that progressed to pulmonary embolism. Her use of oral contraceptives and the presence of inherited factors was discussed. The week after 2 lectures on hemostasis were given, the first case, learning objectives and information on tests of hemostatic function were posted to the course Canvas site. Students were asked to review these prior to a faculty-guided 2-hour session 3 days later where all 30 teams of 6-7 students met simultaneously, in one of 5 classrooms. The session began by polling students via TopHat. Faculty reviewed responses in real time and when needed, explained concepts to their 6 teams. Each team was next given the second case and essay-style questions to answer over the next hour, followed by a faculty-led discussion. Lastly, individual students completed 5 question quizzes which were scored.

RESULTS:
At the start of the session, scores for 7 questions averaged 80.4 +/- 9.4% correct (n=200). For the subsequent quiz, the mean for 5 questions was 89.0 +/- 8.2 (range 60-100). Two topics showed the most improvement: how heparin functions and identifying risk factors. Initially, 84.3% of students correctly identified activation of anti-thrombin, while 26.8% answered incorrectly that heparin degrades fibrin and 22% incorrectly responded that heparin antagonizes vitamin K. In the graded quiz, only 5.5% of students selected either of those 2 incorrect responses. Compared with only 69.6% who initially correctly identified risk factor(s) for thrombosis present, 99.5% did so on the graded quiz.

CONCLUSIONS:
This use of active learning in a team-based setting effectively employed individual accountability along with team work to aid in student understanding of concepts students traditionally viewed as being difficult. Overall, students prepared for the exercise and remained engaged. We saw improvement in answers to questions related to the initially most difficult concepts.

P-19
POSITIVE STUDENT OUTCOMES FROM TAKING A FLIPPED CLASSROOM APPROACH TO TEACHING BIOCHEMISTRY IN A COMPLETELY ONLINE SETTING.

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PURPOSE:
The purpose of the study is to practice a non-traditional teaching approach in assisting students struggling with learning biochemistry.

METHODS:
The flipped classroom, as the name suggests, it is an alternative approach to the traditional classrooms and teaching methods. In a flipped classroom model, the learner does the classwork at home (self-study based on prepared materials sent by the faculty) and completes homework like activities in a classroom-like atmosphere.

In contrast to the traditional classrooms where the faculty primarily are charged with delivering instructional content, in the flipped classrooms, the faculty act as 'guides on the side' and empower students to lead the conversations and further interactions among peers. Since WGU is a fully online university, the classroom segment of the flipped classroom model consisted of an online classroom that utilized innovative conferencing technologies, which more than mimicked the regular face-to-face interactions. The ability of the students to attend an online classroom from the comfort of their natural surroundings promoted overall interaction and encouraged active learning.

Giving early access to the classroom materials and full control over the amount and the depth of content that will be covered during the classroom activities helps the student to not only learn at their own pace from the comfort of their homes but also fosters active learning. The biochemistry team at WGU utilizes the flipped classroom approach for both one-to-one and one-to-many interactions. However, the current study discusses one such strategy in implementing the flipped classroom model to 'one-to-one' type of interaction and the associated positive outcomes for the student on following through the approach.

A sample of students that were unsuccessful multiple times on an objective based biochemistry assessment participated in the study. Since the expectations of the flipped classroom format were set in advance, the students came fully prepared to participate during the live classroom interactions.

For the homework segment of the flipped classroom, the students received specific discussion points (referred to as teach-back prompts) precisely targeting the learning objectives that the student was struggling with. The students then had to prepare responses to these prompts. Following this, the students met with the instructors in an online classroom and taught the content underlying the teach-back prompts back to the instructors in simple terms. For the student to be able to teach the content back to the course faculty, the student had to comprehend the material to the extent that they are able to explain the concept in simple terms that are comprehensible to a non-specialist.

RESULTS:

As once said by Phil Collins, "In learning, you will teach, and in teaching, you will learn." The teach-back strategy in establishing the flipped classroom model encouraged the students to work hard towards comprehending the underlying concepts at a level that they were able to teach the same content back to an individual in simple terms. We noticed a 100% success rate for the students in passing the assessment on their next attempt following the teach-back flipped classroom method.

CONCLUSIONS:

In conclusion, the teach-back approach in establishing the flipped classroom model in a completely online setting boosted student learning and success. This complete paradigm shift from the traditional methods of content delivery enables both students and educators to utilize their time effectively that ultimately lead to positive outcomes for the student in the form of better pass rates and student satisfaction.

P-20

THERAPEUTIC ENZYMES DESIGN LAB FOR INTEGRATION OF BIOCHEMISTRY AND ENGINEERING AT CARLE ILLINOIS COLLEGE OF MEDICINE

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PURPOSE:

Carle Illinois College of Medicine is developing engineering-infused curriculum aligned with its mission to train future physician-innovators to transform and democratize health care. To address this goal at the basic science level, an engineer-biochemist instructor team implemented a 'Therapeutic Enzyme Engineering Design Lab' in the Foundational Elements Course that integrated biochemistry, informatics, product design and marketing communication.

METHODS:

A 'Therapeutic Enzyme Engineering Design lab' was developed by a biochemistry-engineering instructor team as an integrative basic-science-engineering activity within the Foundational Elements course week centered on 'Biochemical Basis of Disease' and engineering concepts of 'Static and Dynamic Equilibria in Biochemical Systems.' Preparatory materials for this lab included biochemistry video lectures on 'Enzyme Catalysis, Kinetics, Regulation' and a reading on 'Enzyme Industrial Applications' [1]. This was followed by an interactive lecture session in which students reviewed bond energy calculations, enzyme reaction thermodynamics and learned to use the BRENDA database [2] to investigate enzyme variants and parameters for optimization in nature and in health using Tyrosinase as an example. Students next worked as teams in a two-hour engineering lab to apply informatics approaches using BRENDA and KEGG [3] databases to research genetics, structure-activity relationships, classification and phylogeny for the commercial enzyme Alteplase [4] and then present a proposal for a re-engineered product design.

RESULTS:

Four teams of six-to-nine medical students each researched the commercial tissue plasminogen activator drug, Atleplase, and then presented a value proposition including customer client identification for a re-engineered formulation. The team proposals were creative in recognizing that allowable patents include modifications of natural and therapeutic enzymes within devices. Proposed ideas ranged from Alteplase alternatives addressing safety from bleeding side effects to micro-dosing via IVC filters and extended-release auto-injectors. Post-lab assessments showed Carle Illinois students performed on par with all participating schools on the enzyme-related questions for the weekly Firecracker quiz and with national scores on NBME-customized Step 1 exam questions.

CONCLUSIONS:

Integration of a 'Therapeutic Enzyme Engineering Design Lab' within the Foundational Elements Course biochemistry curriculum provided an unique way for students to learn enzymes principles while exploring innovative design enhancements to existing enzymatically-based therapies in medicine.

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P-21

USING BIOCHEMISTRY TO EDUCATE STUDENTS ON THE CAUSAL LINK BETWEEN SOCIAL EPIGENETICS AND HEALTH DISPARITIES

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PURPOSE:

Future strategies to reduce health disparities should focus on interventions targeting social determinants of health. While the effects of social factors continue to be a focal point when educating students on health disparities, an emphasis on the biochemical determinants of cause and health outcomes lags behind. The purpose of this work is to design and implement an in-class activity that aims to increase knowledge and awareness of the link between social determinants of health and epigenetic changes.

METHODS:

A one-hour in-class activity was designed to create an opportunity for students to learn about the link between epigenetic changes, social determinants, and health disparities. The activity employs a mini-lecture, a short video, and both small and large group discussion. A reflective paper was used to assess students' understanding of the topic, evidence of synthesis of ideas, and critical thinking skills.

RESULTS:

A post-activity survey was used to describe students' perception of knowledge and awareness of the causal link between social epigenetics and health disparities, in addition to assess students' satisfaction with the activity. This activity significantly increased students' perception of knowledge about social determinants of health, as well as the effect of epigenetic changes on health outcomes. Furthermore, this activity increased students' awareness about the role that social determinants of health play on epigenetic changes, and challenged students to understand the role that society plays in health outcomes.

CONCLUSIONS:

It has been established that social determinants greatly impact health disparities and that health disparities are preventable. Upon reflecting about their role in helping patients prevent diseases caused by epigenetic changes due to social determinants of health, a majority identified patient education, advocacy, and self-awareness as the top three actionable strategies as future pharmacists. As demonstrated through positive evaluations, the one-hour activity proved to be a viable approach for achieving its goals. Notably, this educational activity offers strategies and resources that can be used and implemented by other programs with very few barriers.

P-22

INCREASED ACTIVE LEARNING STRATEGIES IN A BIOCHEMISTRY COURSE ENHANCED STUDENT ATTENDANCE AND IMPROVED CLASS PERFORMANCE

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PURPOSE:

Accreditation Council for Pharmacy Education (ACPE) requires utilization of active learning strategies in the PharmD curriculum. Our goal was to introduce these activities in a biochemistry course by introducing more application-oriented strategies that built on students' prior knowledge.

METHODS:

This is a first-year fall semester course. Students are required to pass a biochemistry pre-test during the summer. Based on the pre-test results, we tailor lectures to review fundamentals first, and then allow students to apply biochemical knowledge to describe how diseases trigger and how therapeutic drugs act. We ask students to read certain chapters from Lehninger Biochemistry textbook and take a pre-test before coming to the class. We introduced research paper discussions in which randomly created student groups reviewed articles, performed a literature search and presented their research in the class. We also introduced small group discussions on how basic biochemistry knowledge can be used to understand the current problems with pharmaceutical drugs. After each exam, we went through each question in class, and students were asked to form small groups to discuss the correct answers to the questions. Lastly, we let the individual students know where they stand with respect to the class in terms of their exam scores by assigning percentile scores to each student.

RESULTS:

After integrating new active-learning strategies into the course, we found that the student participation in class activities significantly increased, and also resulted in improved class performance. Interestingly, student performance in the course did not correlate with their pre-test performance. The course and the instructors have received improved annual evaluations from students.

CONCLUSIONS:

Increasing active-learning strategies in our biochemistry course led to an improved course that enhanced student engagement and elevated the students beyond their previous abilities.

P-23
HOW TO USE COGNITIVE DIAGNOSTIC ASSESSMENT OF STUDENT PERFORMANCE AS A TOOL FOR MONITORING AND MANAGING INSTRUCTIONAL QUALITY IN UNDERGRADUATE MEDICAL EDUCATION

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In higher education, course evaluations by students are a standard tool used by faculty to monitor the quality of their teaching. Typically, students are requested to rate the quality of a course on the basis of adequacy, appropriateness of content, ability of the instructor to convey the content, degree of difficulty of the material, fairness of the exam and grading procedure, and so on. Changes or adjustments to the course are then made based on this feedback. This study proposes an alternative method for instructional quality control that differs from traditional approaches in that it prioritizes students' performance rather than solely relying on students' evaluation of the course. This approach seeks to glean relevant diagnostic information about the effectiveness of a course from in-class exam used to assess students' learning progress. Specifically, the exams employed here are designed as cognitively diagnostic assessments that explicitly target the instructional content. Command of a knowledge domain is perceived as a composite of multiple skills that a student may have mastered or failed to master. This particular feature of cognitively diagnostic assessment provides the opportunity to use in-class tests and end of course exam for the appraisal of (a) which skills specified in the course have been mastered (or not) by the students; (b) how many students have mastered which particular skills and how many have not. Therefore, if the learning goals and objectives have been well-defined at the beginning of a course, then cognitively diagnostic assessment becomes a better, more accurate mechanism for evaluating whether or not these instructional goals/objectives have actually been achieved.

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