
# 59th Annual Meeting
# October 23rd – 25th, 2015
# Missouri Western State University
# St. Joseph, MO

## ACUBE's 59th Annual Meeting Program Overview

**All sessions take place in Agenstein/Remington Hall.**

### Friday, October 23rd

| | |
|---|---|
| 11:00am-12:30pm | Steering Committee Meeting |
| 1:00-2:50pm | Concurrent Workshops/Planetarium Show |
| 3:00-4:50pm | Concurrent Workshops |
| 5:00-7:30pm | Welcome, Dinner, and Dinner Speaker |
| 7:30-8:30pm | Movie Night and Discussion |

### Saturday, October 24th

| | |
|---|---|
| 7:30-8:30am | Continental breakfast |
| 8:30-9:45am | Keynote Presentation |
| 10:00-10:25am | Concurrent sessions |
| 10:25-10:50am | Concurrent sessions |
| 11:00-11:50am | Concurrent sessions |
| 12:00-1:15pm | Lunch, Business Meeting |
| 1:20-3:10pm | Concurrent Workshops |
| 3:30-3:55pm | Concurrent Sessions |
| 4:00-5:00pm | Posters/Exhibitors |
| 5:00-8:00pm | Social Hour, Dinner, Business Meeting |

### Sunday, October 25th

| | |
|---|---|
| 7:30-8:30am | Continental Breakfast |
| 8:00-8:30am | Bioscene Business Meeting |
| 8:30-8:55am | Concurrent Sessions |
| 9:00-9:50am | Concurrent Sessions |
| 10:00-11:50am | Concurrent Workshops |
| 12:00-1:00pm | Box Lunch and Concluding Session |
| 1:00-3:00pm | Steering Committee Meeting |

## Wireless internet for portable devices:

**Connect to the network MWSU-guest**
**Sponsor code: acube**

**This code will give 24 hours of access to the network, which can be renewed each day.**

**We gratefully acknowledge support from Missouri Western State University, the MWSU Biology Department, and the Western Institute for hosting the 59th ACUBE Annual Meeting.**

Missouri Western State University, located on more than 700 acres in St. Joseph, Mo., serves Missouri and surrounding states. Originally founded as St. Joseph Junior College in 1915, Missouri Western was transformed into a four-year college in 1969 and became a full member of the State of Missouri system in 1977. In 2005, Missouri Western received university designation and changed its name to Missouri Western State University.

Today, Missouri Western offers certificates, associate's, bachelor's and master's degrees. Student-centered, high-quality instruction emphasizes experience-based learning and community service. In 2015, Missouri Western celebrates 100 years of transforming lives.


**Our Mission**

Members of ACUBE share ideas and address the unique challengees of balancing teaching, research, advising, administration, and service. We are a supporting and mentoring community that provides professional development opportunities to:

- Develop and recognize excellence in teaching
- Incubate new and innovative teaching ideas
- Involve student research in the biology curriculum
- Advise and mentor students in and out of the classroom
- Enhance scholarship through our national, peer-reviewed journal *Bioscene*

**Governance**

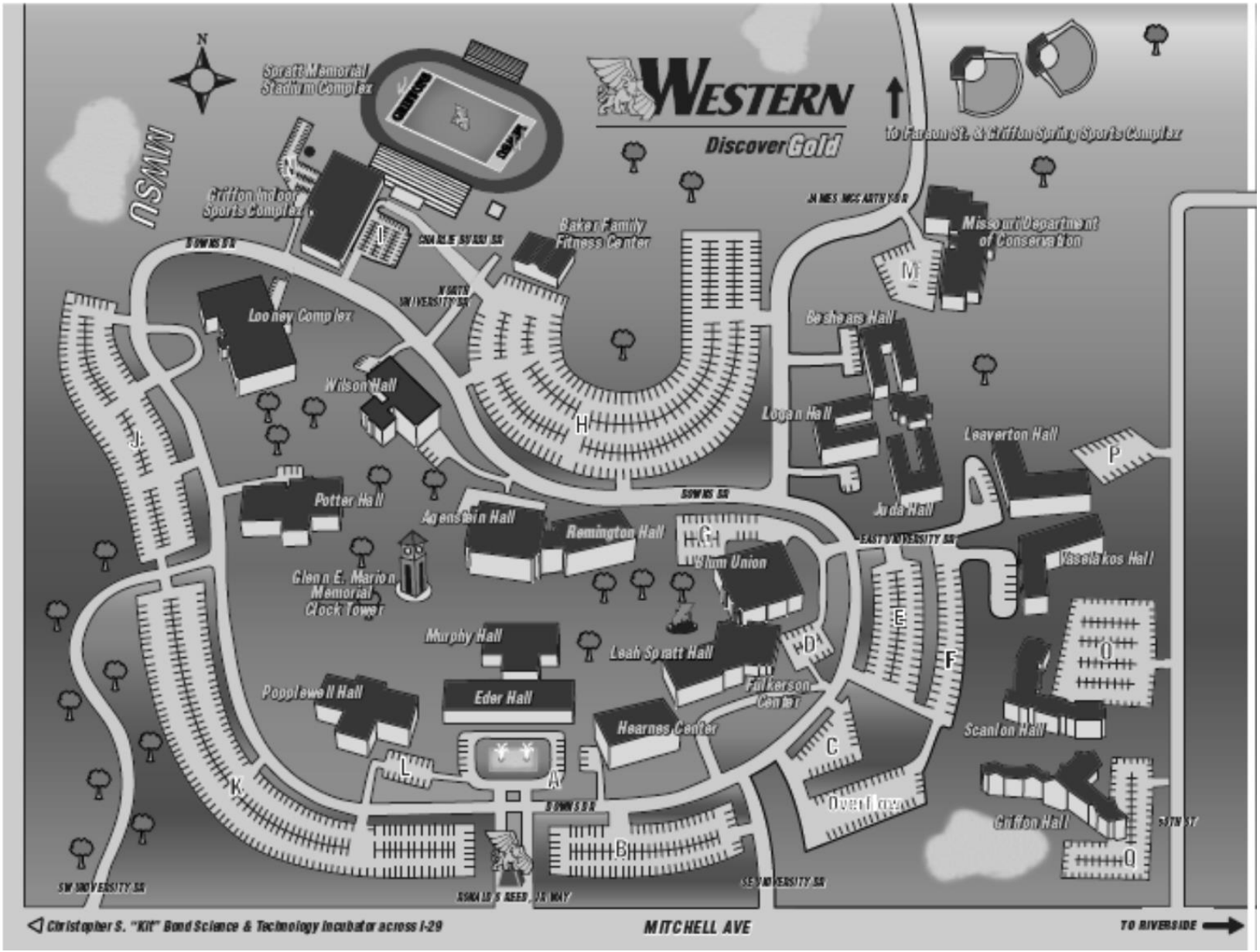
**President**, Aggy Vanderpool, Lincoln Memorial University
**Past-President**, Tara Maginnis, University of Portland
**Executive Secretary of Finance**, Greg Smith, Lakeland College
**Executive Secretary of Membership**, Christina Wills, Rockhurst University
**Secretary**, Paul Pickhardt, Lakeland College
**Historian**, Conrad Toepfer, Brescia University
**Website Editor**, Tara Maginnins, University of Portland

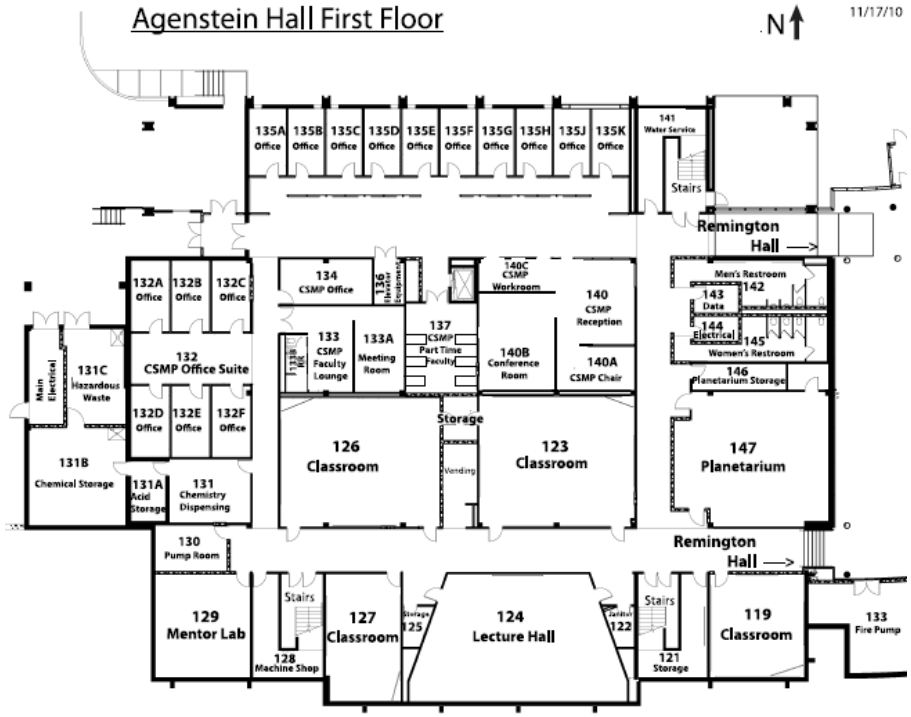
**Steering Committee**

Danielle Rintala, Bryant & Statton College
Rebecca Burton, Alverno College
Marlee Marsh, Columbia College
Jordan Clark, Lincoln Memorial University
Stephen Daggett, Avila University
Khadijah (Gigi) Makky, Marquette University

**ACUBE gratefully acknowledges the support of the following exhibitors at the 59th Annual Meeting:**

**Sapling Learning**
**HHMI BioInteractive**
**Hands-On Labs**
**eScience Learning**


N
WESTERN
Discover Gold
Spratt Memorial Stadium Complex
Griffon Indoor Sports Complex
Baker Family Fitness Center
Missouri Department of Conservation
to Faraon St. & Griffon Spring Sports Complex
Looney Complex
Wilson Hall
Potter Hall
Agenstein Hall
Remington Hall
Glenn E. Marion Memorial Clock Tower
Murphy Hall
Leah Spratt Hall
Popplewell Hall
Eder Hall
Hearnes Center
Fulkerson Center
Blum Union
Beshears Hall
Logan Hall
Juda Hall
Leaverton Hall
Vaselakos Hall
Scanlon Hall
Griffon Hall
Dunklin
Christopher S. "Kit" Bond Science & Technology Incubator across I-29
MITCHELL AVE
TO RIVERSIDE


Agenstein Hall First Floor
N
11/17/10
135A Office
135B Office
135C Office
135D Office
135E Office
135F Office
135G Office
135H Office
135J Office
135K Office
141 Water Service
Stairs
Remington Hall
132A Office
132B Office
132C Office
134 CSMP Office
136 Elevator Equipment
140C CSMP Workroom
140 CSMP Reception
Men's Restroom
142
143 Data
144 Electrical
145 Women's Restroom
146 Planetarium Storage
Main Electrical
131C Hazardous Waste
132 CSMP Office Suite
133 CSMP Faculty Lounge
133A Meeting Room
137 CSMP Part Time Faculty
140B Conference Room
140A CSMP Chair
132D Office
132E Office
132F Office
Storage
126 Classroom
123 Classroom
147 Planetarium
131B Chemical Storage
131A Acid Storage
131 Chemistry Dispensing
Vending
130 Pump Room
Remington Hall
Stairs
129 Mentor Lab
127 Classroom
Storage 125
124 Lecture Hall
Janitor 122
Stairs
119 Classroom
133 Fire Pump
128 Machine Shop
121 Storage


Remington Hall
First Floor
N
101 Math Community Room
104A Server Room
104 Project Room
105 Computer Classroom
107 Walk-in Computer Lab
108 Computer Classroom
Stairs
106 Janitor's Closet
Men's Restroom
Lounge
102 Storage
113 Electrical
112 Data Closet
Elevator
Elevator
118
116 Storage
Women's Restroom
110 Prep Room
109 Physics
Stairs
115 Research Stations
111 Astronomy
110A Prep Staging
117 Classroom
115A Storage
Fire Pump Room
Einstein Bagels

**ACUBE 53rd Annual Meeting**
**Missouri Western State University**
**St. Joseph, Missouri**
**October 23rd – 25th, 2015**

# *Program*

**Friday, October 23rd, 2015**

9:00am-5:00pm Registration (Remington, 1st floor atrium)
Poster setup available all day Friday and Saturday

11:00am-12:30pm **Steering Committee Meeting** Agenstein 228

1:00-2:50pm **Concurrent Workshops** (Abstracts p14; *Note that a planetarium show is available from 2:15-3:00pm)

**Workshop: Teaching Like a Pro in Your First Years** Agenstein 124
Dr. Rebecca Burton, *Alverno College*
Dr. Janice Bonner, *Notre Dame of Maryland University*

**Roundtable Discussions (breakout room available as needed)** Remington 117

- **ACUBE goals and involvement**
  Facilitated by Christina Wills, ACUBE President-Elect, *Rockhurst University*
- **Falling Back in Love with Teaching Science - Strategies for Coping with Burnout**
  Facilitated by Aggy Vanderpool, *Lincoln Memorial University*

2:15-3:00pm **Planetarium show: "Africa: The Serengeti"** Bushman Planetarium (Agenstein 147)

3:00-4:50pm **Concurrent Workshops (Abstracts p14)**

**Workshop: DNA Time Travel: From Discovery to GWAS** Agenstein 124
**Howard Hughes Medical Institute BioInteractive**
Melissa Csiskari, Howard Hughes Medical Institute Education Resources Group

**Workshop: Survival Tips for the Online Science Apocalypse:** Remington 117
**Take Your Science Labs Online**
Andrea Routzon, Hands-On Labs

5:00-7:30pm **Welcome, Dinner, and Dinner Speaker** Remington Atrium
Welcome to Missouri Western State University: Dr. Robert Vartabedian, *President, Missouri Western State University*
Welcome to ACUBE: Aggy Vanderpool, ACUBE President, *Lincoln Memorial University*
Greetings from Conference Chairpersons
Program Chair: Kristen Walton, *Missouri Western State University*
Local Arrangements Chair: Melissa Daggett, *Missouri Western State University*

**Special Guest Speaker: "Dr. Mills, is this a cottonmouth? Tales from the field"**
Mark Mills, *Missouri Western State University*

| | |
|---|---|
| 7:30-8:30pm **Movie Night hosted by HHMI Biointeractive**<br>**"Popped Secret: The Mysterious Origins of Corn" Viewing and Discussion**<br>Melissa Csiskari, Howard Hughes Medical Institute Education Resources Group | Agenstein 124 |
| **Saturday, October 24th** | |
| 7:30 – 8:30am Registration<br>Continental breakfast bar<br>Poster setup available | Remington Atrium |
| 8:30-9:45am **Keynote Presentation (Abstract p15)**<br>**"End of Lecture? The Future of Evidence-Based Teaching"**<br>Mary Pat Wenderoth, *University of Washington* | Agenstein 124 |
| 10:00-10:25am **Concurrent sessions (Abstracts p15-16)** | |
| **Top Hat is a new and accessible class-response system in Genetics teaching**<br>Khadijah Makky, *Marquette University* | Agenstein 124 |
| **Immediate feedback on biology lab group review quizzes improves retention of concepts**<br>Heather Wilkins, *University of Cincinnati Blue Ash College* | Remington 117 |
| **Building Synergy and Connection Among Students and Faculty in Different Courses at Multiple Levels of a Program, through Shared Study of a Microbe**<br>Tamara Mans and Paul Melchior, *North Hennepin Community College* | Agenstein 123 |
| 10:25-10:50am **Concurrent sessions (Abstracts p16-17)** | |
| **Poop pills and Deadly Pandemics- how to get first year biomedical sciences majors excited about microbiology**<br>Lauriann Klockow, *Marquette University* | Agenstein 124 |
| **pClone: Synthetic Biology Tool Makes Promoter Research Accessible to Beginning Biology Students**<br>Todd Eckdahl, *Missouri Western State University* | Remington 117 |
| **Infusing Creative Writing Assignments in an Upper Level Biology Class to Promote Active Learning**<br>Marlee Marsh, *Columbia College* | Agenstein 123 |

11:00-11:50am **Concurrent sessions (Abstracts p17-18)**

**Implementation of introductory biology courses aligned with Vision and Change recommendations** — Agenstein 124
Tessa Durham Brooks, Erin Doyle, Scott Dworak, Brad Elder, Ramesh Laungani, Barb Clement, Kate Marley, *Doane College*

**Integrating Evolution into a General Education Human Biology Course** — Remington 117
Janice Bonner, *Notre Dame of Maryland University*

**Toxins-The Good, The Bad, and the Beautiful as a General Education Course** — Agenstein 123
Mark Milanick, *University of Missouri*

12:00-1:15pm **Lunch & First Business Meeting** — **Remington Atrium**
First call for committee nominations
Out of This World Teaching Contributions

1:20-3:10pm **Concurrent Workshops (Abstracts p18-19)**

**Workshop: Using Bloom's to design assessments that measure meaningful learning** — Agenstein 124
Mary Pat Wenderoth, *University of Washington*

**Workshop: Capturing Student Interest with Digital Interactivity** — Remington 117
Todd Pearson and Midge Hall, Sapling Learning

3:30-3:55pm **Concurrent sessions (Abstracts p19-20)**

**Four Years into Weaving a Thread: This is not the Tapestry I Expected** — Agenstein 124
Conrad Toepfer, *Brescia University*

**Math of Microbiology: an approach to increase math skills in undergraduate science majors** — Remington 117
Jason Baker, *Missouri Western State University*

**Overlap in Upper Level Biology Majors' Courses: Necessity or Wasted Time?** — Agenstein 123
Jim Clack, *Indiana University-Purdue University*

4:00-5:00 **Poster Session/Exhibitors (Abstracts p20-25)** — **Remington Atrium**

**Do multidisciplinary science camps enhance high school student learning and interest in pursuing a career in life-sciences?**
Csengele Barta, Steven Hatch, Stan Svojanovski, John Rhoad, Michael Ducey and Todd Eckdahl, *Missouri Western State University*

**Incorporating Geospatial Technology in Undergraduate Education: Applied Learning in Undergraduate Courses and Research in Mammalogy**
Cary Chevalier, *Missouri Western State University*

**The Drosophila ovary as a laboratory model for introducing the genetic and cellular basis of cell migration**
Melissa Daggett, *Missouri Western State University*, Leonard Dobens, *University of Missouri-Kansas City*

**Botany in Animal Behavior Lab**
Lynn Gillie, *Elmira College*

**Restructuring BIOL 152: Principles of Organismal Biology to Incorporate Active Learning and Student-Engagement with Scientific Data**
David Hall and Kathy Denning, *University of Kansas*

**The PULSE Midwest and Great Plains Regional Network: A community of practice for implementation of Vision and Change recommendations**
Karen Klyczek, *University of Wisconsin-River Falls*, and Michael Kelrick, *Truman State University*

**Integration of Genomics Research in an Undergraduate Genetics Course: A Seven Year Snapshot**
Nighat Kokan, *Cardinal Stritch University*

**Differential effect of Active-based- learning on exam performance of different student populations**
Khadijah Makky and Judith Maloney, *Marquette University*

**Introducing primary literature in a Special Topics in Biology course**
Shauna Marvin, *St. Jude Children's Research Hospital*

**Case studies illustrating the use of Collaborative Projects Across The Curriculum (CPAC) as applied learning activities in biology classes at Missouri Western State University**
Mark Mills and David Ashley, *Missouri Western State University*

**A simple method to culture a micrometazoan for use in teaching and undergraduate research**
Barbara Sisson, Raymond Allen, Elizabeth Thompson, and Robert Wallace, *Ripon College*

**Exploring Peer-Led Team Learning in Introductory Biology Toward Recruitment and Retention of Underrepresented Minority Students in STEM Fields**
Jeremy Sloane, Julia Snyder, and Jason Wiles, *Syracuse University*

**Using primary literature in a journal club format to teach science literacy in an introductory Biology course**
Aeisha Thomas and Natalie Holty, *Crown College*

**Assessment of improvement in student data analysis skills after out-of-class assignments**
Kristen Walton, *Missouri Western State University*

5:00-6:00pm **Social Hour** **Remington Atrium**
Bar and appetizers available (2 complimentary drinks available per registrant)

6:00-8:00pm **Dinner & Second Business Meeting** **Remington Atrium**
Presentation of awards

**Sunday, October 25th**

7:30-8:30am **Continental Breakfast** — **Remington Atrium**

8:00-8:30am **Bioscene Business Meeting** — **Remington 117**

8:30-8:55am **Concurrent Sessions (Abstracts p25-26)**

**Peer Led Team Learning Helps Improve Achievement of Minority Students** — Agenstein 124
Julia Snyder, *Syracuse University*

**Does watching online lecture videos increase student engagement and exam performance?** — Remington 117
Katie Shannon, *Missouri S&T University*

**The Process of Curriculum Reform: Adopting Vision and Change** — Agenstein 123
Laura Salem, Christina Wills, and Jamie Dyer, *Rockhurst University*

9:00-9:50am **Concurrent Sessions (Abstracts p26-27; *Note: This session includes either 50 minute presentations or two 25-minute presentations)**

**9:00-9:25 What makes osmolarity, membrane potential and pH so tough?** — Agenstein 124
Mark Milanick, *University of Missouri*

**9:25-9:50 Teaching the Nature of Science Outside the Scientific Method** — Agenstein 124
Debbie Meuler, *Cardinal Stritch University*

**9:00-9:50 Promoting student engagement and collaboration in physiology lectures** — Remington 117
Judith Maloney, *Marquette University*

**9:00-9:50 Using history and philosophy as the capstone to a Biology major** — Agenstein 123
Neil Haave, *University of Alberta, Augustana Campus*

10:00-11:50am **Concurrent Workshops (Abstracts p28)**

**Pre-health Academic Advising Workshop: Preparing Students for a Career in Health Care** — Agenstein 124
Stephen Daggett, *Avila University,* and Khadijah Makky, *Marquette University*

**Workshop: Facilitative leadership as a tool for departmental transformation** — Remington 117
Michael Kelrick, *Truman State University*, and Karen Klyczek, *University of Wisconsin-River Falls*

12:00 - 1:00 **Box Lunch & Concluding Session** — Remington Atrium
Resolutions: TBD
Executive Secretary Reports: Greg Smith and Christina Wills
*Bioscene* Editor Report: Debra Meuler
Presidential Address: Christina Wills
2016 Meeting (60th) at Cardinal Stritch University

1:00-3:00pm **Steering Committee Meeting, includes newly elected members** — Agenstein 228

# ABSTRACTS

**Workshop: Teaching Like a Pro in Your First Years**
Rebecca Burton, Alverno College

Explore topics such as effective pedagogy, excellent resources, classroom management, and authentic assessment with experienced educators.

**Workshop: DNA Time Travel: From Discovery to GWAS**
Melissa Csiskari, Howard Hughes Medical Institute Education Resources Group

Come and learn an engaging way to teach students about DNA and Genomics. We will follow the trail of evidence that led James Watson and Francis Crick to discover the structure of the DNA molecule by combining clips of HHMI's short film The Double Helix and primary literature. Then we'll fast-forward to explore how current genomic technologies, particularly genome-wide association studies (GWAS), are used to map genotypes and phenotypes. Participants will complete a hands-on activity that uses real data to help students understand how to link Single Nucleotide Polymorphisms (SNPs) to specific traits in dogs. Explore HHMI BioInteractive's free activities and materials to help bring DNA, gene mapping, and statistical analysis successfully into your introductory biology course.

**Workshop: Survival Tips for the Online Science Apocalypse: Take Your Science Labs Online**
Andrea Routzon, Hands-On Labs

The online science apocalypse is upon us and there is nothing we can do to stop it. Are you prepared? Join Hands-On Labs to get practical tips on how to survive your online science class. Hands-On Labs has been helping instructors improve student engagement, learning outcomes and subsequent enrollment numbers for over 20 years. Join us as we demonstrate the future of online science labs with modern pedagogies, cloud-based learning platforms and hands-on experiments that enhance student's online experience.

**End of Lecture? The Future of Evidence-Based Teaching**

Mary Pat Wenderoth, *University of Washington*

We recently published a meta-analysis of 225 papers that compared student performance under active learning versus lecturing in undergraduate courses across the STEM disciplines. The results indicate that on average, students are 1.5 times more likely to fail when being lectured to compared to taking the same course with an active learning component, and that active learning increases exam scores by almost half a standard deviation. I will summarizes the research results that provide robust data on teaching methods that increase student achievement and I will engages participants in discussion of the way even small changes can close the gap between our teaching and student learning. These teaching methods are based on results from cognitive and learning sciences and rely heavily on the "Testing Effect" and "Desirable Difficulties". I will engages participants in discussion of the way even small changes can close the gap between our teaching and student learning because shrinking that gap has tremendous implications for all students, but especially those from underrepresented groups. Says Toby Bradshaw, Chair of Biology at UW: "'By reducing the failure rates, capable students are able to go on, rather than being washed out of the system because they came in a bit underprepared and no one was willing to change the way they did things to help them out….The impact down the road is that we will have a larger, more diverse, more capable work force.'"

**Top Hat is a new and accessible class-response system in Genetics teaching**

Khadijah Makky, *Marquette University*

With new advances in the field of precision medicine, courses on human genetics and genomics become increasingly critical to pre-health profession students. As with many biology related classes, the goal is to keep students interested, engaged, and to improve their retention of the material beyond the semester and the final exam.

Active-based learning has been proven to be fundamental for student education. Class response systems (to aid in student engagement in large classes) such as the Clicker; have been in use since the mid 1900s and after that many others were developed. Top Hat is a relatively newer classroom response system. It was developed in 2009 and it allows students to use many of their electronic devices (laptop, tablet, and cellphone). As an instructor using this system I have found it easy to set up for each lecture and have had an excellent experience with technical support from the developer. Here, I describe our experience using this class response system in the course Human and Applied Medical Genetics. The advantages and disadvantages of the system will be presented and complimented with a demo course. Students' evaluation designated several positives such as price, class engagement and the ability of the system to help understanding the topics taught. In conclusion, the system was easy to use for both students and instructors, it proved to be a useful tool for interactive learning, and helped our students with the application of the material presented.

**Immediate feedback on biology lab group review quizzes improves retention of concepts**

Heather Wilkins, *University of Cincinnati Blue Ash College*

Introductory biology courses often cover many topics very broadly in quick succession, and therefore, mastery of concepts and critical thinking can sometimes be challenging. Providing immediate feedback to students as they are learning material has been shown to improve their retention of correct concepts, especially if they first give an incorrect response (Pashler et al. 2005). Immediate correction of misconceptions through use of the Immediate Feedback Assessment Technique (IF-AT) can prevent students from internalizing incorrect information and has been shown to increase performance on tests (Dihoff et al. 2004). Two biology lab sections completed multiple choice review quizzes. One group used the IF-AT scratch-off answer sheet where the correct answer is revealed by a star. Retention on individual lab practical tests was compared. The IF-AT could help to improve student retention of scientific concepts in an introductory biology lab class.

**Building Synergy and Connection Among Students and Faculty in Different Courses at Multiple Levels of a Program, through Shared Study of a Microbe**

Tamara Mans and Paul Melchior, *North Hennepin Community College*

By focusing diverse labwork on a single organism, we were able to collaborate across courses, share resources, and energize our students' research. We used one bacterial species to study genetics, biochemistry, growth characteristics, and ecological roles during extended projects in multiple courses and levels of a bachelor degree program. Senior students took a leadership role: as a capstone project, they tested and adjusted protocols for use with the bacterium, then co-wrote a detailed manual aimed at students for the second year of the program. Students in introductory biology courses, genetics, advanced biochemistry, and other research students worked with the same microbe, each with varying goals which matched their courses' objectives. The explicit connection between projects at different levels demonstrated the cumulative nature of scientific research. It increased student confidence and project momentum, and thus motivated participants. Intentional collaboration fostered growth of a scientific community among a wide group of students and faculty.

**Poop pills and Deadly Pandemics- how to get first year biomedical sciences majors excited about microbiology**

Lauriann Klockow, *Marquette University*

Watching the trailer of the medical thriller, "Contagion", students see how a novel virus transmitted by aerosols and fomites can rapidly spread through a population. They see how medical researchers and public health officials attempt to identify and contain the disease and the loss of social order that could occur as a result of a deadly pandemic. "Could this happen in real life?" I ask. This is how I introduce freshmen biomedical science majors to the course they will take in their junior/senior year: Medical Microbiology. In this presentation, I will briefly describe and give examples of the small group activities I do during 2 class periods with 150+ first year biomedical sciences undergraduates to introduce them to the field of medical microbiology. One class period focuses on pathogens, specifically on viral outbreaks comparing the pandemic potential of influenza to Ebola. The second session uses the topic of fecal microbiota transplants as a way to engage students in learning about the healthy bacteria that make up our microbiome. I will describe how I use excerpts from the popular press and from journal articles as well as video clips to prompt group discussion. The activities I will describe have also been adapted for science outreach with a small group of high school students. They could also easily be adapted for teaching the microbiome and viral outbreaks to more advanced undergraduate students in a large or small class setting.

**pClone: Synthetic Biology Tool Makes Promoter Research Accessible to Beginning Biology Students**
Todd Eckdahl, *Missouri Western State University*

The Vision and Change report recommended genuine research experiences for undergraduate biology students. Authentic research improves science education, increases the number of scientifically literate citizens, and encourages students to pursue research. Synthetic biology is well suited for undergraduate research and is a growing area of science. We developed a laboratory module called pClone that empowers students to use advances in molecular cloning methods to discover new promoters for use by synthetic biologists. Our educational goals are consistent with Vision and Change and emphasize core concepts and competencies. pClone is a family of three plasmids that students use to clone a new transcriptional promoter or mutate a canonical promoter and measure promoter activity in Escherichia coli. We also developed the Registry of Functional Promoters, an open-access database of student promoter research results. Using pre- and posttests, we measured significant learning gains among students using pClone in introductory biology and genetics classes. Student posttest scores were significantly better than scores of students who did not use pClone. pClone is an easy and affordable mechanism for large-enrollment labs to meet the high standards of Vision and Change.

**Infusing Creative Writing Assignments in an Upper Level Biology Class to Promote Active Learning**
Marlee Marsh, *Collumbia College*

Histology, like many biology courses, is a content-heavy course where students tend to focus on rote memorization of facts in order to understand structure and function in a biological context. In the hopes of infusing more critical thinking and active learning into this course, a creative writing assignment was added in which students produced a case study on a histologic topic of their choice. In addition, students were tasked with writing extensive teaching notes for their case. Students were also asked to design or find a video to supplement their case study so that their case could possibly be used in a flipped classroom setting. Students chose to write cases about a variety of topics including diseases of the blood and autoimmune diseases. In this presentation, I will give a quick background of the course, the assignment, results and feedback from students.

**Implementation of introductory biology courses aligned with Vision and Change recommendations**
Tessa Durham Brooks, Erin Doyle, Scott Dworak, Brad Elder, Ramesh Laungani, Barb Clement, Kate Marley, *Doane College*

The Doane College Biology Department has undergone steady transformation over the last fifteen years starting with a required senior research experience for majors which led to integration of inquiry laboratories throughout introductory Biology courses and most electives. When the Vision and Change report was published in 2011, the department was well positioned to re-evaluate the introductory course sequence in light of the report's Core Concepts and Competencies. This re-evaluation led to the design of a new introductory sequence, launched in Fall 2013, consisting of a freshman-level inquiry laboratory (BIO 110 - Inquiry Laboratory) followed by two integrative lecture based courses (BIO 111 - Energy of Life and BIO 112 - Information of Life). Student perceptions of learning gains in BIO 110 were assessed using internal IDEA survey administration. Learning gains in experimental design in BIO 110 compared to pre-V&C implementation were measured using the EDAT instrument. Gains in understanding of biological concepts between students who had completed the new introductory core compared to pre-V&C graduating seniors were measured using an in-house adaptation of several currently available biology concept inventories. Initial results suggest high student satisfaction in BIO 110 and strong learning gains in Core Concepts in BIO 111 and 112.

**Integrating Evolution into a General Education Human Biology Course**

Janice Bonner, *Notre Dame of Maryland University*

Successfully integrating evolution into a General Education biology course can be challenging because students often don't have sufficient background to which they can relate the evolution-based concepts presented in the course. This session describes how the trade book , The Story of the Human Body: Evolution, Health and Disease (Lieberman, 2013), was integrated into a Human Biology course for non-majors. It explains how the course was designed to provide an ongoing foundation to support the explanation of human evolution, how it incorporated student activities carried out both in class and as course assignments, and how the instructor ensured that students had read the designated chapter of the book prior to class.

**Toxins-The Good, The Bad, and the Beautiful as a General Education Course**

Mark Milanick, *University of Missouri*

I will outline my experience teaching a General Education science class, Toxins, the Good, the Bad, and the Ugly and then lead an audience discussion of what should be the goals of such a class. On the one hand, this course could be aimed to get the students interested in science and thus concentrate on interesting stories and puzzles about toxins, but would this be like having a General Education chemistry class that is driven by neat demonstrations? If so, is that good or bad? In my class, I am attempting to provide some idea of how science is done by providing some examples of solid scientific conclusions, for example, the grasshopper mouse that can eat scorpions with feeling any pain. I intersperse examples where there is controversy, including whether lead or digitalis could have affected van Gogh's color perception. I will share other examples and my experiences trying to motivate student discussions by posing questions about whether the students, if they were an investor, which toxin diagnostic or therapeutic based company would they invest or if a relative had cancer or altered pain perception, which research trial toxin based medication would they recommend that the relative join.

**Workshop: Using Bloom's to design assessments that measure meaningful learning**

Mary Pat Wenderoth, *University of Washington*

Most faculty agree that academic success should be measured not just in terms of what students can remember, but what students are able to do with their knowledge. However, frequently the exams and other assignments that faculty use to gauge student learning do not measure this type of meaningful learning. In this workshop, we will discuss how to better align formative and summative assessments with course learning goals. We will introduce Bloom's taxonomy of cognitive domains and teach participants how to determine the "Bloom's level" of exam questions. Participants will practice designing questions and/or assignments that address each of the six Bloom's levels: Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation. Participants are encouraged to bring one of their exams or class assignments with them to the workshop.

**Workshop: Capturing Student Interest with Digital Interactivity**

Todd Pearson and Midge Hall, Sapling Learning

Exciting students about biology and engaging them in the process of learning is a challenge faced by many biology educators. With the wide variety of digital resources available, it can be difficult to determine not only which resources to incorporate, but how to use those resources most effectively while teaching. We explore the theory behind the creation and the application of one particular type of resource; an open-ended digital interactive activity referred to from here on as an *Interactive*. These interactives provide visually appealing environments that allow students to manipulate variables, environmental conditions, and/or objects to explore challenging topics in biology. They are designed as inquiry-based activities with many possible applications including lecture demonstrations, small group student work, homework assignments, and pre-lab activities. We discuss the theory behind the design and creation of these interactives as well as how they can be used in the classroom or lecture hall. Instructors will discover the power of learning through visual exploration and how it can be incorporated into their teaching in order to increase student engagement.

**Four Years into Weaving a Thread: This is not the Tapestry I Expected**

Conrad Toepfer, *Brescia University*

In the Fall of 2011, two of us began an interdisciplinary project, "Weaving a Thread," involving six of our courses over the academic year. Seventy-five students from those classes examined a common topic from the specialization of each class and all students interacted at semester-end symposia. Students were expected to synthesize content at the end of the fall term and apply that content to a novel situation at the end of the spring term. We presented early results and our plans for tweaking the thread at the 2012 ACUBE meeting and provided an update at the 2013 meeting. Our plans, however, did not involve the project unexpectedly taking on a life of its own. Since 2012, the project has grown to include faculties from chemistry, physics, math, psychology, political science, business, and art, and has the potential in the 2014-15 year to involve 40-50% of our entire on-campus enrollment. This presentation will focus on the elements leading to the unexpected growth, the challenges associated with that growth, and a discussion of which pieces of the project are most critical if anyone is interested in implementing a version at another institution.

**Math of Microbiology: an approach to increase math skills in undergraduate science majors**

Jason Baker, *Missouri Western State University*

Mathematics is an integral part of many science-based careers yet a large percent of science undergraduates (Biology, Biochemistry and Molecular Biology, Medical Technology, Natural Science, Biotechnology, etc) at Missouri Western State University lack confidence in mathematics. A life science industry summer sabbatical in 2011 reinforced the need to teach math skills in the undergraduate science curriculum. In an effort to increase math skills relevant to science careers I have implemented a systematic integration of basic algebra, units and unit conversions, and math problem solving into the microbiology course taken by science majors. Students must master calculations related to microbial cell enumeration, growth rate, thermal death rate, solution preparation, concentrations, and dilutions. Integrated into this are the skills of unit conversions, magnitudes, estimating, correct use of calculators, and scientific notation. Interactive math activities are integrated into lectures, labs, a lab report, a math worksheet, and ultimately a 30 pt math skills quiz as part of the course final exam. A four-year evaluation shows a 73.1% average score for mastering these math skills.

**Overlap in Upper Level Biology Majors' Courses: Necessity or Wasted Time?**

Jim Clack, *Indiana University-Purdue University*

I have previously demonstrated significant overlap in the course material of several majors' and non-majors' introductory biology courses. Analysis of upper level courses covering different sub-disciplines has revealed similar overlap in material. Is this overlap in coverage a necessary evil or does it simply waste time that might be spent expanding on topics more central to the particular sub-disciplines?

**Do multidisciplinary science camps enhance high school student learning and interest in pursuing a career in life-sciences?**

Csengele Barta, Steven Hatch, Stan Svojanovski, John Rhoad, Michael Ducey and Todd Eckdahl, *Missouri Western State University*

STEM education increases science literacy, fosters critical thinking and problem-based learning and enables the next generation of innovators. While science camps have been frequently offered in the past as means to enhance science literacy and discovery-based learning, the impact of multidisciplinary applied science camps on student learning and interest in pursuing a future career in life-sciences is still not understood. Here we report on the design, implementation and impact of a novel, short-term, multidisciplinary science camp, developed at Missouri Western State University (MWSU) offered to junior- and senior level high school students in 2014 and 2015. Students enrolled in the week-long "Discover Science! Summer Day Camp" learned research techniques and applied them in the laboratory through two, interconnected and hands-on protein biochemistry and molecular biology experimental modules. The impact of the camp on student learning/interest in pursuing a career in life-sciences was assessed using pre- and post- camp knowledge and perception surveys and self-reflective essays. Preliminary analysis of data supports a significant increase in the content knowledge of students and an increase- or sustained interest in pursuing science careers in the future. Future work will target the long-term impact of applied multidisciplinary, integrated science camps, and the longer term academic success of summer camp alumni.

**Incorporating Geospatial Technology in Undergraduate Education: Applied Learning in Undergraduate Courses and Research in Mammalogy**

Cary Chevalier, *Missouri Western State University*

Geospatial technology (mapping Global Positioning Systems, GPS, and Geographic Information Systems, GIS) are essential to modern organismal biologists (as well as many other non-biological disciplines). There is increasing use of geospatial technology in answering questions involving organismal ecology, behavior, conservation, and management. I introduce students to the use of mapping grade GPS and GIS for various applications in the undergraduate course in Mammalogy I teach as well as in every research project I have (habitat selection, roundworm distribution, population monitoring, population density estimations and dynamics). Examples include 1) locations of specimen collection, 2) construction of trapping grids and transects using GPS and special techniques such as offsetting of points, 3) precision navigation to transect sites, 4) how to analyze spatial data such as home range data to determine use patterns and use intensities (using GIS). These technologies can be easily adapted to a wide variety of biological exercises, thereby enhancing students' experiential Applied Learning enrichment. Further, these types of experiences can be incorporated into courses and field exercises that can be accomplished right on campus.

**The Drosophila ovary as a laboratory model for introducing the genetic and cellular basis of cell migration**

Melissa Daggett, *Missouri Western State University*, Leonard Dobens, *University of Missouri-Kansas City*

Drosophila has been widely used in many teaching laboratories to introduce students to the practical uses of a model organism in scientific research, in particular to present and observe the outcomes of simple Mendelian inheritance. Here we present the details of a laboratory module that uses Drosophila to demonstrate the importance of gene expression in the process of cell migration. Cell migration in the Drosophila ovary is critically important for the proper morphological development of the egg chamber during oogenesis, a process that interestingly shares many of the signaling components required for cell migration observed throughout normal animal development and during tumor invasion in human cancers. This laboratory provides an opportunity to discuss the genetic and cellular basis of cell migration and to demonstrate techniques used in a modern Drosophila research laboratory including the basics of sorting males from females and identification of cuticle markers , but also the development and use of enhancer traps, balancer chromosomes, microdissection, histochemistry and microscopic analysis. Components of this laboratory module have been found to be appropriate for presentation and completion by students ranging from advanced high school laboratories through graduate level cell and developmental biology laboratory courses.

**Botany in Animal Behavior Lab**

Lynn Gillie, *Elmira College*

Interdisciplinary work can reveal patterns and relationships among organisms that may be challenging to unravel. Students tend to compartmentalize their learning rather than draw from a range of experiences. A guided research project can help them integrate multiple disciplines. Using multi-week field projects, students in a mixed science major and non-science major Animal Behavior course applied botany and chemistry to explain behavior of organisms. Habitat selection of aquatic invertebrates and foraging behavior of butterflies in a meadow were the two main projects that students completed. The labs always generate more questions than answers, and illustrate how science is done.

**Restructuring BIOL 152: Principles of Organismal Biology to Incorporate Active Learning and Student-Engagement with Scientific Data**

David Hall and Kathy Denning, *University of Kansas*

Here we present our approach to redesigning the ecology laboratory component of BIOL 152: Principles of Organismal Biology; a four credit hour integrated lab-lecture course at the University of Kansas that serves as a foundational course for biology majors. The overarching goal of our redesign is to implement a series of three lab sessions that will: 1) familiarize students with how scientific inquiry is carried out and how ecologists collect and visualize data, and 2) allow the students to formulate and test hypotheses, using data collected by KU researchers. In this lab series, students will first learn how to critically evaluate data and data sources using real-world examples collected from print and online media. Next, students will use publically available scientific data repositories (GBIF, eBird) to visualize and develop hypotheses regarding temporal changes in the distribution of three focal species. Finally, students will read a selected peer-reviewed journal article, then use data collected by KU researchers to formulate a hypothesis related to the article's theme. Students will test these hypotheses by creating a graph in MS Excel and will present and receive peer feedback from the class.

**The PULSE Midwest and Great Plains Regional Network: A community of practice for implementation of Vision and Change recommendations**

Karen Klyczek, *University of Wisconsin-River Falls*, and Michael Kelrick, *Truman State University*

The Partnership for Undergraduate Life Science Education (PULSE) was established to develop strategies for department-level transformation and implementation of Vision and Change recommendations. One of the approaches to achieving these goals is the development of regional networks of faculty and institutions dedicated to the formation of local communities of practice that can exchange knowledge, ideas, and resources. PULSE Leadership Fellows representing the Midwest/Great Plains (MWGP) region have organized two regional conferences (June 2014 and 2015) that brought teams from institutions to work on developing a shared vision and a plan for achieving that vision, and to learn creative problem solving strategies to facilitate effective, productive collaboration toward departmental transformation. In addition, groups of participants in sub-regional hubs have received project-driven funding to hold local workshops, as well as to promote and expand the network. This poster will summarize activities in the MWGP network and describe how participants can connect with MWGP network resources.

**Integration of Genomics Research in an Undergraduate Genetics Course: A Seven Year Snapshot**

Nighat Kokan, *Cardinal Stritch University*

The Genomics Education Partnership (GEP, http://gep.wustl.edu), a growing consortium of undergraduate institutions across the US, provides students at primarily undergraduate institutions (PUI) with a genomics research experience. The research question under investigation uses comparative genomics in Drosophilae species: how do the sequence organization and gene characteristics differ between heterochromatic and euchromatic domains? The genome annotations research curriculum has been implemented mainly in an upper level genetics course in the Biology majors program. The annotation experience has been instrumental in providing Cardinal Stritch University students with the use of bioinformatics tools and databases and providing the students with a real research experience over the past seven years, given the limited resources at a PUI. Forty-two students have enrolled in the BL308 genetics course and have participated in the annotation research from 2009 to 2015. Sixteen out of the thirty students who contributed annotations on four drosophila species during the 2009 -2012 period are co-authors on publications. This poster will share insights, challenges, solutions and student responses over the seven years.

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**Differential effect of Active-based- learning on exam performance of different student populations**

Khadijah Makky and Judith Maloney, *Marquette University*

A classroom response system (CRS) was used in a large lecture hall to apply Active-based-learning (ABL), and determine which population of students benefits the most from CRS. A CRS was used in two different classes, a required and elective course. Students utilized CRS to answer critical thinking questions that were incorporated into the lecture and received bonus points for these questions. Results showed that students' exam performance correlated with both their participation and bonus score. Moreover in both classes, the percent of students that achieved the maximum bonus scores correlated with their letter grades. Which student benefited the most from ABL? In both classes, achieving the maximum bonus points did not significantly alter the grades between the midterm and final for strong and highly motivated students. In contrast, for lower performing students this parameter differed between the two classes. Excitingly, in the required class, the data identified a group of students in the BC range that benefited significantly from the CRS, whereas this was not the case in the elective class. In conclusion, our study suggests that the academic benefit of ABL may differ depending on the population of students and their motivation to take the course.

**Introducing primary literature in a Special Topics in Biology course**

Shauna Marvin, *St. Jude Children's Research Hospital*

Special topics courses offer students an opportunity to study important issues in biology not covered in regularly offered courses, often with a smaller class size. This provides an opportunity to use a variety of material for teaching a particular topic, including primary literature. Multiple strategies were used in a Special Topics-Virology course with the ultimate goal of students being able to understand and discuss primary literature. Approximately 50% of the students in this junior-senior level course had not been exposed to primary literature. The beginning of the course included introductory lectures about the viral lifecycle and of particular viruses that would later be discussed using primary literature. To help prepare students for the primary literature paper, specific virus lectures included the common methods used to study that virus and examples of primary data. Additionally, to encourage student participation and provide preparation for discussion-based courses, lecture classes ended with a discussion on a current news topic about a particular virus. To help prepare the students for discussion, pre-class homework assignments for each primary literature paper were turned in prior to class. Examples of key lecture components, assignments and literature used will be presented and discussed.

**Case studies illustrating the use of Collaborative Projects Across The Curriculum (CPAC) as applied learning activities in biology classes at Missouri Western State University**

Mark Mills and David Ashley, *Missouri Western State University*

We will illustrate our use of long-term collaborative research projects in biology courses on our campus by focusing on two or three case studies, detailing learning objectives, logistics and outcomes. These research collaborations involve multiple courses over multiple years and generate datasets that can be examined by students during applied learning experiences. One such research project, a coverboard study in a campus natural area, has involved students in introductory-level classes (Organismal Biology and Evolutionary Ecology) and in upper-level courses (Herpetology, Invertebrate Biology, Entomology). Another case study will describe a project monitoring invertebrates at cave decomposition stations that has been repeated over multiple years by students in different courses (i.e. Cave Ecology, Invertebrate Biology, and Entomology). Students in classes conducting such research projects (or miniprojects) are expected to enter data to common datasets and then manipulate and analyze the datasets to test hypotheses they generate. In some courses, all students enrolled will prepare individualized manuscripts concerning the same project while in other courses, students (or teams of 2-3 students) are responsible for summarizing one of several class miniprojects conducted that semester. A student might be exposed to the same research project over several years and courses.

**A simple method to culture a micrometazoan for use in teaching and undergraduate research**

Barbara Sisson, Raymond Allen, Elizabeth Thompson, and Robert Wallace, *Ripon College*

Rotifers are often raised for aquaculture, and serve as an excellent food source for developing larval zebrafish. In particular, the halophillic rotifer, Brachionus plicatilis, is an excellent model system for use in undergraduate teaching and research. Here we describe a culture apparatus that permits growth of B. plicatilis in amounts sufficient to raise larval zebrafish to adulthood with little daily maintenance in a small academic setting. Culturing rotifers enables students to conduct a wide variety of experiments on larval zebrafish development and address toxicology questions related to the food chain. This species also is suitable for studies of predator prey dynamics, aging, and toxicology.

**Exploring Peer-Led Team Learning in Introductory Biology Toward Recruitment and Retention of Underrepresented Minority Students in STEM Fields**

Jeremy Sloane, Julia Snyder, and Jason Wiles, *Syracuse University*

The President's Council of Advisors on Science and Technology (PCAST) has predicted a deficit of one million college STEM graduates over the next decade and called for diversification of instructional strategies to increase student persistence in STEM. The report also suggested that recruiting and retaining members of underrepresented minority groups (URMs) is of particular importance. Prior research indicates that active and team-based learning approaches foster environments more conducive to student achievement, recruitment, and retention in STEM fields, and suggests that underrepresented populations may benefit most from these approaches. The present study explores the effectiveness of Peer-Led Team Learning (PLTL) in a mixed-majors Introductory Biology course toward increasing recruitment and/or retention of undergraduates in STEM fields with a focus on URM students. Students frequently cite uninspiring introductory courses as a factor in their decisions to leave STEM majors, and previous work on discursive identity suggests that URMs can benefit substantially from small-group learning environments with an instructor who is more like themselves. Hence, we predicted, and analyses have revealed, that students who participated in PLTL workshop sessions associated with introductory biology had higher rates of recruitment and retention over four years in STEM majors compared to students who did not.

**Using primary literature in a journal club format to teach science literacy in an introductory Biology course**
Aeisha Thomas and Natalie Holty, *Crown College*

Reading primary literature has been shown to be effective at developing science literacy (Johanna Krontiris-Litowitz, 2013). This study tries to address whether science literacy can be developed in a course where a journal club format is used to read these articles. Students from an introductory Biology course met and discussed primary science literature with the instructor. Science literacy development was also likely complemented by other aspects of the course such as the librarian teaching students how to choose sources, traditional laboratory work and other instruction. The approach was successful since there was an increase in science literacy total scores. Further, most students liked the journal club format and found reading the article helpful. Overall student attitude to science however did not change. Although the study included an investigation of the role of student choice of the topic of the primary literature on their learning, the results of that part of the study are less clear and the data will be presented. Most students however liked being able to choose the topic for the article and thought it made them more interested in primary science literature indicating that choice of article is of value to the students.

**Assessment of improvement in student data analysis skills after out-of-class assignments**
Kristen Walton, *Missouri Western State University*

The ability to understand and interpret data is a critical aspect of scientific thinking. However, although data analysis is often a focus in biology majors classes, many textbooks and lab manuals for allied health majors or general studies classes are primarily content-driven and do not include substantial amounts of experimental data in the form of graphs and figures. In a lower-division allied health majors microbiology class, students were exposed to data from primary journal articles and their data analysis skills were assessed in a pre/post test format. Students were given 3-4 assignments that included data analysis questions. Assignments ranged from case studies that included a figure from a journal article to reading a short journal article and answering questions about multiple figures or tables. Data were represented as line or bar graphs, gel photographs, and flow charts. A pre- and post-test was designed incorporating the same types of figures to assess whether the assignments resulted in a change in data analysis skills. The mean class score showed a small but significant improvement from the pre-test to the post-test (50.4% correct versus 60.0% correct, $p<0.001$ by paired t-test). Scores on individual questions testing accurate conclusions and predictions improved the most. This supports the conclusion that a relatively small number of out-of-class assignments through the semester resulted in a significant improvement in data analysis abilities in this population of students.

**Peer Led Team Learning Helps Improve Achievement of Minority Students**
Julia Snyder, *Syracuse University*

We implemented Peer-led Team Learning (PLTL) in the context of a mixed-majors introductory biology course at a large, private university in the northeastern United States with the aim of improving achievement among underrepresented minority students (URMs), particularly those who had elected not to enroll in an optional lab associated with the second course of the introductory sequence. Students who did or did not take the lab course were not found to be statistically significantly different in terms of prior achievement. Results indicate that for URM students opting out of the laboratory course, achievement as measured by final course grades was markedly and significantly improved if they participated in PLTL workshops. There were no statistical differences among other groups indicating that PLTL has the highest potential for increasing achievement among URM students, which may have implications toward recruitment and retention among populations underrepresented in STEM fields.

**Does watching online lecture videos increase student engagement and exam performance?**
Katie Shannon, *Missouri S&T University*

I have flipped one day a week of my Cell Biology course. For the flipped day, students watch online videos before class. During class, students work in groups on application level problems. For the other two days of the week, students are assigned a textbook reading before the lecture. Although there are incentives for both types of pre-class preparation, studies have shown that students rarely read the textbook before class. I hypothesized that more students would watch the videos than read the textbook. The online videos provide a vast amount of data on student viewing including number of plays and total minutes watched. To collect data on student reading, I give questions at the end of each exam asking how often they read the textbook before class, beginning in fall 2014 semester (58 students) and continuing in spring 2015 (38 students). Preliminary analysis of the data shows that exam performance correlates most frequently to reading and less often to watching the online videos. Multivariate analysis to control for student GPA and ACT score needs to be performed. Engagement was mixed, with approximately equal numbers of students watching videos more or reading the textbook more often.

**The Process of Curriculum Reform: Adopting Vision and Change**
Laura Salem, Christina Wills, and Jamie Dyer, *Rockhurst University*

The Biology Department at Rockhurst University worked collaboratively over a two year period to examine our curriculum. We will present the steps we took in the process including the hiring of two new faculty and the addition of a new course to our curriculum. The process included lengthy discussions and reflection, a visit from a Vision and Change colleague, the use of rubrics and matrices to evaluate our current curriculum, and the development of an assessment plan.

**What makes osmolarity, membrane potential and pH so tough?**
Mark Milanick, *University of Missouri*

Why, when referring to hyperosmolar, is it the outside of the cell compared to inside of the cell? But for membrane potential, we do the reverse? Most students understand that molecules can move from the more concentrated solution to the less concentrated solution. Thus some students are confused by the fact that water moves from the lower osmolar solution to the higher osmolar solution. Perhaps we should say that water moves from the more dilute to the less dilute solution and define a measure of dilution as amount of water per particle with a unit of ralomso for dilution just as mho's are used for conductance units. I tell my students that most scientists cannot quickly answer the question, which is higher inside animal cells, the free proton concentration or the free calcium concentration. Why do we insist on using pH for the former but nanomolar for the latter? I will briefly discuss the historic reasons for these terms and then lead an open discussion on the audience's opinions on how to balance an introductory science class coverage of the concepts with student friendly terms or of providing students with the vocabulary to read the scientific literature.

**Teaching the Nature of Science Outside the Scientific Method**

Debbie Meuler, *Cardinal Stritch University*

Understanding the Nature of Science (NOS) is critical for scientific literacy. Teaching how science works allows one to recognize good science from bad and distinguish real science from non-science. So what does it mean to teach the NOS? Is it more than just the scientific method? During this session I will share some of the ways I teach the NOS outside of the scientific method and then I will open it up to the audience to share their ideas and experiences. We will look at definitions used in science that differs from how they are used in everyday language and what it means to say science is tentative, historical, and self-correcting.

**Promoting student engagement and collaboration in physiology lectures**

Judith Maloney, *Marquette University*

This study describes a method that utilizes the Immediate Feedback Assessment Technique (IF-AT) to incorporate active learning into lecture. This method is inexpensive, easy to develop, and promotes student engagement and collaborative learning. In a small physiology class, students worked in groups to answer multiple choice questions using IF-AT cards. This enabled the questions to be part of their course grade, and gave students partial credit for second or third choices. Another component of the course was team based learning (TBL) for review of the week's material. The assessment of this strategy consisted of a student survey on the use of the in-class IF-AT cards and TBLs, gaging class attendance, and open ended comments on the course evaluation. Survey results and the course evaluation indicate that students were overwhelmingly positive toward the course and especially the use of IF-AT cards. The cards and working as a team was beneficial to their understanding of the material; encouraged them to be more attentive; and motivated them to come to class. Class attendance during the sessions that utilized the IF-AT cards was 98.5%. Therefore, the use of IF-AT cards appears to be an alternative way to positively engage students in lecture.

**Using history and philosophy as the capstone to a Biology major**

Neil Haave, *University of Alberta, Augustana Campus*

Capstone experiences have high educational impact (Hauhart and Grahe 2015) with a number of approaches for biology (Davis 2011 Bioscene 37(1)). In most capstones, students produce a major project (Hauhart and Grahe 2015), typically as an undergraduate research experience (Haave 2015 Bioscene 41(1)), with a primary goal to integrate students' learning (Smith 1998 The Senior Experience). At Augustana, our biology capstone uses history and philosophy to frame students' reflection and integration of their biological education within our liberal arts and sciences curriculum. In a flipped classroom approach, students write a response to the assigned reading before class, when the paper is discussed through student-lead seminars. Assigned papers consider the philosophy and historical development of biology focusing on its three conceptual pillars: function, development, and evolution (Haave 2012 Bioscene 38(2)), allowing students to examine how biologists arrived at their current understanding of life. Assessment of ten years of course offerings indicates students' ability to write and speak are being successfully developed in students, but that thinking shows no significant learning gains between the midterm and final exams. Student quantitative and qualitative ratings of the course indicate that it is a valuable learning experience, despite its heavy workload and difficult nature.

**Pre-health Academic Advising Workshop: Preparing Students for a Career in Health Care**

Stephen Daggett, *Avila University,* and Khadijah Makky, *Marquette University*

Academic advising is a critical component of a successful college or university education. The manner in which prehealth advising is carried out at different institutions varies. However, many of the methods and concerns overlap regardless of the institution. It is an on-going challenge for advisors of students who express interest in the health professions, to advise students who have clear misconceptions about what it takes to succeed. This workshop will focus on strategies for advising well-prepared students in addition to those who are not as prepared. The facilitators will each give a short presentation and then guide a discussion on ways of addressing this challenge. Part of the discussion will be to focus on what the term "success" means in each of these situations and the importance of teaching professionalism to both groups during the advising process. In addition, the facilitators will provide updates on aspects of the application process for a several health professions.

**Facilitative leadership as a tool for departmental transformation**

Michael Kelrick, *Truman State University*, and Karen Klyczek, *University of Wisconsin-River Falls*

The primary goal of the PULSE Ambassador program is to facilitate productive discussions in life sciences departments, to catalyze institutional change and promote department-wide implementation of the Vision and Change recommendations. Based on lessons learned from our pilot visits to date, workshop participants will gain experience with some of the strategies used during Ambassador visits to departments, aimed at enabling department members to work collaboratively toward a common vision. The practice of listening with empathy will be highlighted using active role-playing, engaging participants in scenarios that represent challenges faced by department members with varying perspectives on important issues. Such empathetic listening skills are critical when tackling the long-term organizational change efforts, at the heart of the transformation recommended by Vision & Change. In addition, participants will identify various leadership styles and learn strategies that invite all department members to contribute to the transformation efforts.

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