STEM-UP Network
Innovative Teaching Symposium
March 24, 3018

Using Digital Tools Outside the Classroom
Presented by Pranshu Gupta
In most courses, understanding and retention of terminology is important but most significantly there is need for reinforcing logic, terminology and methodologies. A simple quiz like assignment becomes tedious and boring and not very effective for enforcement and retention of material. In this presentation, a web application will be introduced that allows to create an interactive learning environment using videos from various sources. The tool was used in three courses teaching C/C++ (freshmen), Java (sophomore/junior) and Computer Networking (junior/senior). It was used by a diversified set of students and majority of the students provided a very positive feedback with a great learning experience. Other advantages of this tool is that videos can be shared among faculty and can be edited based on class needs.

Boxes, Bumps and Breakfasts: Object Lessons for Teaching Human-Centered Research and Analysis
Presented by: Tamara Peyton, Assistant Professor of Social Computing and HCI, Harrisburg University
The interdisciplinary fields of Computer Engineering and Human Computer Interaction are increasingly faced with developing human-centered solutions faster, with fewer project members. As a result, while learning the process of design, students feel pressured to just go ahead and start building as quickly as possible. This is not the right approach, as students will then ignore the crucial problem identification phase of any project. In order to foster the right human-centered mindset in students, it is often necessary to get them to think outside the box, break down the bumps, and collaborate over breakfast. In this talk, I'll share with you three different object lessons I've used in the classroom that wake students up to the need to think before they make. No tech skill needed!

Online Rubric-Based Grading Tool for STEM Exams
Presented by Sara Atwood
In this session we will present our experiences using an online grading tool in engineering courses. The tool helped facilitate feedback that was prompt, equitable, explanatory and formative, as well as streamlining programmatic assessment. Using this tool, faculty can transform how effectively they grade and give feedback in their courses.

Strategies for Gaining Student Buy-in
Presented by Deborah Gochenaur
Students struggle in our courses for many reasons. Early identification of at-risk students, and working with them on a plan of action for the course, can make the difference between students passing or having to retake the course. There are a number of strategies that are useful in getting student buy-in for Action Plans; without their buy-in the Action Plan will not be implemented. During this session I will discuss strategies for getting students to buy-in, as well as follow-up strategies and some anecdotal results from my own work with Action Plans.

Teaching with Digitized Natural History Collections
Janice L. Krumm, Associate Professor of Biology, Widener University, Chester, PA
Elizabeth K. Shea, Curator of Mollusks, Delaware Museum of Natural History, Wilmington, DE
Jean L. Woods, Director of Collections and Curator of Birds, Delaware Museum of Natural History, Wilmington, DE

Increased access to natural history collections data through digitization has created new opportunities for students at institutions with limited or no access to physical specimens. Students can complete research projects on topics such as climate change and biogeography that often require large historical and geographic datasets. Through a Natural History Collections course at Widener University, students are engaging in semester-long collaborative research projects with Widener faculty and Delaware Museum of Natural History (DMNH) curators. Student teams designed and executed original research projects incorporating digitized natural history collections data publically available through iDigBio, VertNet, InvertEBase, and other online data portals. Collaboration between students, faculty and curators yielded projects with strong experimental design, large rigorously edited "big data" sets compiled from multiple sources, and sophisticated analysis. Digitized natural history collections are invaluable resources for any ecology and evolution course, and student experiences are enhanced by collaborative experiences that bridge between scientific institutions.

Getting to Know Your Students Through Reflective Writing Assignments
Presented by Dana Olanoff
An important aspect of teaching is being able to build on your students' understandings and present material in a way that helps them learn. In order to do this, it is essential to know what their understandings are and how they learn best. In this session, I will share some reflective writing assignments that I have used in my classes in order to get to know my students and get feedback from them about the aspects of the class that they enjoy as well as those that they want changed. I will discuss how I use the students' writing to help myself more clearly articulate my teaching goals and communicate them with the class. We will end the session by brainstorming some different ways that professors in classes of various sizes could incorporate some reflective writing into their own classrooms.

Plickers and MUD: Instant Formative Assessments for General Chemistry Lecture
Presented by Elizabeth S. Sterner
Effective formative assessment in general chemistry lecture courses achieves two goals: better instructor information of student progress and promoting student self-assessment of learning. I employ three different, easy-to-use tools as part of a holistic strategy to assess student content mastery, student self-awareness of mastery, and use of effective study strategies. Plickers offers a lower-tech, freeware class response system for multiple choice questions that requires an instructor smartphone and no other device. MUD cards encourage students to self-assess what content they do and do not understand, providing practice at this study skill and serving as a useful contrast to Plickers data. Lastly, start-stop-keep inventories administered at midterm and end of semester allow students to form a longer-term view of their study strategies, in addition to providing information useful to new college students on how to succeed. All three tools are low-or-no tech, very inexpensive, and simple to employ.

Using a Synthesis Matrix to Improve Information Literacy and Scientific Writing Skills
Presented by Tiffany Frey and Heather Lehman, Dickinson College Biology Department
As science educators, we often want our undergraduate level students to execute higher order skills such as the analysis, evaluation, and synthesis of data. These skills require the ability to select and appraise appropriate sources (information literacy skills) and also to be able to compare and ultimately synthesize information from those sources. We have found that the use of a synthesis matrix as either a classroom activity or out of class assignment is useful in teaching these skills. A synthesis matrix is a table that can be used to organize key information from multiple references. We have used it in various classes at all levels of the curriculum to help students 1) find appropriate sources, 2) focus attention on key information in each source, 3) evaluate the information in each source, 4) synthesize information from multiple sources, and 4) come to a conclusion based on multiple perspectives. Specific examples will be provided during the presentation.

Teaching with the SimGlobal System
Presented by John McKnight
SimGlobal is a game system for teaching undergrad social science courses via simulation and roleplay, developed at Harrisburg University of Science and Technology in Pennsylvania, US. It offers a dynamic, engaging means of teaching critical thinking and interdisciplinarity while being adaptable to curriculum goals and instructor expertise. This workshop will cover the development and mechanics of this non-digital game system, and provide hands-on experience with gameplay for up to 15 participants.
The workshop is intended as an introduction to the system for anyone seeking to reorganize a course around a full-semester immersive experience. It will provide participants with the ability to apply simple and robust game mechanics to a course; to develop embedded assessment tools for a range of core skills and advanced subject matter knowledge; to develop scenario tools at minimum expense; to apply mechanics from live-action roleplay to ensure student engagement, immersion, and participation safety; and to gain an appreciation for the student experience within the SimGlobal system.
In this workshop, the designer and a facilitator will discuss the origins of the SimGlobal system for live action roleplay of a response to a complex humanitarian/natural disaster scenario in the undergraduate classroom. We will address scenario creation, learning objectives, assessment tools, and lessons learned from the assessment of data collected during the initial runs of the system in senior-level courses at a STEM university.
We address issues identified in the literature addressing entertainment and artistic live-action roleplay and serious gaming, and their impact on a student learning environment, along with the challenges of teaching within a semester-long immersive roleplay environment. We will explain game mechanics, technological augmentations to a core tabletop system, and the role of a facilitator in the SimGlobal system.
Attendees will be asked to roleplay as humanitarian response specialists called on to address a natural disaster, using the SimGlobal game system and scenarios to challenge leadership, teamwork, and critical thinking in a crisis. We will debrief to brainstorm refinements and opportunities for attendees to adapt our techniques in their classrooms. SimGlobal is a noncommercial product in prototype, and all our materials are publicly available under a Creative Commons Attribution-NonCommercial 4.0 International License.

Tutoring with Tilapia: The Cross-Curricular Use of Aquaculture with Urban Students Presented by Steven Hughes

Though aquaculture has been an integral part of world agriculture for over 3,000 years, it is only within the past two decades that it has been viewed as a major component of classroom education. Though many urban students and educators are not familiar with aquaculture, this branch of agriculture presents many opportunities for engaging students in STEM through its use of natural sciences, innovative technology and math while also providing professional development opportunities for our educators. A discussion of the cross-curricular use of this science will be presented while also trying to enlighten educators on some of the difficulties with incorporating aquaculture into urban educational systems.

Design before you Build: A Hands On Activity on Use Case Diagrams for Middle School Students Presented by Donna DeMarco

Middle school students are coding using programs such as Scratch and Alice. But how do they design their programs? How do they identify the problem, and their solution? This activity takes students through the process of designing a game using Use Case Diagrams. It demonstrates the importance of thinking through the design Before coding and the concepts of reuse and object oriented design. Come participate in the activity and see how much fun it is to design before you build.

Bridging the Gap Between the Older Generation and Millennials
Presented by Marcia Prince-Cuffe

Every generation is compared to its predecessors. The Millennial generation is no exception. Generational differences manifest in all areas of life, inclusive of the college classroom where instructors are tasked with the responsibility of facilitating learning. Differences between the older and the millennial generation in values, in perspectives, and in teaching and learning styles can result in educational gaps that impede student learning.

As a member of the older generation—Generation X, technology use and communication methods differ from those of the Millennial. While my use of technology to complete daily activities has experienced an upward trajectory, its usage remains limited and is punctuated by the shadow of the reliable pen and paper. To interact with others, a telephone call, face to face dialogue, or a hand-written letter remain highly-valued and sought-after means of communication. The former is in sharp contrast to the modus operandi of the Millennial generation. As they navigate their way through life, “Millennials have no memory of a world without the World Wide Web, cell phones, or personal computers. They are an Internet-surfing, iPoding, texting, Googling, Facebooking, and IMing generation. They have come of age during a time of dramatic technological changes in our society. Just consider the fact that the cell phone has become the fastest-adopted invention in the history of humankind. For many of them, texting and instant messaging have become the chosen methods of communication. Perhaps most of all, they have been plugged into one or another electronic device since they were toddlers” (Nevid). These differences, present in the college classroom, can create teaching and learning gaps that require bridging.

To bridge the possible learning divide, it is important to understand what makes the Millennial tick. To effectively teach them, Nevid suggests that "...we need to reevaluate how we reach them and teach them both inside and outside the classroom." Recommended methodologies include amending the current lecture format, using technologically enhanced lessons, applying principles of psychology, and encouraging peer collaboration. Work Consulted: Nevid, Jeffery. “Teaching the Millennials .” *Association for Psychological Science*, May/June 2011, www.psychologicalscience.org/.

Peer Review of Writing to Improve Scientific Communication
Presented by Susannah Gal
In teaching a laboratory class, I found the laboratory reports were filled with English language mistakes and didn't use the type of scientific writing I wanted. I was taking a lot of time to grade these reports and seeing the same mistakes over and over again. Then, I was fortunate to attend a workshop about peer review with a creative writing faculty on our campus. We worked on what specific expectations I had for the writing and created a peer review guide that provided those expectations with examples of what to do and not. I then implemented peer review in class with the students providing each other comments 1 week before the reports were due. This had many positive outcomes for me and for the students. I have since applied this approach to other writing classes in both science and non-science contexts. Specific examples of the peer review guide will be provided at the workshop.

The Impact of Changes in Introductory Programming Courses on Students' Learning and Performance
Presented by Eun-Joo Lee
For computer science majors, introductory programming is an essential process and is used as a fundamental tool for advanced computer science courses. The previous sequence consists of 12 credits and 3 courses, but students who are majoring in Computer Science or those who have little experience in programming have had many difficulties in acquiring key points in programming. In order to improve the previous sequence, our department proposed 4 courses totaling 12 credits. The new sequence allocates more time to the first 2 steps of Java programming, allowing students to learn more about the basics of programming. This study was conducted over 5 years and measured students' learning performance based on ABET[1] skill assessment data and major student retention rates in the computer science department.

Flipped Classes in Civil Engineering: Really Useful ?
Presented by Rajarajan Subramanian from Pennsylvania State University at Harrisburg
Flipping the class means changing the traditional style of teaching (via lectures) to facilitate self-learning through engaging the students. The students' attention span is as short as 15 minutes; hence, the traditional lecturing does not promote effective learning. Sometimes, it looks chaos when 50 or more students interact with each other to try to solve engineering problems to arrive at the right solution. Nevertheless, at the end of the class period, the number of students that learn right improves a lot. This presentation explores the different ways of flipping classes through different case studies and the personal experiences of flipping classes for the past 6 years of teaching at Penn State. Also, the pros and cons of flipping of classes will be discussed in this presentation.

Making a Case for Real World Application
Presented by Stacy Goodman
Case studies can be a useful tool to encourage students to apply what they learn over the rote memorization of facts. Whether through the use of interrupted studies or simulations, students develop critical thinking skills while working in a collaborative environment. I will discuss some pedagogical resources that I have found useful for my upper level Animal Behavior and Human Physiology courses and the benefits of incorporating even short case work activities into the classroom and laboratory.

Teaching as Learning – An Alternative Lab Approach
Presented by Kathryn Shirk
Students enrolled in Shippensburg University's Introductory Physics (algebra-based) and Intermediate Physics (calculus-based) lecture courses are encouraged to concurrently enroll in Introductory Physics Laboratory. This lab course is often taught by a professor other than their lecture professor and can draw students from all lecture sections. Student preparedness and comprehension of the material to be covered in the lab can vary widely. To mitigate this, I have introduced open-note prelab quizzes and short post-lab reflection papers. Our traditional lab structure includes a brief lecture on the topic at hand and equipment used, followed by pairs of students collecting data and filling in tables or graphs included in the lab handout. In fall 2017, I offered an alternative lab assignment to select sections of Introductory Physics Lab in conjunction with Grace B. Luhrs University Elementary School. The college students still completed the pre-lab quiz, and they were given the brief lecture and instructions in their usual classroom. Students then took their lab equipment to a classroom in the elementary school where pairs of college students were teamed with pairs (or more) of elementary students. The college students attempted to complete data collection with the elementary student's help. College students completed a survey after the experience instead of the usual post-lab reflection paper. It is unclear whether this approached allowed students to learn and retain the material covered in lab any better than the traditional lab approach. However, qualitative results indicate that student attitudes and confidence in the material did improve. This study impacted only 48 of approximately 200 students enrolled in introductory physics labs, so further studies are needed.