

**C² Summit for Pedagogical Advancements in
STEM**

Session Program

Friday, October 15, 2021 9am-2pm
ONLINE

Hosted by Raritan Valley Community College

Welcome and Keynote Session 9:00am-10:00am

Main Zoom meeting room

9-9:10am, Welcome Remarks:

Sarah Imbriglio, Ph.D., Dean of STEM & Health Sciences, RVCC

9:10-10am, Keynote Presentation: **Integrating the Diversity of Human Experience with Human Anatomy and Physiology**

Amanda Haage, Assistant Professor of Biomedical Sciences, University of North Dakota



Amanda Haage is a native Midwesterner, growing up in Iowa, and getting her PhD at Iowa State University in molecular, cellular, and developmental biology, before doing a 5 year post doc on cell-ECM adhesion in animal development at the University of British Columbia. Her assistant professorship is in the "educator scholar" track, meaning she is high teaching load person in a traditional research department, teaching a large enrollment (~400 students / semester) anatomy and physiology undergraduate course with flexible delivery options. She is also particularly interested in the integration of social justice and STEM teaching, having created the only STEM courses at her university which are also certified as part of the diversity minded core curriculum.

Keynote Abstract: While intercultural competency is recognized as an essential part of many of our universities' missions, it has often been relegated to something outside of STEM. We fail to commonly recognize how much of the diversity of human experiences is derived by both real and perceived diversity in human anatomy and physiology, let alone conveying to students that science is neither objective or neutral, but has an important part to play in the fabrication of our culture. This talk will present a new, from scratch build of a 200-level large enrollment anatomy and physiology course based on standard objectives created by the Human Anatomy and Physiology Society. These standard objectives are completely integrated with additional objectives on a survey of human diversity topics, including race and gender as social constructs. Every module has the potential to bring a first pass of essential intercultural competency training to our allied health students. The course design is also founded in evidence based best practices of active learning and has multiple flexible delivery options, including in-person and online.

Concurrent Session 1: 10:15am-10:50am

Room A: Free NSF digital algebra games

Kathleen Offenholley, Professor, BMCC

Games can provide a way to engage students and to break up the long hours of a co-requisite course. Games help students with math anxiety feel less anxious and more able and willing to engage in problem solving. Games can also help students to practice and understand math more deeply.

In this highly interactive presentation, you'll play two digital algebra games, Algebots and xPonum, while learning how to use them in the classroom. The games span topics in developmental algebra through precalculus and involve both conceptual learning and practice. The games were developed for an NSF grant and are available for free MAC or PC download, and for ipad/iphone. Download them in advance of this talk, or bring your ipad! More at <https://mathgamesforstem.wordpress.com/>

Room B: Functions, Derivatives, Antiderivatives with Sketchpad

Agnes Azzolino, Assistant Professor & Webmaster

Built to support lectures, examine one Sketchpad with a collection of sketches to remind before introducing functions (support Sketchpads linked), to introduce and explore derivatives from different viewpoints, and including plotting antiderivatives from a Reimann Sums point of view. Brief history also included. It is better if you have a Geometer's Sketchpad and can play while we work.

Room C: Using Discussion Board and Blog Assignments in a WI Microbiology Course to Help Science Students to Become Civically Engaged

Julie Trachman, Associate Professor, Hostos Community College - CUNY

With constant news reports of microbial outbreaks and pandemics, emergence of superbugs, etc., it should be abundantly clear as to the relevance of microbiology in our lives. Pre-Allied Health Science and STEM students taking an introductory writing intensive microbiology class participate in blog and Discussion Board assignments as well as other writing assignments during the course of the semester which ask the students to utilize the basics of what they have learned in class, correlate that information with lived experiences and start having them correlate that to information to public health concerns, especially those dealing with infectious disease agents. With many of these assignments, readings including newspaper and journal articles are provided to help provide students some background information and context. Some of these assignments including assignments dealing with public policy considerations associated with the current coronavirus epidemic and the recent measles outbreak as well as an assignment asking students to think about the importance of voting and participating in the 2020 Census will be described to conference attendees. These assignments are designed to help students start becoming civically engaged and maybe even start reaching out to their communities on health issues even while they are students.

Room D: Virtual Reality Gamification of SARS-CoV-2 Drug Development to Teach Fundamental Principles in Biology and Chemistry

Paulina Cardaci, Instructor, Brian Olson & Dr. Keri Flanagan, Morris County Community College

The County College of Morris works in Nanome virtual reality software in Oculus headsets to gamify teaching of molecular biology and organic chemistry while doing socially relevant research. We use the main protease of SARS-CoV-2 to study a single protein structure in depth. We cover the topics necessary to understand this protein and how to attempt drug design in a virtual 3D world. We cover amino acids, and primary, secondary, tertiary, and quaternary structures of proteins using selection and visualization of the different components of SARS-CoV-2 main protease. For the organic chemistry portion, we cover common organic atoms, intramolecular bonds, polarity, functional groups, and drug-like structures. Players learn about substrate catalysis and enzyme inhibitors. We cover the basic function of the protease while learning the structural regions of the protein with an emphasis on the active site, and intermolecular bonds between the drug molecule and the residues in the binding pocket. Finally, we learn about water displacement and drug binding in an active site with some analysis of water and energy. Then players attempt to design drugs to inhibit SARS-CoV-2 main protease. We demonstrate how interdisciplinary collaboration can propel learning while doing authentic research with potential for great social impact.

Room E (15 minute sessions):

The Genomics Education Partnership: A Faculty Perspective (10:15-10:30)

Marie C. Montes-Matias, Assistant Professor, Union County College

The Genomics Education Partnership (GEP) is a consortium of institutions with the goal of providing equitable access to experiential learning and course-based undergraduate research experiences (CURE) in Biology education. It is a faculty network that intends to provide support, mentorship, and guidance to science educators in the implementation of genomics and bioinformatics training, while exploring biological systems. Implementation of the curriculum does not require additional infrastructure, making the experience accessible to most institutions, including 2-year colleges and institutions historically serving under-represented groups. Resources can be utilized in various ways which could range from incorporating short eukaryotic gene structure lessons into current courses to participating in authentic research, such as comparative gene annotation projects. This presentation aims to elaborate on the faculty perspective as a program mentee and share student experiences utilizing the resources and navigating the genome browser.

Making Open STEM Textbooks: Building and Sustaining a New OER Publishing Model to Support Science-based Career and Vocational Education (10:35-10:50)

Steve Chudnick, Middlesex County College & Rob Hilliker, Rowan University

In renewing the Open Textbook Program grants this past year, the U.S. Department of Education updated their Absolute Priorities to focus on addressing gaps in the “Open Textbook Marketplace”. This reprioritization reflects the success of initiatives such as OpenStax and the Open Textbook Network in providing for general education courses as a way to maximize the financial impact of their efforts. Our (now-funded) three-year proposal to create a Community College-led, state-wide Open Textbook Collaborative in New Jersey seeks to fill an important need for Open Textbooks that support STEM-intensive Vocational and Career Education programs. Working with our partners, we aim to support a more practical and adaptive approach to pedagogy and curriculum development, as well as providing students with pathways to remunerative career opportunities in growth industries. In this session, we will discuss our progress towards a new model for career-oriented Open Textbook publishing based on a library-led collaboration between individual faculty members, educational institutions, professional associations, and industry partners.

Concurrent Session 2: 11:05am-11:40am

Room A: A Visual Approach to Teach Fundamentals in Mathematics

Aradhana Kumari, Assistant Professor, Borough of Manhattan Community College, City University of New York

Approaches to teaching mathematics have been lecture driven. After teaching almost 10 years and analyzing students work, I realize that in the Developmental and in Elementary Algebra courses there is a disconnection between students understanding of concepts and procedural fluency. In some cases, students can perform the procedure, but they do not understand when the procedure is valid. In other cases, students do not understand the concept but are able to perform the procedure. For example I have found that students have difficulty in squaring an algebraic expression. They can square and simplify expressions like $(x^3y^4)^2$ but they make mistakes when they simplify expressions like $(x^3+ y^4)^2$. After analyzing student work, I have concluded that they did not understand the underlying concept that is squaring an algebraic expression. A visual approach using the "box" technique helps students to understand the concept of squaring an algebraic expression and write each step with correct reasoning. In this talk I will show more examples on how to use visual approaches to solving mathematical problems to improve student learning outcomes in mathematics, learning experiences in mathematics and student comprehension of concepts. I identified that visual way of teaching mathematics is highly effective in helping students to understand fundamental concepts in mathematics. **This work was supported by Borough of Manhattan Community College, City University Of New York, Faculty Development Grant for the 2021-2022 cycle.**

Room B: Who answers my question?

Jing Huang, Physics Professor, Mercer County Community College

Digital tools can be used to enhance student to student and student to faculty interaction. Two digital tools Discord and Calendly are introduced with demonstration to show how digitally enhanced student to student and student to faculty interactions may enhance student learning by getting their questions answered 24/7 by peers and one-on-one by the professor.

Room C: Strengthening Student Success and Engagement in Math and Science Courses Through Use of the On-campus Tutoring Center

Frank Pietropollo, Anna Cecala & Heather Wolfgang, County College of Morris

This presentation will introduce several initiatives that have been implemented in math and science courses through the Tutoring Center at County College of Morris, which aim to increase student success and mastery of course learning outcomes. The goal is to utilize active learning and student-centered techniques for greater student engagement in courses that typically have a low success rate, such as Anatomy and Physiology I, Calculus, and College Algebra. These various strategies can easily be applied to other STEM courses.

Room D: Creation of an OER Lab Manual

Pascal Meier, Assistant Professor, Raritan Valley Community College

Just a few years ago, the Organic Chemistry students at RVCC were required to purchase a lab manual costing over \$100 in order to access lab procedures. With OER sources, online resources, and OneNote, we have created our own digital lab manual, bringing the cost to \$0. This presentation will outline the step-by-step process we followed to drastically reduce the overall cost of the lab manual for our students, making the course material more accessible for all.

Room E: Foundations for Physics: Implementation and Assessment of a Multi-Modal Pre-Physics Program at a Two-Year Community College

Wayne Warrick, Instructor of Physics, Passaic County Community College

The challenge of teaching introductory physics is compounded when students do not have the prerequisite math foundations. In the Spring of 2021, a pre-physics program was successfully implemented in remote-learning physics courses at an HSI community college. In the Fall 2021, the program was expanded to in-person modality. An assessment quiz quantified student's prerequisite mathematical background. Class averages of 49% for an algebra-based (AB) and 40% for a calculus-based (CB) course verify students' mathematics deficiency.

Of the students that performed poorly (<60%) on the assessment, 83% and 70% viewed the pre-physics content afterwards in the AB and CB courses. Overall, 75% of students viewed the program content. With continued interest in the program, performance indicates enhancement of basic skills and problem-solving abilities that makes it possible to accelerate the pace of the CB course. Of the students who viewed the program at least once, 75% scored more than 80% on the first pre-lab quiz in the AB course and 71% in the CB course.

Pre-physics assessment indicates it is the most effective technique to enhance student performance with a possible correlation between students who viewed the content and assignment performance. In the presentation, a demonstration of the pre-physics program will include the guide, rubrics, how the program extends into the laboratory, assessment data, future expansion of the program and its multi-modal adaptability.

Room F: (15 minute sessions):

Open Educational Resource Based Physics Course Development through OpenNJ and VALE (11:05-11:20)

Moe Tabanli & Marilyn Ochoa, Middlesex County College

An increase in textbook costs has an adverse effect on reducing the achievement gap. In our experience, textbooks also lack sufficient tools for students with diverse background and learning modalities in the era of Covid-19. Remote learning made it further difficult to achieve equity and inclusion. Open Educational Resources (OER) is one way to reduce the achievement gap. OpenSTAX College Physics textbook is a suitable place to start. It includes basic lecture presentations. Our aim is to supplement lectures with classwork and online simulation activities to provide a path for continuous learning. A sample work is presented at this summit. The flow of our presentations starts with a review of concepts, units, and formulas. A solved problem simulated by an OER app is presented. Several guided practices provide students basic tools for their continuous learning process. Our goal is to enable students to be more focused on core topics and be more confident. The work will be available at the OpenNJ repository and will be distributed through the VALE system. OpenNJ is a statewide repository and referatorium collection developed for New Jersey higher education institutions for its educators to find and access materials. The VALE (Virtual Academic Library Environment of New Jersey) Consortium was developed in 1998 as a grassroots organization to develop inter-institutional information connectivity and collaborative library application projects among New Jersey academic libraries.

Interdisciplinary Learning Community: Sustainability and Agriculture (11:25-11:40)

Dorothy Salinas & Dr. Jill Schenum, County College of Morris

An interdisciplinary approach to environmental topics, such as climate change and sustainability, helps to bridge the gap between identifying an environmental concern and implementing a societal resolution. This presentation aims to highlight an interdisciplinary learning community established between two college courses: Biology of Environmental Concerns (BIO 127) and Contemporary Social Issues (SOC 202). The learning community involved scheduled, overlapping class meetings that promoted the exchange of information between students enrolled in each course. Accordingly, the topic of sustainability and agriculture was evaluated from the environmental and sociological perspectives. The students designed and executed a collaborative oral presentation based on a selected field experience from which they could evaluate the topic through an interdisciplinary lens.

Concurrent Session 3: 12-12:35pm

Room A: Projects that Change Perspectives

Elisabeth Jaffe, Assistant Professor, Borough of Manhattan Community College

In this workshop we will look at projects in mathematics that change students' perspectives. Students see mathematics as a right or wrong answer. They do not see the beauty of the subject. They often struggle to be innovative and don't see the mathematics in the world around them. They don't see it in water fountains, in the light patterns of a flashlight, or in the choice of a box of chocolates. They don't hear it in the sounds of the city. They don't realize they do complex mathematics in their heads every day, and we simply help them put it on paper. Projects can help give students the space to explore mathematics while also providing them with freedom of choice in the classroom. We will examine projects that use literature including Einstein's Dreams by Alan Lightman and The Housekeeper and The Professor by Yoko Ogawa. We will also look at a project that explores patterns that permeate multiple areas of mathematical content. Another project allows students to analyze the value of statistical information that they are often accosted with by the media. Finally, we will look at a project that explores mathematics in art, allowing students to once again, recognize patterns and discover that they can see mathematics in everything around them. Each of these projects can be adapted for any mathematics classroom and requires students to think creatively and logically. They allow students to showcase their other talents while applying what they learn in the classroom.

Room B: Social Annotation with Hypothes.is

Melanie Lenahan, Professor, Raritan Valley Community College & Dr. Carlos Goller, Associate Teaching Professor, North Carolina State University

Social annotation is reading and thinking together. Students open a PDF or webpage, then highlight, comment on, and share ideas about the text. When students comment on the text itself it leads to strengthening community, literacy skills, and constructive dialogue around content.

There are many ways you can use Hypothes.is in a STEM discipline including using primary literature, data analysis and open access articles. Students can annotate in a group or individually to explain concepts through text, memes and videos. Social annotation uses active reading strategies that allow for instructors to ask questions directly on the text and elicit comments and ideas from students about the text.

In this presentation, we will show participants how to use Hypothes.is and provide the opportunity to collectively annotate a blog post.

Room C: Using Embedded Student Tutors to Improve Study Habits

Eric Cameron, Associate Professor, Passaic County Community College

Our students have so many responsibilities. Many of them, if not required to do so, will not put as much time as we'd like into our classes. In STEM classes, that can spell disaster.

We have had success at Passaic County Community College with embedded tutors, with a few twists. First, we try to find students who recently took the class with us (rather than a professional tutor with a higher-level degree). Second, we get them to attend our lectures and be part of the class community, someone the students see and interact with. Third, the tutors schedule weekly workshops with the students, of which students are required to attend a number (usually, 5) during the semester.

The combination of working with peers in a low-stakes environment has led to strong results. Among the questions I will answer:

- a. How do these tutors get paid?
- b. How do I mitigate complaints about the workshops and busy schedules?
- c. Is the success causation or correlation?
- d. How much work does the faculty member have to do?
- e. Are there other rewards aside from improving student success?

(If you can't attend, the short answers to the above questions are: a) grants or course fees, b) "the carrot" works better than the stick, c) more causation than correlation (I believe), d) not as much as you think, and e) yes there are).

Room D: Reflections on Remote and Hybrid Chemistry Laboratory Experiences

Dr. Mary-Ellen Rada, College Lecturer, Ocean County College

A year ago, we were tasked with immediately turning our Chemistry Laboratory Experience into something that did not require an in person presence. In the flurry of that chaos, some things worked well, others didn't work at all, and some things needed a lot of tweaking. The remaining Spring 2020 term, the Summer 2020 terms and the Fall 2020 term gave us great insight into the multitude of issues regarding this task. While we all hoped for an in-person Spring 2021, it did not happen. What we did do was to create hybrid experiences. No one expected the lockdown to occur, but now that it has, we can be much more prepared should something cause us to return to the unusualness of a non-campus setting. This presentation recaps our experiences and best practices that came out of that tumultuous time.

Room E: Increasing the Accessibility and Affordability of Online Science Courses

Dorothy Salinas & Caitlin Burns, County College of Morris

This presentation will address techniques to increase the accessibility and affordability of online science courses. These techniques remove barriers to student success and promote equity by eliminating geographic limitations (online), supporting students with disabilities (ADA Compliance, QM Standards), and promoting enrollment of students from varying socioeconomic status (open education and low-cost options). Examples will be provided for biology major (Anatomy and Physiology) and non-biology major (Concepts in Biology) course offerings.

Room F: (15 minute sessions):

Embedding YouTube videos in WeBWoRK (12-12:15)

Ivan Retamoso, Professor of Mathematics, Borough of Manhattan Community College

WeBWoRK is widely used by Instructors as a free of cost Homework system to teach STEM courses. Over 15 minutes, I would like to present a simple method to embed YouTube videos to Homework problems in WebWoRK.

Pedagogical Improvements in Synchronous Online STEM Courses (12:20-12:35)

Raymond Lam, Assistant Professor, Queensborough Community College, The City University of New York

Synchronous online teaching was plagued with reduced student engagements during class time in comparison with in-person face-to-face teaching in classrooms. The student engagement was further reduced if students were allowed to turn off their cameras and microphones. Texting became the only channel of communication between students and an instructor during synchronous online classes. It was therefore difficult to keep track of students' progress during synchronous online classes.

An improved pedagogical approach was implemented to engage students in synchronous online STEM classes. The pedagogical improvement approach includes (1) welcoming email to students before the start of a course, (2) VoiceThread app for student introduction of himself/herself, (3) emoji for students expressing his/her state of mind when logging in a class, (4) raised-hand emoji for positive response of his/her understanding of course materials, (5) Mentimeter app for instantaneous students' feedbacks, and (6) polling for determining students' status during in-class work assignments.

Discipline Networking Session: 12:45-1:30pm

Rooms:

BIOLOGY

ANATOMY & PHYSIOLOGY

CHEMISTRY

PHYSICS

ENVIRONMENTAL SCIENCE

ENGINEERING

COMPUTER SCIENCE/PROGRAMMING

MATH

DEVELOPMENTAL MATH

TECHNOLOGY

NON-MAJORS SCIENCE

Closing remarks: 1:35-1:45pm

Main Zoom meeting room