

ISEC '11

at the Trenton Computer Festival
The College of New Jersey
Saturday, April 2

Program Book



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Integrated STEM Education Conference
The Trenton Computer Festival, Inc.

PRESENTATION GRID

	SSB 321 Session A	SSB 323	SSB 324 Session B	SSB 325	Anthropology Sociology Conference Room
8:30 - 10 am					
10 am			Welcome / Plenary		
10:30 am (1)	PTLW STEM Programs <i>C. Malstrom, PLTW</i>		STEM Integration with Informatics <i>S. Zilora, RIT</i>		
11 am (2)	Enhancing STEM Classes Using Weave <i>A. Baumann, et al., UMass- Lowell</i>		Computer Programming: A Building Block of STEM <i>S. Dutta and R. Mathur, Bridgewater- Raritan HS</i>		Continental Breakfast
11:30 am (3)	AFRL Information Directorate's STEM Activities <i>S. Muccio, T. Vestal, and J. DeMatteis, AFRL</i>	Speaker Prep Room	From Design to Prototype - Manufacturing STEM Integration in the Classroom and Laboratory <i>E. Flynn, Gateway CC</i>	Registration	
noon - 1:30 pm					ISEC Café
1:30 pm (4)	Reenergizing and Reengaging Student Interest Through CAPSULE <i>J. Chin, et al., Northeastern U.</i>		Project-Based Pedagogy for First Year College Students in Imaging Science <i>J. Pow and M. Helguera, RIT</i>		

PRESENTATION GRID

	SSB 321 Session A	SSB 323	SSB 324 Session B	SSB 325	Anthropology Sociology Conference Room
2 pm (5)	Project Blob: Edible Emulsions <i>A. Darwish, et al., U. of Cincinnati</i>	Presenter Prep Room	STEM Education in Colombia <i>M. Duque, et al., U. of the Andes</i>	Registration	Afternoon Break
2:30 pm (6)	Student Initiation to Science by Computer- Aided Teachers <i>P. Filipovic, et al. (various)</i>		A National Framework to Integrate Remote Sensing Science and Education in K-20 Training <i>S. Merchant and R. Khanbilvardi, CUNY</i>		
3 pm (7)	Accelerated Software Development Experiences <i>R. Kelly, Monmouth U.</i>		Integrating Engineering into Secondary Math and Science Curricula <i>R. Carr and J. Strobel, Purdue U.</i>		
3:30 pm (8)			Drug Design as a Video Game <i>J. Salisbury, Brandeis U.; S. Morgan and J. Williams, RIC</i>		
4 - 5 pm	ISEC Roundtable Discussion				

10 – 10:30 am

SSB 324 – Welcome and Plenary; speaker tbd

10:30 – 11 am

SSB-321: Project Lead The Way Engineering and Biomedical Sciences Curriculum Programs Engage Students and Improve Performance in STEM (1A)

Carolyn Malstrom (cmalstrom@pltw.org), Project Lead the Way

Abstract: Project Lead the Way (PLTW), a nationwide non-profit organization, is transforming schools by delivering innovative methods of project-based learning through rigorous and relevant engineering and biomedical sciences curricula that combine Science, Technology, Engineering, and Mathematics (STEM) in order to prepare middle and high school students for academic and professional success. The activity, project, and problem-based instructional models allow students to apply the academic content from multiple disciplines to solve real-world problems. Teachers and students use state-of-the-art equipment found in STEM fields such as robotics, biotechnology, electronics, medical, civil engineering and architecture, engineering design, and aerospace. Students develop high levels of computer literacy, utilizing software applications to research, organize data, solve problems and communicate their findings. Students in the engineering courses have the opportunity to take industry certification exams for proficiency in using software for computer-aided design related to manufacturing or civil engineering and architecture.

SSB-324: STEM Integration With Informatics (1B)

Stephen J. Zilora, Rochester Institute of Technology (sjz@it.rit.edu)

Abstract: The current generation of students operates in a mode of constant stimulation. Immediate relevance is the overriding determinant of their interest in a particular topic. As such, teaching fundamentals to this generation solely for the sake of a better future understanding of advanced concepts becomes an uphill battle. Whether it be ABCs, multiplication tables, or laws of science, standalone foundational knowledge carries with it no immediate benefit and is therefore of little interest to this generation. Informatics, however, is by its very nature an interdisciplinary and domain-relevant field. Informatics makes it possible to teach foundational concepts in context, most notably in a context relevant to high school students. We introduce the concept of teenformatics and describe how we can leverage informatics to build interest in the STEM disciplines and to show students the relevance of STEM in their lives.

11 – 11:30 am

SSB-321: Enhancing STEM Classes Using Weave: A Collaborative Web-Based Visualization Environment (2A)

Alexander Baumann (baumann.alex@gmail.com), Safi Shams (safi_shams@uml.edu), Matthew_Ross@student.uml.edu), William Mass (william_mass@uml.edu), and Georges Grinstein (grinstein@cs.uml.edu), University of Massachusetts - Lowell

Abstract: Learning within a STEM classroom environment can be greatly benefited by engaging the students in real-world

datasets. This provides the opportunity to go beyond textbook examples that are often only marginally close to those students will see in their future careers. The Weave (WEB-based Analysis and Visualization Environment) developed at the University of Massachusetts - Lowell allows collaborative data visualization in a web browser that is highly applicable to STEM classrooms. Larger and more field appropriate datasets can be loaded into the system, hypotheses can be made and confirmed, and students can collaboratively work together. This paper discusses the ways in which Weave could be used in the STEM classroom to foster learning.

SSB-324: Computer Programming – A Building Block of STEM (2B)

Srijoy Dutta (newyork1996@gmail.com) and Rohan Mathur (rohanmathurs@yahoo.com), Bridgewater-Raritan High School

Abstract: Programming is an important tool in the field of engineering and technology. Programming creates a code that is used to instruct a computer to execute a series of actions. Programming is widely used for creating software and applications in such diverse fields as finance, energy, transportation and healthcare. It is widely used in today's high-tech world and has enormous growth potential in the future. This paper provides an overview of how programming stands today and its future impact from the viewpoint of high school students. It covers a brief history of programming, programming for the current grade school generation, the role of programming in today's world followed by how it helps develop non-technical skills for personal and professional growth. Programming has had a huge impact on how technology has progressed so far, and will continue to do so, in the future.

11:30 am – noon

SSB-321: The Air Force Research Laboratory Information Directorate's STEM Activities (3A)

Sarah Muccio (Sarah.Muccio@rl.af.mil), Thomas Vestal (Thomas.Vestal@rl.af.mil), and Jeffery DeMatteis (Jeffrey.DeMatteis@rl.af.mil), Air Force Research Laboratory

Abstract: Science, Technology, Engineering and Mathematics (STEM) is an interdisciplinary approach to education. This has also come to be an educational awareness program to encourage young students to study these disciplines. The Department of Defense's National Defense Education Program is an answer to the pressing need for more personnel to study in the STEM disciplines. This paper describes the Department of Defense's STEM initiatives and the Air Force Research Laboratory Information Directorate's approach to STEM educational outreach that is done through hands-on learning and interactive discussions.

SSB-324: From Design to Prototype – Manufacturing STEM Integration in the Classroom and Laboratory (3B)

Eric P. Flynn (eflynn@gwcc.commnet.edu), Gateway Community College

Abstract: The community and technical college systems possess unique opportunities to showcase the integration of Science, Technology, Engineering, and Math (STEM) programs into cohesive, collective, and collaborative learning environments. It will be shown that involvement from separate disciplines within

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STEM fields facilitates a learning environment greater than the sum of its individual parts. Critical involvement from industry partners and sponsors will become fundamental when approaching STEM program integration. Furthermore, with the proper selection and utilization of lower-cost educational technology and machinery, the opportunity to emulate a manufacturing paradigm “from design to prototype” presents itself. The fundamental challenge to take theory shown in class, to a fully realizable product, produced in the college laboratory will be examined. In addition, the question will be asked of whether the funding necessary to develop a premier STEM-based college laboratory could be within reach of the typical community / technical college budget? And ultimately, a discussion of the hurdles faced to integrate faculty and staff from the separate STEM disciplines into one collaborative unit will be presented.

Noon – 1:30 pm
ISEC CAFÉ

Have lunch at Eickhoff Dining Hall, where your biggest dilemma will be “what shall I choose next?” Food court sites include Green Farm Salads, Ceva (pizza and pasta), 91.3 Wok, C-Street Grill, Roscoe’s Tacos and More, and Quimby’s Kitchen. You may eat in the dining hall or bring your takeout to the Anthropology/Sociology Conference Room.

1:30 – 2 pm

SSB-321: Reenergizing and Reengaging Student Interest through CAPSULE (4A)

Jessica Chin (chin.jes@husky.neu.edu), Abe Zeid (zeid@coe.neu.edu), Claire Duggan (c.duggan@neu.edu), and Sagar Kamarthi (sagar@coe.neu.edu), Northeastern University

Abstract: We need innovators, inventors and forward thinking students who are going to drive the future of our economy. These days, students rarely ask where did that products come from or how is they are made? Post secondary students have lost their curiosity. However, this does not begin with the students, this begins with the educators - it begins with the teachers, their knowledge, resources and tools. The classroom is only as good as the person standing at the front. Through, CAPSULE, we are trying to restore that inquiry and motivation to explore ideas, regardless of the practicality. Engineering is all about try, try and try again. It is about teamwork, hands on learning and understanding the work behind the pair of sneakers kids are wearing or the newest iPod to hit the market. The theory and tools behind product innovation is what CAPSULE is trying to bring to America’s high schools – to teach and engage teachers using 3D modeling, the engineering design process and implementing project based learning using these tools and according to specific processes.

SSB-324: A Project-Based Pedagogy for First Year College Students in Imaging Science (4B)

Joseph J. Pow (pos@cis.rit.edu) and Maria Helguera (helguera@cis.rit.edu), Rochester Institute of Technology

Abstract: The Chester F. Carlson Center for Imaging Science (CIS) at the Rochester Institute of Technology (RIT) has completely abandoned its traditional lecture-based pedagogy for incoming freshmen, and in its place implemented a radically

different project-based curriculum for all first year students. With this new approach, all first year students work together as a single integrated multidisciplinary team for a full academic year to design, develop, build, and test a unique, fully functional imaging system. The goal in implementing this approach is to provide the students with a foundational experience which is more relevant, more engaging, more challenging, and more motivating than the pedagogy which has been used to date. If successful, the impact of this approach on undergraduate STEM (Science, Technology, Engineering, and Mathematics) education could be transformational. It could change long-held perceptions about the abilities of first year students, and could lead to a new understanding of the role of faculty in technical undergraduate degree programs.

2 – 2:30 pm

SSB-321: Project Blob: Edible Emulsions (5A)

Amina Darwish (darwisam@mail.uc.edu), University of Cincinnati; Mary Ann Schnieders (schniem@cpsboe.k12.oh.us), Western Hills Engineering High School; Andrea Burrows (burrowac@ucmail.uc.edu), Anant Kukreti (kukretar@ucmail.uc.edu), and Stephen Thiel (thiels@ucmail.uc.edu), University of Cincinnati

Abstract: Most blobs are emulsions. From a chemistry perspective, emulsions turn two liquid phases into what appears to be one continuous phase through the use of surfactants. This lesson, created by a chemical engineering graduate student, allows the secondary students to observe this phenomenon in the transformation of vinegar, oil, and egg yolks into mayonnaise. The students, juniors at Western Hills Engineering High School, also see the distinct phases of a colored water and oil in a lava lamp and see the phases turn into what appears to be one phase as soap is added the solution. Assessments show the students’ ability to explain how soap washes away dirt, draw the chemical components of the emulsion and relate the same chemistry to surfactants used in the Gulf oil spill cleanup. The application of emulsions to protein separation research for pharmaceutical purposes was also discussed.

SSB-324: Pequeños Científicos Program: STEM K5-K12 Education in Colombia (5B)

Mauricio Duque (maduque@uniandes.edu.co), Jose Tiberio Hernández (jhernand@uniandes.edu.co), Margarita Gómez (mgomez@pequenoscientificos.org), and Claudia Vásquez (clav_arango@pequenoscientificos.org), The University of the Andes

Abstract: This paper presents a Colombian national STEM program, promoted by a network of 10 Colombian universities, coordinated by the University of the Andes in Bogotá, Colombia and their engineering and education schools, oriented towards the professional development of science and technology teachers from primary and secondary schools. This initiative, the Pequeños Científicos (little scientist) Program, has achieved high national and international acknowledgment. The program seeks to renew experimental science and technology teaching and learning in Colombia. The program introduces active learning applying Inquiry-Based Science Education as the pedagogical approach (IBSE). This paper also explores the contexts and reasons that motivate an engineering school to get involved in promoting scientific and technological literacy in

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K9-K12 levels. It also presents a short description of how the program seeks to promote STEM abilities and knowledge from science education and professional development inquiry workshops.

2:30 – 3 pm

SSB-321: Student Initiation to Science by Computer-Aided Teachers: A Case Study (6A)

Predrag Filipovic (predrag@tdgresearch.com), The Diffusion Group; Jovica Milisavljevic (mjovica@yahoo.com), Matematička Gimnazija; Silvija Kokalj-Filipovic (skokalj@gmail.com), Bell Labs/Alcatel-Lucent; and Narcisa Stankovic (narcisa@unoluxns.com), UNO-LUX NS

Abstract: We present a case study, based on the STEM teaching toolkit “Scoolio,” that demonstrates how carefully designed experiments, based on computers, real and virtual instruments, can extract the essence of complex scientific concepts, present it to the students in a hands-on manner, and invite them to explore further and deeper. The study also illustrates the effectiveness of the computer-aided science education even in low-budget conditions, and provides evidence that the cooperation of open-minded and creative teachers, and small businesses, can constructively shape the education of the future.

SSB-324: A National Framework to Integrate Remote Sensing Science and Education in K-20 Training (6B)

Shakila Merchant (smerchant@ccny.cuny.edu) and Reza Khanbilvardi (khanbilvardi@ccny.cuny.edu), NOAA-CREST Center, City College of the City University of New York

Abstract: The National Oceanic and Atmospheric Administration-Cooperative Remote Sensing Science and Technology (NOAA-CREST) Center at the City College of the City University of NY, funded through major grant by NOAA’s Educational Partnership Program (EPP) is one of the NOAA’s lead research and education partner in application of remote sensing science & technology to issues pertaining to assessment, monitoring and stewardship of earth’s environment. NOAA/EPP’s goal to increase the number of students, especially those from underrepresented populations in STEM, to be trained and graduated in NOAA sciences resonates with CREST’s mission and is honed over the Center’s ten years to recruit, educate, train and graduate students through academic programs strongly complemented by hands-on participation in state-of-the-art research. CREST recruits and trains high school, undergraduate, master’s and doctoral students in NOAA sciences with special emphasis on satellites and remote sensing technology to help increase a diverse STEM workforce of NOAA, other agencies and industries alike. CREST offers summer high school internship and science enrichment program including weather camp, and year-round seminars; summer internships with NOAA and industrial partners and school-year research assistantships for graduate and undergraduate students.

3 – 3:30 pm

SSB-321: Accelerated Software Development Experiences for High School Students (to 4 pm; 7A)

Robert Kelly (rkelly@monmouth.edu), Monmouth University

Abstract: For the past three summers, the Rapid Response Institute at Monmouth University has conducted a program in which high school students passionate about computer technology work with University professors to create prototype software systems that have real world deliverable focused applications. The program has been a success in many dimensions and has exposed the students to a unique learning experience, a systems perspective, process in building software systems, working with external stakeholders, teamwork, and exposure to many technologies, including ones that are just emerging. The program has encouraged innovation, initiative, and adaptability and has resulted in useful software prototypes in a variety of areas including agents, web sites for real-time data, and a complex emergency management application. One of these has evolved to a production system.

SSB-324: Integrating Engineering into Secondary Math and Science Curricula: A Course for Preparing Teachers (7B)

Ronald Carr (rlcarr@purdue.edu) and Johannes Strobel (jstrobel@purdue.edu), Purdue University

Abstract: Future secondary math and science teachers, engineering education doctoral students and engineering graduate students participated in a graduate level course designed to provide strategies for integrating engineering in stand-alone or integrated environments. A hybrid setting of face-to-face and online instruction modeled project based learning that provided the opportunity for students to apply research based methods of integration and engineering instruction throughout the learning process. Concepts, knowledge and attitudes were assessed using student products, concept maps and student feedback.

3:30 – 4 pm

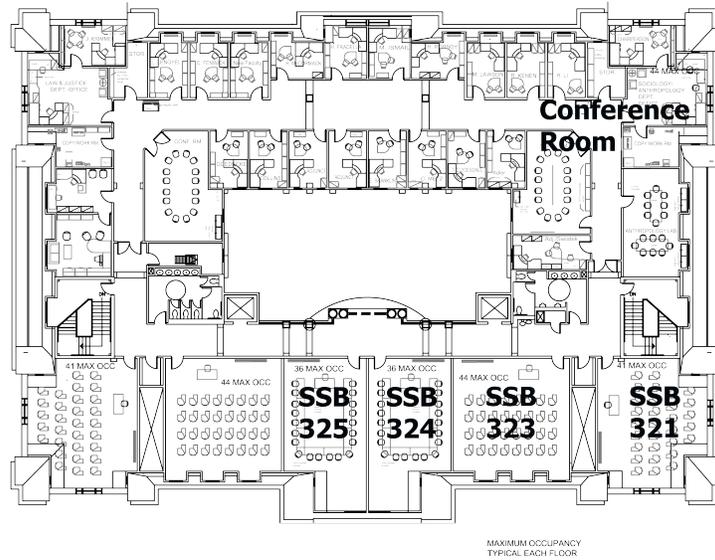
SSB-324: Drug Design as a Video Game: A Summer Program Integrating Chemistry, Biology, and Computer Science (8B)

Joseph Salisbury, Brandeis University (jpsbury@brandeis.edu); Steven Morgan (stevenn.morgann@gmail.com) and John Williams, Rhode Island College (jwilliams@ric.edu)

Abstract: Virtual drug screening is a rapidly evolving technique that offers great promise for the systematic evaluation of large chemical libraries to identify potential drug candidates. eHiTS Lightning is a commercial drug design software which takes advantage of the Cell Broadband Engine processor present in the video game console Sony PlayStation 3 to accelerate computations greatly. In the summer of 2008, a computational chemistry program for high school students was held at Rhode Island College that incorporated several different modules that combined biology, chemistry, and computer science. One of these modules focused on computer-aided drug design. Here, we describe the objectives, methods, achievements, and future goals of that aspect of the program where a high school student, mentored by a graduate student, used eHiTS Lightning on a Sony PlayStation 3 in order to identify molecules which may be potential cancer therapeutics.

4 – 5 pm

ISEC ROUNDTABLE DISCUSSION
SSB 321



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