

FALL 2012

Science & Technology INNOVATIONS



Using the power of today's science to influence tomorrow's technology



STEM FOR OUR FUTURE

FEATURING INITIATIVES FOR SUCCESS

VIRTUAL WORLDS

Exploring Open Source
Applications for STEM

A CALL TO ARMS

Lead the Way
as a Mentor

STEM STUDENT
SHOWCASE



Programs and Projects Supporting:
Science, Technology, Engineering & Mathematics (STEM)

S&T INNOVATIONS

ABOUT THE NEWSLETTER

Science & Technology (S&T) Innovations is an annual publication with the primary purpose of promoting the use of today's science to influence tomorrow's technology. This newsletter hopes to inspire those within industry, academia, and Government to initiate innovative thinking that contributes to the S&T community.

This edition is focused on projects and outreach initiatives related to Science, Technology, Engineering, and Mathematics (STEM). *S&T Innovations* is sponsored by the U.S. Army Research, Development and Engineering Command (RDECOM), the U.S. Army Research Laboratory Human Research Engineering Directorate (ARL HRED), and the SFC Paul Ray Smith, Simulation and Training Technology Center (STTC).

This publication is produced by the Applied Cognition and Training in Immersive Virtual Environments (ACTIVE) Laboratory at the University of Central Florida's Institute for Simulation and Training (UCF-IST).

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Mr. Irwin L. Hudson is the S&T Manager responsible for leading STTC's Unmanned Ground Systems Research. This research focuses on *Human-Robot Interaction*, *Physiologically-based Interaction*, *Unmanned Ground Vehicles*, *Remote Weapon Systems*, *Virtual Combat Profiling*, and *STEM Outreach*. Mr. Hudson is Contract Officer Representative (COR) for The HRI Analysis for Training Simulations and Operational Neuroscience (HATS-ON) program. He also serves as the Assistant Contract Officer Representative (ACOR) to Dr. Neal Finkelstein for the Research Academic and Operational Support (RAOS) Indefinite Delivery, Indefinite Quantity (IDIQ) contract, which supports a large percentage of the research and development budget for STTC's Blended Systems Research Branch (BSRB).

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Joy works at UCF-IST where she fills various roles within multi-media and research. Her experience in the fields of Business Administration, Digital Media, and Modeling & Simulation enable her to support research and other initiatives underpinned by STEM-related topics. Joy is a dedicated STEM advocate with the desire to help advance STEM initiatives that support learning.

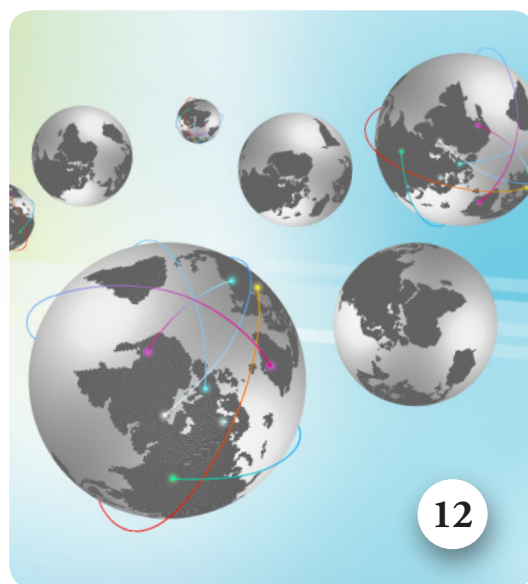


UCF-IST ACTIVE

Nestled in the heart of the Florida High Tech Corridor in Orlando, UCF-IST's ACTIVE Laboratory is at the forefront of Modeling and Simulation research. The ACTIVE Lab is engaged in basic and applied research and development for the analysis and improvement of human performance. Our multi-disciplinary team of more than 35 members conducts investigations in a variety of fields, including *Human-Robot Interaction*, *Physiological Assessment & Human Factors*, and *Simulation-Based Training & Education*.



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STEM Outreach Initiatives Update



Investing in Science, Technology, Engineering, and Mathematics for the Future

By **Irwin L. Hudson**, irwin.hudson@us.army.mil

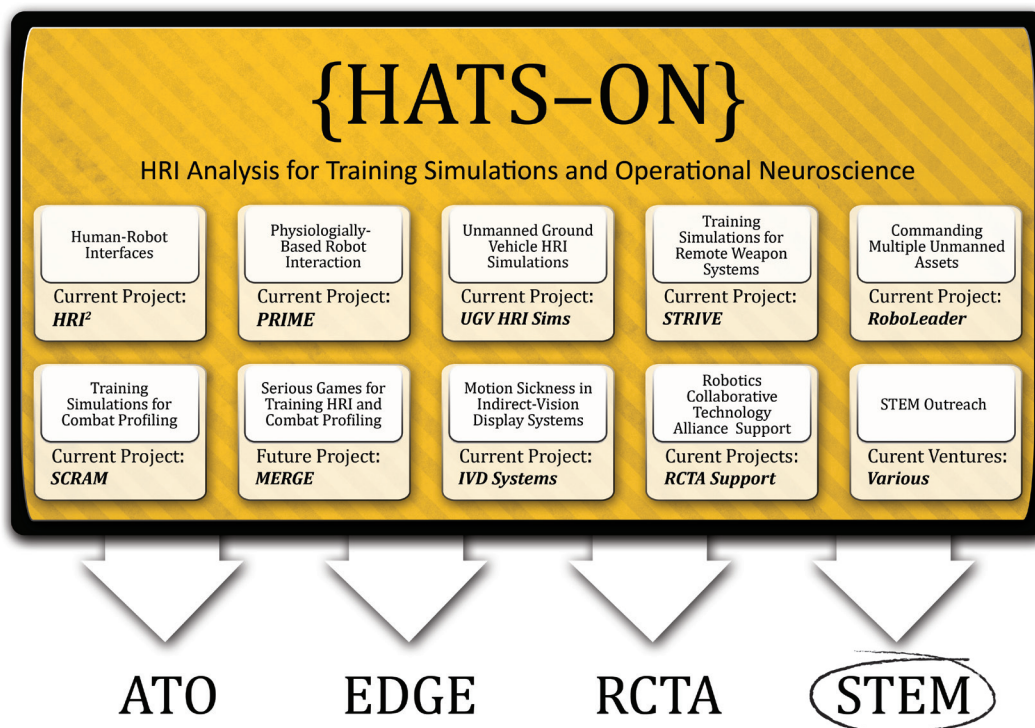
Last year's edition of *S&T Innovations* introduced our comprehensive research and development effort known as HRI Assessment of Training Simulations and Operational Neuroscience (HATS-ON). HATS-ON was Army Research Lab's (ARL) and the Science Technology Training Center's (STTC) response to the growing need for the Army to gain more knowledge in the area of Human Robot Interaction (HRI), Modeling and Simulation, and Operational Neuroscience. HATS-ON comprises ten sub-tasks which come together to produce valuable information and products that support four larger areas of research including Army Technology Objectives (ATO), Robotics Collaborative Technology Agreement (RCTA), Enhanced Dynamic Geo-Social Environment (EDGE), and last but certainly not least, Science, Technology, Engineering, and Mathematics (STEM) outreach.

STEM outreach is a very important area of concern

for the Army since our future engineers, technologists, and leaders require support to develop the skills needed for critical STEM-related roles. STEM Outreach initiatives supported by HATS-ON reach the community via efforts such as the Robotics Club at UCF, STEM TECH Olympiad (including BattleBots), Otronicon, and the Federal Virtual Challenge (FVC). Each one of these initiatives touches on higher-level skills, as well as instilling collaborative thinking among individuals that participate. Because of outreach supported by the STTC, students are receiving valuable experience and knowledge by participating in challenging and satisfying programs that support STEM experiential learning.

STEM support is clearly a crucial topic in the White House. Education Secretary Arne Duncan emphasizes that "the Department of Education takes the STEM competitive priority very seriously—and states should

as well." The goal of this year's edition is to shed even more light on the need for STEM education and address the White House's concern regarding the future of STEM jobs. According to a recent www.whitehouse.gov press release, President Obama announced an exciting campaign to improve the participation and performance of America's students in STEM, called





“Educate to Innovate.” This campaign seeks ways to secure America’s future with a strong STEM workforce and will include efforts from the Federal Government and from leading companies, foundations, non-profits, and science/engineering societies to work with young people across America to excel in STEM. As a part of the campaign, the Administration plans on doing a series of events, announcements, and other activities that will build on the President’s “call to action.”

Therefore, after hearing the “call” loud and clear, we set out to do whatever possible to promote and encourage the STEM agenda. Hence, we’ve dedicated this edition of *S&T Innovations* to STEM—locally and nationally.

This edition features articles from passionate STEM crusaders dedicated to sharing information and providing STEM opportunities across the nation. At the STTC, we’ve been diligently working to create local and statewide opportunities for elementary, middle, and high school students. We also provide support for students and organizations looking to one day fill the expected vacancies of jobs related to STEM. Increasingly, one of our richest sources of employment and economic growth will be jobs that require skills in STEM.

Another goal of this edition is to advocate to professionals looking to discover ground-breaking resources and ventures that are just beginning or already underway. We hope to stir up awareness, whether by providing information about projects that show how Virtual Worlds can potentially support teaching STEM, or just continuing to drive the message of a “call to arms” for current STEM professionals as mentors to guide and teach students.

Upcoming Supported STEM Events:

January 18–21, 2013

OTRONICON

Otronicon is a celebration of interactive technology using videogames to demonstrate the future of how we live, learn, work and play. Learn more: [HTTP://WWW.OTRONICON.ORG](http://WWW.OTRONICON.ORG)

March 31, 2013

FEDERAL VIRTUAL CHALLENGE (FVC)

Winners will be announced at GameTech in the categories of *Critical Thinking/Adaptability* and *Navigation Interface into a Virtual Environment*. Learn more: [HTTP://FVC.ARMY.MIL](http://FVC.ARMY.MIL) OR read more on page 13.

April 5–7, 2013

STEM TECH OLYMPIAD 2013

At STEM TECH Olympiad, the process of creating unmanned systems is brought to life and captured as students design, build, and compete with their own robotic creations. Through this hands-on effort, students gain practical working knowledge within the STEM focus areas. Learn more: [HTTP://WWW.USATL.ORG](http://WWW.USATL.ORG)

June 7–10, 2013

INTELLIGENT GROUND VEHICLE COMPETITION (IGVC)

The IGVC offers a design experience that is at the very cutting edge of engineering education. It is multidisciplinary, theory-based, hands-on, team-implemented, outcome-assessed, and based on product realization. Learn more: [HTTP://WWW.IGVC.ORG](http://WWW.IGVC.ORG)

July 8–14, 2013

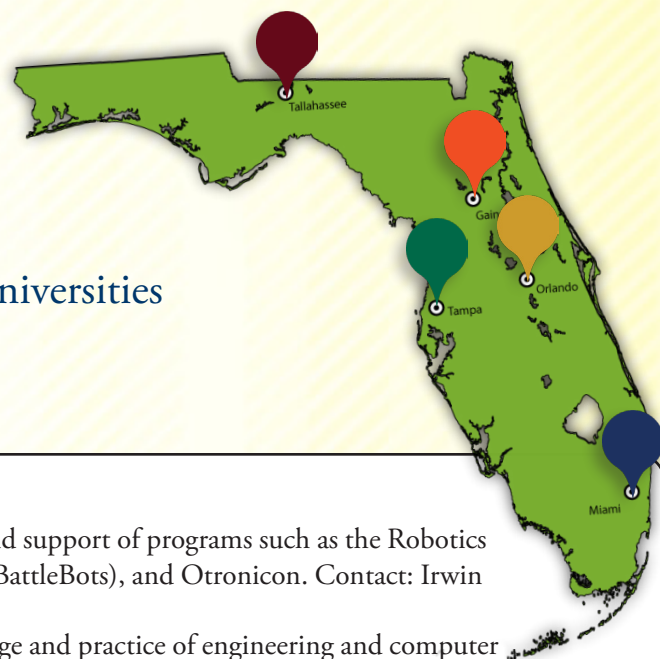
RoboBoats

The RoboBoat Competition is a student robotics challenge in which teams race autonomous surface vehicles (ASVs) of their own design through an aquatic obstacle course. Learn more: [HTTP://ROBOBOAT.ORG](http://ROBOBOAT.ORG)

Florida STEM

A Highlight of STEM Outreach in Florida Universities

By Staff, active.newsletter@ist.ucf.edu



UNIVERSITY OF CENTRAL FLORIDA (UCF)

- UCF-IST STEM Outreach—enables partnerships and support of programs such as the Robotics Club at UCF, STEM TECH Olympiad (including BattleBots), and Otronicon. Contact: Irwin Hudson, IRWIN.HUDSON@US.ARMY.MIL
- UCF-CECS Outreach—aims to further the knowledge and practice of engineering and computer science professions nationally and internationally. Contact: Bruce Furino, BFURINO@MAIL.UCF.EDU
- EXCEL Program—provides resources that increase student success in the first two years of their college career in STEM disciplines. Contact: Terrell Hodges, EXCEL@UCF.EDU



UNIVERSITY OF SOUTH FLORIDA (USF)

- USF STEM Academy—directly involves students in inquiry, discovery, and research in STEM disciplines through a residential program offered to students. Contact: Richard S. Pollenz, PRECOLLEGE@USF.EDU
- USF Robert Noyce STEM Scholars program—provides stipends to graduating seniors, recent graduates, and career changers who are interested in earning their teaching credentials in specified STEM areas. Contact: Michael DiCicco, MDICICCO@USF.EDU
- Helios STEM Program—focuses on the development of content and pedagogical knowledgeable middle school teachers supporting mathematics or science. Contact: Gladis Kersaint, KERSAINT@USF.EDU



FLORIDA STATE UNIVERSITY (FSU)

- FSU-Teach—assists FSU science or mathematics students in developing a deeper understanding of their major, exploring possibilities of becoming a mathematics or science teacher, and developing a profound knowledge of teaching in their content area. Contact: Vicki Veader, VVEADER@FSU.EDU
- Science on the Move—provides resources, materials, and training needed to conduct high-tech lab work in physical science. Contact: Erica Staehling, SCIENCEONTHEMOVE@BIO.FSU.EDU
- Sea-to-See—enables elementary school students to observe and touch living marine creatures under the guidance of FSU instructors. Contact: Barbara Shoplock, BSHOP@BIO.FSU.EDU



UNIVERSITY OF FLORIDA (UF)

- Innovation through Institutional Integration (I³ or I-Cubed) at UF—encourages youth and incoming college students to consider STEM disciplines and careers and fosters integration of student-based research and training programs in STEM. Contact: Sandra Russo, SRUSSO@UFIC.UFL.EDU
- Florida STEM TIPS—supports teachers by partnering with school districts and serving as a model statewide. Contact: T. Griffith Jones, STEMTIPS@COE.UFL.EDU
- Science for Life—enhances early undergraduate research, faculty recognition and opportunities, and transforms laboratory teaching in the life sciences. Contact: Ben Dunn, BDUNN@UFL.EDU



FLORIDA INTERNATIONAL UNIVERSITY (FIU)

- South Florida Regional Science Bowl—enables teams of students to compete in a fast-paced verbal forum to solve technical problems and answer questions in all branches of science and math. Contact: Juan Rodriguez, JBRODRIGU@GMAIL.COM
- STEM Transformation Institute—invests in STEM education while promoting cross-college collaboration by serving as an interdisciplinary STEM think-tank at FIU. Contact: Laird Kramer, LAIRD.KRAMER@FIU.EDU
- FIU CEC SWE partnership with National Girls Collaborative Project—partners for outreach, recruitment, and retention of women in STEM fields. Contact: Stephanie Strange, SSTRAOOI@FIU.EDU

A Call to Arms

Guiding Future STEM Professionals

By **Abdul Siddiqui**, abdul.m.siddiqui@us.army.mil

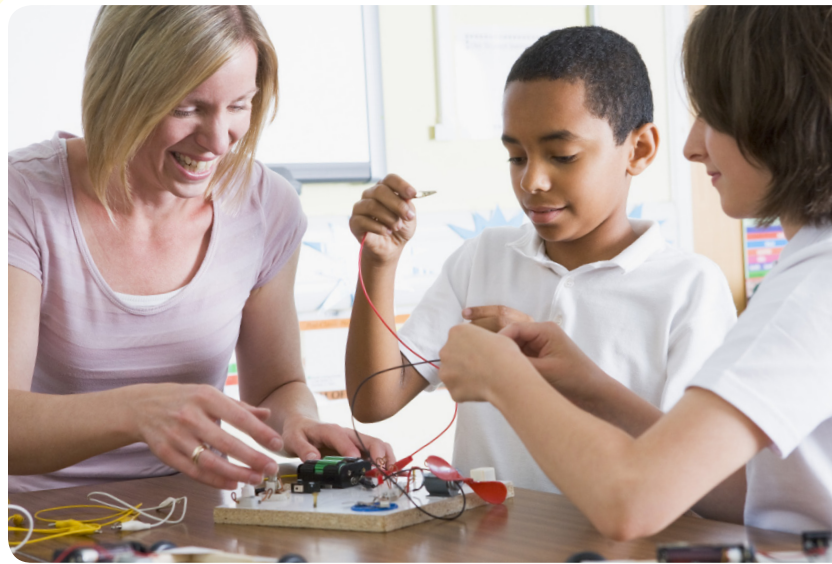
STEM's Importance

STEM workers drive our nation's innovation and competitiveness by generating new ideas, new companies, and new industries. Over the past 10 years, STEM jobs have been notably on the rise, and the U.S. needs a strong science and technology work force to maintain global leadership and competitiveness. Reports show that students educated in STEM disciplines are less likely to experience joblessness than their non-STEM counterparts. Improving STEM education for our children (our next generation workforce) will strengthen their science and engineering foundation and facilitate innovative ideas to boost the U.S. economy.

STEM's Potential Impact

STEM-related jobs are a gateway to many career choices. In the fierce global competition for high value jobs, STEM education gives many younger workers a chance to earn more during their careers. It provides more seasoned workers with skill sets that can be improved and adapted to employer needs as the economy is expected to change over the next decade.

Young people as well as parents need to know about the potential of attaining rewarding and high-paying careers in STEM. STEM professions and occupations are among the highest paying jobs. They are also the basis for a successful, globally competitive and innovative economy. Many jobs related to STEM also impact other growing concerns in the



U.S. such as energy and sustainability and are considered “Green” jobs. During the next decade, overall U.S. demand for scientists and engineers is expected to increase at four times the rate of all other occupations.

Filling the Gaps

One of the largest gaps to fill is building mentoring programs that will continue to support students in experiential learning. So many folks have good intentions and want to help, but don't know where to start. If you are an experienced professional in a STEM-related field, that challenge lies with you to seek out local mentor programs wherever you are! The supportive affirmation that mentors can provide students can make all the difference in helping them succeed.

Central Florida's Future

Central Florida boasts the highest concentration of simulation and training related activities in the nation. For us to continue meeting this expectation we have to consistently support the educational demand for high caliber scientists and engineers.

A “call to arms” is needed to urge more local STEM professionals to become involved in internship activities that orient and inform students early on and get them going in the direction that our future depends on. Now is the time to get involved!

Local STEM Mentor Opportunities

Central Florida STEM Education Council (CFSEC)

- [HTTP://WWW.MYAWESOMEFLORIDACAREER.COM](http://www.myaawesomefloridacareer.com)

National Center for Simulation (NCS)

- [HTTP://WWW.SIMULATIONINFORMATION.COM/EDUCATION](http://www.simulationinformation.com/education)

US Army PEO STRI Engineering Internship

- [HTTP://WWW.HANDHGRAPHICSORLANDO.COM/STEM](http://www.handhgraphicsorlando.com/STEM)

Science Olympiad at UCF

- [HTTP://WWW.SCIENCEOLYMPIAD2012.COM](http://www.scienceolympiad2012.com)

Top STEM Occupations

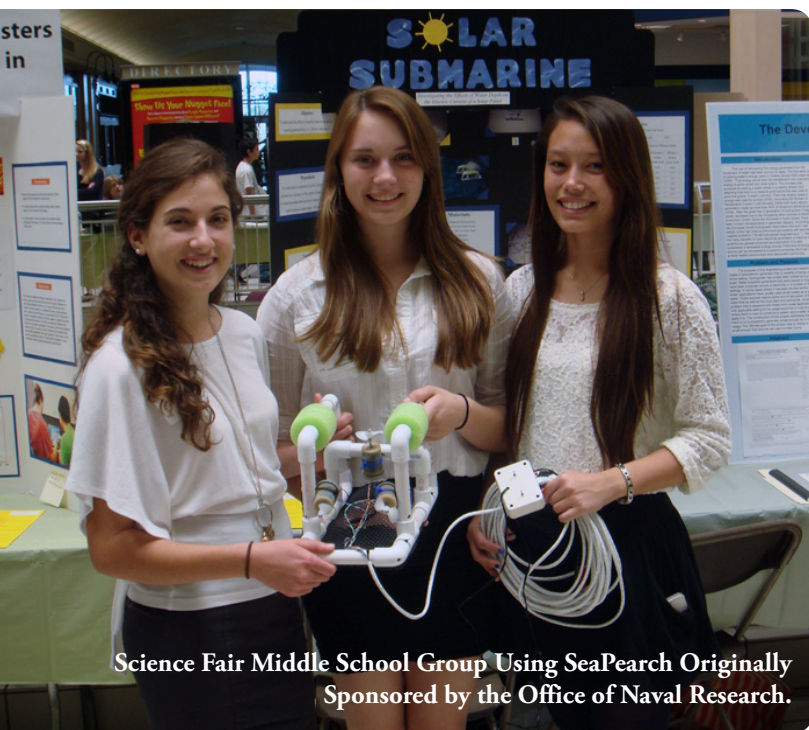
According to ONetonline.org, the following STEM-related jobs are both “Green” and have bright outlooks.

- Automotive Engineering/Specialty Technicians
- Biochemical Engineers
- Biofuels/Biodiesel Technology and Product Development Managers
- Biomass Power Plant Managers
- Civil Engineers
- Climate Change Analysts
- Construction Managers
- Electrical Engineering Technologists
- Electromechanical Engineering Technologists
- Environmental Restoration Planners
- Financial Quantitative Analysts
- Manufacturing Engineers
- Mechatronics Engineers
- Microsystems Engineers
- Nanosystems Engineers
- Photonics Engineers
- Precision Agriculture Technicians
- Risk Management Specialists
- Software Developers
- Transportation Planners
- Transportation Engineers
- Validation Engineers
- Water Resource Specialists

STEM-Focused Science Fair

STEM Initiative Update: Team Orlando

By **Christine Allen, Ph.D.**, christine.allen2@us.army.mil



Science Fair Middle School Group Using SeaSearch Originally Sponsored by the Office of Naval Research.

As professionals, we have an increased responsibility to mentor future generations. The U.S. is currently ranked 17th in science and 25th in mathematics among students who are 15 years old¹. Facts such as these are alarming and efforts are underway to mitigate STEM concerns. One way to mentor is through STEM initiatives. Opportunities for young students to participate in STEM-related activities can increase their likelihood of choosing a career in science, technology, engineering, or mathematics.

STEM activities provide fun ways to learn by making a connection between the skills needed to conduct scientific research, develop technologies, and engineer new products. Such activities include hands-on technologies similar to Lego NXT Mindstorms, BattleBots, and model rockets as well as scientific experimentation in areas such as chemistry, physics, anatomy, physiology, and earth/space science. These fun activities help the students learn critical-thinking and problem-solving skills while increasing their creativity. In addition, the life lessons learned in

¹ [HTTP://WWW.USATODAY.COM/NEWS/EDUCATION/2010-12-07-US-STUDENTS-INTERNATIONAL-RANKING_N.HTM](http://www.usatoday.com/news/education/2010-12-07-US-STUDENTS-INTERNATIONAL-RANKING_N.HTM)

Great Minds in STEM

Army STEM Mentors Recognized at National STEM Conference

By **Dennis Neal**, dennis.l.neal.civ@mail.mil

Two U.S. Army engineers were recognized by Great Minds in STEM for their achievements and dedication to protecting and serving the nation.

Leticia Pacheco, an engineer with the Research, Development and Engineering Command's Army Research Laboratory, and Angel Castro, an engineering technician with RDECOM's Edgewood Chemical Biological Center, received their awards at the 24th annual Hispanic Engineer National Achievement Awards Conference (HENAAC). Great Minds in STEM, a Los Angeles-based nonprofit

organization dedicated to advancing STEM education, hosted the three-day conference Oct. 11-13 in Orlando, Fla.

Castro is recognized as a Military Luminary, which according to HENAAC, shares three common factors: they are highly respected by their peers and management; they are valuable authorities in their fields; and they are blazing the trail for future generations of engineers and scientists.

"Mr. Castro, a retired Army noncommissioned officer, continues to be a day-to-day mentor to our engineers and scientists," said Alvin Thornton, Director of the ECBC

STEM-related events can truly affect our youth as they become productive members of society.

During the first half of 2012, Team Orlando participants including the Simulation and Technology Training Center (STTC), the Program Executive Office for Simulation Training and Instrumentation (PEO STRI), and the Naval Air Warfare Center Training Systems Division (NAWCTSD) in partnership with the University of Central Florida Institute for Simulation and Training (UCF-IST) participated in the Seminole County Regional Science Fair, U.S. Alliance for Technical Literacy (USATL,) and the Science Olympiad, also hosted by UCF. By leveraging across organizations, Team Orlando participants were able to support many events, creating an enriched learning experience.

At the Seminole County Science Fair, students demonstrated experimental results of completed projects. Students at the USATL and Science Olympiad completed projects both ahead of time and during the weekend of competition. In many cases, the USATL and Olympiad tournament required participants to repair their projects in between competition heats to prepare for the next round of judging.

Students are able to build on previous experience to improve their projects from year to year. For example, winners from the Seminole County Regional Science Fair moved onto the state competition, while winners from the Science Olympiad received the opportunity to visit the White House. Regardless of where they placed, students learned valuable lessons from STEM.

Team Orlando also plays a role within the Central Florida STEM Education Council with the opportunity to create new initiatives and support on-going activities. Initiatives requiring support include science fairs, USATL, and other competitions as judges and mentors. Furthermore, STEM professionals, volunteering for classroom participation in middle and high schools has a direct effect on students deciding to pursue a career in STEM.

Current opportunities for involvement are provided by the PEO STRI, UCF's College of Engineering and Computer Science, and UCF-IST. Whether it is a career talk at a school, participating as a mentor, or helping a student with a science fair project, professionals within the STEM fields can help improve the technical literacy of a student. The lives touched are benefited from the time and efforts of our government and academic volunteers.

To learn more about Team Orlando, and STEM outreach that members are involved in, please visit: [HTTP://WWW.TEAMORLANDO.ORG](http://www.teamorlando.org)



Engineering Directorate. "He brings a Warfighter's perspective to our mission."

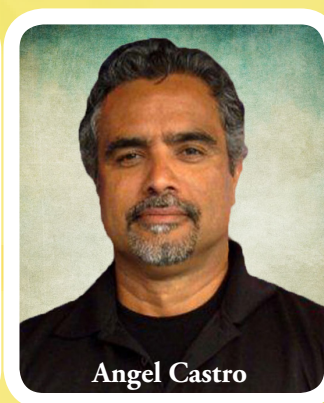
"His unique capabilities and qualities set [him] apart from others," said Humberto Galarraga, chief of Detection Decontamination Engineering Division. "He is selflessly dedicated not only to the Warfighter's mission, but the mission of the center to provide the highest quality services to our customers in the assessment of chemical, biological, radiological and nuclear equipment."

Pacheco was recognized by HENAAC during The Salute to our STEM Military & Civilian Heroes dinner at the conference.

"Dr. Pacheco believes in giving back to the community," said Laurel Allender, director of ARL's Human Research and Engineering Directorate.

"[She creates] opportunities for students to have a rich educational experience," she added. "Not only is Dr.

Pacheco the consummate leader and professional, she is also an excellent science, technology, engineering and math role model." Learn more about Great Minds in STEM at: [HTTP://WWW.GREATMINDSINSTEM.ORG](http://www.greatmindsinstem.org)





FIRST® Tech Challenge

FIRST Robotics Club Support for High School Engineering Magnet Program

By **Karen Fisher**, karin_fisher@scps.k12.fl.us

According to the Economics and Statistics Administration in July, 2011, growth in STEM-related jobs was three times as fast as growth in non-STEM jobs. STEM workers play a key role in the sustained growth and stability of the U.S. economy, and are a critical component in helping the U.S. win the future. In China, 60% of the Bachelor degrees awarded are STEM related. In the U.S., that number is only 5%. It is estimated that 90% of the world's scientists and engineers will be located in Asia. Without sustained growth in STEM fields, we won't even be able to fill the STEM-related job openings in the U.S. for the military.

The Seminole County Public School District in Central Florida is trying to address this shortage by offering an engineering magnet program at Lyman High School. One of the options Lyman uses to generate more interest in STEM careers is to offer an after-school robotics club where students can join the Lyman Robotics Team. The team comprises twenty-five students and is part of an organization known as *For Inspiration and Recognition of Science and Technology* (FIRST). The Lyman team competes with three different robots. Two of the robots compete in the FIRST Technical Challenge (FTC); the third competes

in the FIRST Robotics Challenge (FRC). Students design, build, and program the robots to play a specific game as designed by FIRST. They design the robots using computer-aided design (CAD), build them using Tetrix and other aluminum parts, and program them using RobotC, C++, or Java. Last year, the FTC game consisted of moving racket balls, bowling balls, and baskets. The FRC game involves basketball shooting robots, which are also capable of balancing on ramps.

Outreach is also an important part of FIRST. The team is not only expected to build competitive robots, they are encouraged to reach out to the community to provide service while spreading the word about FIRST. Lyman participates in demonstrations at I/ITSEC, the Orlando MiniMaker Faire, Planet PTC Live convention, hosts robotics merit badge workshops as well as a summer robotics camp for middle school students. Students also raise funds through corporate sponsorships and grant writing. Our goal is to let others know about our school, our club, FIRST robotics, and the importance of motivating our future workforce to become interested in STEM fields. We are training tomorrow's engineers today.

STEM TECH Olympiad 2012

STEM Outreach Comes Together

By **Nola Garcia**, nola@usatl.org

The STEM TECH Olympiad 2012 marked the first time a multitude of STEM challenges occurred under the same roof. During the exciting three-day event held April 27–29, 2012, 169 teams comprising students from elementary school through college came from across the country to compete in 10 different STEM-related events.

Students at all levels touted their STEM-related skills by working with LEGO robots, VEX task-oriented robots, and BattleBots creations. Other challenges included a Video Game Programming Competition, Assistive Device Competition, and the first on-site College Design Challenge (among many others). Footage from the College Design Challenge will be made into a documentary showing the engineering design process in a new and inspiring way. The Disaster Relief Challenge required the design and construction of disaster relief boat prototypes using a limited budget and only 48 hours. In this event, West Point led the way as Purdue, FIU, and other college teams followed. Younger students were inspired by the high school and college teams in the BattleBots event and captivated by teams creating video games at the STEM TECH Olympiad.

The response from corporate sponsors, the general public, teachers, and students was overwhelmingly positive! The Miami Beach Convention Center will be home to the 2013 STEM TECH Olympiad April 5–7, 2013. Make plans to come and see what the future innovators and technological leaders are up to! For more information, go to [HTTP://WWW.USATL.ORG](http://www.usatl.org)



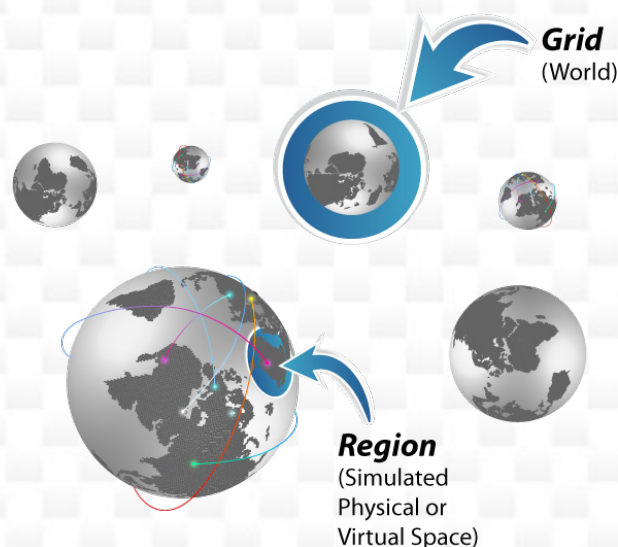
Virtual Worlds for Learning

Using OpenSimulator as a Platform for Research, Learning, and Assessment

OPENSIMULATOR

By **Joy M. Martinez**, jmartinez@ist.ucf.edu

If you are familiar with Virtual Worlds such as Second Life, you may want to take a close look at a resource that is gaining respect among Virtual World users and developers. OpenSimulator is an open source 3D virtual environments server that is compatible with Second Life and can be used on both Windows and Unix-based platforms. OpenSimulator allows users to create customizable Virtual Worlds that mirror the structure of Linden Lab's Second Life. This allows users to develop regions that represent a physical or virtual space within a grid (similar to a world map) that avatar positions reside within. While there are major differences in Second Life and OpenSimulator, developers have found the latter to be flexible and affordable due to its open source nature. Because of this, developers can apply technologies best suited for their needs when building Virtual Worlds.



Why is this important for STEM? Users and developers have found this software, integrated with the appropriate hardware, to be a valuable tool for the facilitation of research, testing secure collaborations, and delivering alternate e-learning experiences, among other uses. Resources are becoming increasingly available as time goes on. A good

starting point for those interested (especially educators) is a comprehensive free e-book by David W. Deeds, Ph.D. called "OpenSimulator: School Quick Start Guide."

OpenSimulator supporters such as Douglas Maxwell, of the U.S. Army's Simulation Training Technology Center (STTC), embraced OpenSimulator as a viable option to host a private grid used for research and development of using Virtual Worlds for training and collaborative efforts. His MOSES, or Military Open Simulator Enterprise Strategy project utilizes a private grid where users from both inside and outside of the Defense industry can work together.

MOSES PROJECT

By **Douglas Maxwell**, douglas.b.maxwell@us.army.mil

A couple of years ago, there was a need to investigate alternate platforms similar to Second Life to cope with the discontinuation of the Second Life Enterprise project. OpenSimulator offered a way to salvage vested interests previously devoted to Second Life.

With that said, the MOSES project began as an exploratory effort supported by the U.S. Army Research Lab (ARL) and the STTC designed to evaluate the ability of OpenSimulator and provide independent and secure access to a virtual environment. Among many positive features of OpenSimulator, the most important are being open source and having the ability to host private, secure grids that are no longer available with the loss of Second Life Enterprise.

The Army's support of the MOSES project has proven to be quite successful. For the past couple of years, the STTC has been testing the OpenSimulator platform for Government needs. At this point, the MOSES project has reached a level of maturity such that it is no longer considered "proof of concept."

MOSES has allowed select researchers inside and out of the Defense industry to look closely at the use of OpenSimulator as a research environment and collaborative space. Members within MOSES use the environment to work with other OpenSimulator users, run experiments, and even teach select students within the environment.

One way that MOSES contributes to the growing success of using OpenSimulator for education and training is simply the aspect of collaboration. Developers and practitioners such as Dr. Kay McLennan and Robert Daniel—to name a few—test and help perfect the MOSES OpenSimulator installation. Dr. McLennan states that “the relationship between MOSES and the community members in MOSES is more of a ‘give and take’ with the different members of the community contributing time and ideas in exchange for the collective [Virtual World] experience of the group.” For more information about MOSES, go to: [HTTP://BROKENTABLET.ARL.ARMY.MIL](http://BROKENTABLET.ARL.ARMY.MIL)

FROM A PRACTITIONER'S VIEWPOINT

By **Kay McLennan, Ph.D.**, kmclenna@tulane.edu

When I started offering Virtual World activities to my students (in Second Life), I only offered the learning activities as optional activities since I could not guarantee my students had a computer advanced enough to handle the computing demands of a Virtual World. For the first two years I offered Virtual World learning simulation activities with a choice of real time and asynchronous learning activities in Second Life. Only about 10% of the students elected to participate in the activities. Then when Second Life announced the end of the educator discount, I took the opportunity to move to the OpenSimulator. More specifically, I elected to set-up a private [hosted] grid and accordingly, had to pre-create avatars for my students. In turn, I was pleasantly surprised to see the voluntary participation in the Virtual World activities immediately jump from 10% to about 33%. The amount of participation has remained relatively constant (with one spike in participation to 46%) since 2010. One thing to note is that the increase in participation rates has to do with the use of a private grid (that is not connected to the distractions of Second Life) as well as my pre-creation of avatars which takes a bit of the chore of participating off of the students.

While I think OpenSimulator is brilliant and easy to use, as a rule, the learning curve for creating Virtual World simulations may be steep at this time for novices. However, I believe that once acclimated, users will find the in-world building tools and availability of pre-created content in the OpenSimulator to be perfect for different types of educational simulations. In regard to how OpenSimulator can help support STEM learning, an initiative I have worked on focuses on applied mathematics using my Prisoners' Dilemma game and other strategy simulations. Using Virtual Worlds in education is cost effective, safe, and most importantly, can simultaneously support both remedial and enrichment learning.

Some points for educators interested in learning about using Virtual Worlds such as OpenSimulator for teaching STEM subjects are that:

- 3D Virtual World platform simulations provide a unique way for staging interactive and engaging mathematics lessons.
- 3D Virtual World platform simulation [in educational applications] are amazingly adaptable, scalable, and inexpensive once an educator conquers the learning curve associated

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FVC

FVC 2013

The United States Army Research lab (ARL), Simulation & Training Technology Center (STTC) is conducting a global challenge to explore technical solutions for recognition and award.

The Federal Virtual Worlds Challenge is now called the Federal Virtual Challenge. This name change signifies that the Challenge is not intended to be exclusive to Virtual Worlds. Although Virtual Worlds are still a critical target platform for the Challenge, entries can be provided in any 3D virtual environment (games, simulations, Virtual Worlds, etc). Entries do not need to be persistent nor multi-player to apply to the Challenge. If there are questions, please contact FVWC.STTC@US.ARMY.MIL.

The Federal Virtual Challenge is an open, global Challenge to the world for the best implementations as demonstrated in or with a virtual environment. The Challenge is an annual event led by the ARL-STTC. The event is conducted to explore innovative and interactive solutions in virtual environments. The criteria are intentionally unbounded to encourage creative results.

The benefits of entering the Challenge include the potential to receive award money, travel, recognition, and an opportunity to advertise your capabilities to an interested audience.

Entries in the Navigation category will be recreated at the STTC Labs to evaluate functionality. All intellectual property remains with the submitter.

Deadline for entries is December 12, 2012. Winners will be announced March 31, 2013 09:00 AM EDT.

Additional information is available at the Challenge website: [HTTP://FVC.ARMY.MIL](http://FVC.ARMY.MIL)

with using the Virtual World platform.

- DIY (Do It Yourself) is the most expedient way for an educator to use an emerging technology like 3D Virtual World platforms.
- 3D Virtual World platform used in higher education needs a larger “network effect.” That is, [like the example of the adoption of the telephone] the use of 3D Virtual World platforms in education will become a more valuable tool as more educators adopt the technology. Right now I am the only educator at my School of Continuing Studies and even at the entire university where I teach who offers Virtual World learning. In turn, the voluntary participation rate in my courses (currently equal to about 1 in 3 students each semester) will remain low until it is more efficient for students to take the time to learn about Virtual Worlds (for use in more of their courses/studies).

In addition, best practices for e-teaching in Virtual Worlds are still being identified. For example, I have collected student feedback data on individual 3D Virtual World simulations that have been invaluable to me when it comes to perfecting my builds. Yet, the students I survey are older, non-traditional [college] students that self-select to participate in the Virtual World learning activities I stage. In other words, I am only collecting data on one small group of college students and the best practices for use I have identified may differ when it comes to other groups of students.

In summation, my view is that the use of 3D Virtual Worlds in college e-education is slowly gaining ground with students (but the students that do self-select for participating provide highly positive feedback). Still, the learning curve for e-faculty may be too steep to motivate most e-instructors without more of a network effect.

For further information on projects, please visit:
[HTTPS://SITES.GOOGLE.COM/SITE/FVWC I 2MCLENNAN](https://sites.google.com/site/fvwci2mclennan)



BLENDING TECHNOLOGIES FOR EDUCATION

By **Robert Daniel**, daniel@bluegrid.com

As an adjunct professor, I am very interested in applying the latest technologies in my classes. In the Telecommunications Security Protocols course that I teach, I use what some students call “non-traditional” and “unorthodox” methods. The class involves the combined use of Virtual Worlds, augmented Reality, and classroom lectures in a serious game based on principles of Cyber Security (Virtual Worlds), Physical Security (augmented reality), and Social Engineering (classroom lectures).

In this serious game, CyberSim, students utilize different methods to connect to me and classmates. Students can access the game through Second Life and OpenSimulator-based grids (worlds). We have exercises blending the Virtual World and live class. They can use their avatar within the world to call a land line, or set up a variety of other telecommunications in-world. In this course, I have found that using Virtual World Challenges—where students must interact with each other and me while creating a virtual task and reporting on it—works the best. I challenge students with tasks such as cracking encrypted boxes to reveal important hidden information, all while they are learning about social engineering and other collaborative aspects.

One thing that is great about OpenSimulator is that it is modular and can be up and running right away for collaboration. My biggest recommendation for educators looking at using OpenSimulator for education, especially for STEM, is to form a grassroots movement and work together. Using Virtual Worlds like ones based in OpenSimulator can be a valuable tool not only to use as an environment to teach, but to educate students about the technology that goes into developing, maintaining, and securing the technology.

For further information, please visit: [HTTP://WWW.CYBERSIM.NET](http://www.cybersim.net)

Interactive 3D for STEM

Study Shows Increased Engagement in STEM Learning

By **Tracey Masamoto Marler**, tmasamoto@jtmconcepts.com and **Joy M. Martinez**, jmartinez@ist.ucf.edu

The STEM education community, and of course our nation's future, benefits when businesses such as Texas Instruments' DLP® Technology (DLP Technology), which developed the capability to show 3D in a standard classroom projector, actively supports emerging educational initiatives. With user support, cutting-edge 3D technologies for teaching STEM-related subject matter are gaining enthusiasm for both teachers and students. A published case study analyzes the application of an emerging learning technology initiative known as Classroom³® (Classroom Cubed) across the nation using the 3D-Ready DLP® projector system. A partnership between DLP Technology and JTM Concepts, Inc. out of Illinois, enables the delivery of Classroom³'s library of 3D educational visualization- and simulation-based content. Highly engaging lessons amplify educational experiences by providing learners with accurate conceptual representations of difficult concepts and subject matter. According to DLP Technology, "using 3D supplements to traditional lessons offers a unique way to engage students on a higher level and make the most out of many STEM subjects."

Table 1. Data from Case study

Subgroup	Average Subgroup Gains	Subgroup	Average Subgroup Gains
Free/Reduced Lunch	32%	Female	35%
Full Paid Lunch	31%	Male	29%
Non-White	32%	IEP Students	31%
White	32%	Non-IEP Students	32%
Math ISAT Below	31%		
Math ISAT Meets	33%		
Math ISAT Exceeds	30%		

Comparing the use of Classroom³ 3D simulations with traditional textbook delivery showed great promise for the 3D lessons. Outcomes of the case study showed the comparison of two student groups, one group being exposed to a normal, 2D lesson, and the other a 3D simulated lesson. The control group's (2D) test scores increased 9.7% while the 3D lesson group saw an unheard average gain of 32% (shown in Table 1).

Through the highly visual and interactive simulated lessons, students attained confidence in topics that they had previously found challenging. Feedback from the students

was inspiring. One student stated "If I could learn everything this way, my grades would go from F's to A pluses."

Teachers are even more excited about using this unique teaching tool due to increased engagement. Educators reported an astounding difference in students' behavior. Normal distractions were virtually eliminated because of the high levels of interest students showed in the delivery of the content. For more information on JTM Concept's Classroom³, go to: [HTTP://WWW.JTMCONCEPTS.COM/C_HOME.HTML](http://www.jtmconcepts.com/C_HOME.HTML)



STEM-Focused Curriculum

Teaching Modeling and Simulation (M&S) to Today's Youth

By **Joy M. Martinez**, jmartinez@ist.ucf.edu and **Richard Hartshorne, Ph.D.**, richard.hartshorne@ucf.edu

The diverse field of Modeling and Simulation (M&S) is experiencing rapid growth in the United States—especially in Florida. As the nation's hub for M&S, Central Florida's High Tech Corridor is a wealth of resources from within industry, academia, and Government. With this in mind, the National Center for Simulation



(NCS), under leadership of Lt.Gen. (Ret) Tom Baptiste (President and CEO), has partnered with local, state, and national agencies to form an *M&S Curriculum Development Task Force*. This comprehensive team of experienced professionals hopes to encourage a strong future M&S workforce by developing and implementing an M&S curriculum throughout

local high schools in the Florida High Tech Corridor initially, and then expand it throughout the State of Florida.

The task force's goal is to develop course standards, framework, and curriculum for a four year high school program in M&S that meets the State of Florida requirements. This initiative strives to give students the ability to graduate from high school with STEM-based skills and technical certificates geared toward the field of M&S that can help them gain internships and entry-level jobs within Florida's M&S industry of over 150 active companies. Since M&S draws heavily from several STEM-related specialties, this curriculum will incorporate a variety of learning goals including important skills within mathematics, computer programming, visualization, logistics engineering, and more.

At a recent meeting of the NCS Education and Workforce Development Committee, Dr. Kim Dahl, (Seminole County Public Schools), Phil Tillery, (Timber Creek High School) and Hank Okraski, (NCS Committee Chairman) described the development of the high school program for M&S as having a curriculum underpinned by Florida standards with added M&S course standards. Students will be able to choose either a Software or Visual track within M&S. Further details regarding the curriculum will be unveiled at I/ITSEC 2012 in the STEM Pavilion. The curriculum will also be on the NCS website: WWW.SIMULATIONINFORMATION.COM

For additional information, please contact the task force lead, Mr. Hank Okraski with the National Center for Simulation: HENRY.OKRASKI@GMAIL.COM



Educating our Educators

Smart Ways to Support STEM Teachers

By **Richard Hartshorne, Ph.D.**, richard.hartshorne@ucf.edu

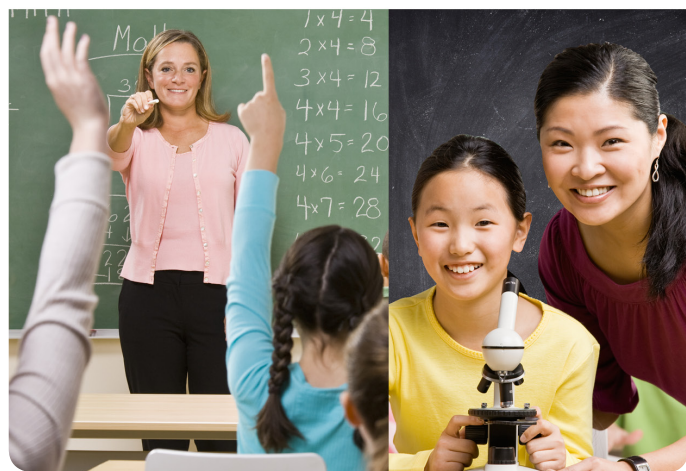
Current and future educators play a crucial role in inspiring a new generation of STEM students. However, when it comes to current education students interested in teaching STEM, several gaps have been identified. Attempts are underway to bridge these gaps for our future educators.

- **Gap:** Proper training and certification must be made available for teachers to teach an M&S Curriculum.
- **Solution:** Provide STEM-focused (and M&S-focused) certificates and/or minors offered through UCF.

Up-and-coming educators in the process of receiving their degrees and certification would greatly benefit from specialized education preparing them to teach STEM. Dr. Richard Hartshorne, of UCF's College of Education, is currently working with administrators to develop a STEM minor focused on M&S for Education majors to satisfy the current need of STEM-specialized teachers. Additionally, Dr. Mike Hynes is in the early stages of working with College of Education and other UCF faculty members to develop a center for the use of simulations and technology in education. Last, there are a number of efforts underway to support the development and implementation of opportunities to recruit students to pursue careers in STEM fields, as well as become STEM educators.

- **Gap:** Resources must be provided to educators who specialize in teaching STEM skills.
- **Solution:** Offer summer camps and other programs for developing STEM teachers.

In addition to fundamental training, educators participating in summer camps, such as UCF's Careers in STEM Camps (led by Dr. Lisa Dieker and in cooperation with Workforce Central Florida) and other activities to inspire STEM learning, such as UCF's Convincing Outstanding-Math-Potential Admits to Succeed in STEM (COMPASS) project (led by Drs. Cynthia Young, Michael Georgiopoulos, Christopher Parkinson, Andrew Daire, and Melissa Dagley) and the Lockheed Martin/UCF Mathematics and Science Academy.



STEM STUDENT SHOWCASE



Dar-Wei Chen

the University of Michigan (Ann Arbor) where he received a bachelor's degree in Industrial and Operations Engineering.

Dar-Wei has been immersed in STEM subjects from an early age and names his parents as his two greatest influences in helping him discover the elegance of the universe's scientific explanations. Teachers such as Mrs. Peggy Donovan (fifth grade) and Mr. Donald Worcester (high school) also inspired him to achieve in science and mathematics.

During two summers in between his Michigan academic years, Dar-Wei returned to his hometown of Orlando

to conduct research at UCF's Institute for Simulation and Training, where he received invaluable mentorship from Drs. Stephanie Lackey and Lauren Reinerman-Jones. Time there enabled him to experience the impact that STEM research can have on training initiatives founded in Science that keep us moving forward. Dar-Wei is grateful to STEM-based initiatives for connecting him with great people and shaping him into an informed citizen.

On occasion, Dar-Wei takes breaks from his profuse studying to serve as a columnist at the Michigan Daily, partake in musical performance, or play basketball at the nearby gym.



Jonathan Mohlenhoff

a Bachelor of Science in Electrical Engineering (BSEE) and a minor in Computer Science.

As an undergraduate student, Jonathan participated in many STEM activities including the Robotics Club at UCF and the Institute of Electrical and Electronics Engineers (IEEE) UCF chapter. In the Robotics Club, he had the opportunity to participate in International Robotics Competitions which taught him about the technology involved in developing unmanned surface vehicles, underwater vehicles, and ground vehicles.

Due to his STEM experience and achievements, he was accepted into

the competitive DoD-funded SMART (Science, Mathematics & Research for Transformation) Scholarship Program for Graduate School. Because of this opportunity, he continued his education at UCF attaining a Master of Science in Electrical Engineering (MSEE). Post-graduation, Jonathan is committed to working civil service for the Air Force branch of the DoD. As a civil servant Jonathan has the opportunity to perform research and sustainment in airborne RADAR systems.

Outside of his STEM interests, Jonathan is an avid fisherman and enjoys scuba diving.

Jonathan Mohlenhoff is a STEM enthusiast. After graduating high school as salutatorian, Jonathan attended the University of Central Florida (UCF), thanks to generous scholarships. While at UCF's exceptional College of Engineering and Computer Science, he earned



Tatiana Viecco

to find professors that believed in her and pushed her forward to succeed—not only in learning English—but also pursuing her dreams.

From a young age, Tatiana found herself excited about math and science. Tatiana's family played a large role in inspiring her to learn math, specifically. She and her father often worked on math puzzles and lessons when she was a child. Little did she know that those same lessons would help inspire her to pursue a career in STEM today.

She believes that everyone has the potential to succeed in the careers that they want, they just need the guidance. However, sometimes underrepresented

communities do not have the mentors needed to inspire and teach.

Because of this, Tatiana has been involved in STEM outreach programs for years. This year, Tatiana is co-coordinating an effort at UCF with the Tau Beta Pi Engineering Honors Society known as MindSET. This program partners with local schools to allow both middle-school and high-school students to visit UCF and learn about engineering from up-and-coming engineers. The hope is that by modelling the way, more students will be inspired to pursue careers in STEM-related majors and provide them with guidance about college.



Amani Rahman

(SWE), Institute of Electrical and Electronics Engineers (IEEE), and FIRST® Robotics Junior Lego League while pursuing her degree in Aerospace Engineering and Applied Mathematics at Florida Institute of Technology.

She is currently an Assistant Professor at Indian River State College (IRSC) in the Mathematics Department and continues to transfer her passion for Engineering and Mathematics to her students. She is a big supporter of discovery-based learning techniques to engage students. Her students are assigned various projects to use principles of mathematics. Her belief is that

by highlighting applications of mathematics, students will leave her class with a higher appreciation of the subject and will desire to learn more.

Amani was recently recognized as the Douglas J. Stephen Endowed Teaching Chair—awarded by the IRSC Foundation—allowing her to create innovative, dynamic teaching aids using Processing, Maple, and Mathematica. Her goal with this project is not only to benefit current IRSC Mathematics faculty, but also to train STEM students in the Secondary Mathematics Education program who can use it in their classrooms to inspire a new generation of STEM enthusiasts.

Amani Rahman is currently pursuing her Ph.D. in Modeling and Simulation at UCF focusing on Quantitative Aspects of Simulation. She first became interested in STEM initiatives through her involvement in the American Institute for Aeronautics (AIAA), Society of Women Engineers



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