

Transmission

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TEACHING STUDENTS TO THINK LIKE EINSTEIN

More than a century ago, Einstein did the impossible and explained gravity. But how did he make this breakthrough without the benefit of today's high-tech instrumentation or high-speed computers?

THE ANSWER LAY IN HIS ABILITY TO THINK CRITICALLY

“Successful people are able to think critically and solve problems,” says Merri Lynn Casem, professor of biological science and director of non-majors biology education. “Our goal is to develop our students’ critical thinking capacity and help them learn to use logic and reasoning to be better problem solvers.”

This September, College of Natural Sciences & Mathematics (NSM) freshmen will be the first to take the Think Like Einstein course, a foundation-building program designed to help them develop the critical thinking skills necessary to succeed in science-based college majors and careers.

BUILDING CRITICAL THINKING SKILLS

Think Like Einstein is one of the ways NSM is supporting the University’s plan to transform the academic experience and help first-year students succeed from Day One, Term One.

“As the NSM faculty discussed the skills and abilities students need to be successful in the STEM majors, we identified critical thinking as a common skill. That led to a discussion of combining a critical thinking/scientific reasoning course with a first-year experience,” explains Casem.

Faculty from each NSM department designed the course, which features case studies that help students understand how mathematicians, geologists, chemists, physicists, and biologists think about and solve problems.

“By working with students this way in their first year, we help them learn to think deeply about a particular question and, with logical reasoning, produce a strong argument,” says Laura Smith Chowdhury, newly promoted associate professor of mathematics. “This skill will prepare them for success in the more rigorous courses they will take after their first year.”

By exposing students to all five disciplines in their freshman year, the course is expected to help them build a strong academic foundation and to think like scientists.

“I was a first-generation college student and know what it’s like to be confused by what it means to think critically. This course gives us, as faculty members, the opportunity to invest in our most vulnerable students right when they declare NSM as their college home,” says Allyson Fry-Petit, assistant professor of analytical and materials chemistry.

FOSTERING APPRECIATION FOR SCIENCE AND MATH

What will a week in the life of a Think Like Einstein student include? Monday and Wednesday class time will be spent learning scientific problem-solving in the five disciplines. On Fridays, students will work in small groups headed by peer mentors to develop important skills like time management and study skills. And student teams will collaborate on a semester-end project to create short videos that highlight their critical thinking skills related to a science topic in the news.

“We hope that the course will also help develop a more robust community and give students a sense of the culture of science within the college,” says Casem.

The collaborative aspect of the course should also help first-year students more quickly engage academically and make peer connections, which helps with retention.

“We believe this course will give students important structure to their learning and help them build a cohort,” says Wylie Ahmed, assistant professor of physics, one of the course’s teachers. “Exposing freshmen to how math and physics connect with our everyday experiences will help them see the value in their studies.”

The course will also introduce students to the learning opportunities available in each of the NSM departments. “We hope that students interested in science will use the class to help identify where their hearts and minds fit best. Sometimes students think they want to study biology, but don’t realize that physics may be a better fit,” says Casem.



“Our goal is to develop our students’ critical thinking capacity and help them learn to use logic and reasoning to be better problem solvers.”

Merri Lynn Casem

Professor of biological science and director of non-majors biology education



“Critical thinking helps prepare students for success in the more rigorous courses they will take after their first year.”

Laura Smith Chowdhury

Assistant professor of mathematics



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Wylie Ahmed

Assistant professor of physics

That's a great opportunity for the majority of first-year students who may know they want to pursue a career in math or science, but who are unsure of what major to declare.

"As a geologist, we don't often have many freshman majors. I think this course will be a great introduction to geology for the students," says Joe Carlin, assistant professor of marine geology. "Some may realize that geology may be the path they want to take that they had never realized. But I hope most will realize how intertwined science and math are to their everyday lives." •

SUPPORTING STUDENT SUCCESS

The Black Family Trust has provided seed funding to cover a portion of the support needed to hire upperclassman as peer mentors. The college plans to increase philanthropic support through alumni giving and grants to sustain and grow the mentorship aspect of the program, which is not supported through state funds.

"Peer mentors will help our freshmen in many ways," explains Colleen McDonough, assistant dean for student affairs. "They will be important role models to show freshmen that there is a community of people working toward common goals and to encourage them to join this community. They will also help them understand the wide variety of resources and support services available that are designed to help them be successful students. We are hopeful that this aspect of the course will mean students take advantage of these resources early on."

As the course progresses, faculty will actively engage students to get their feedback and gauge how well they are learning to think critically, how they are using the many support services available to help them academically, and how quickly cohorts form.

"The Foundation's generosity will allow us to run this course as a pilot and obtain the data we need to determine its impact on students," says Casem.



"I hope that through this course, most students will realize how intertwined science and math are to their everyday life."

Joe Carlin

Assistant professor of marine geology



"The peer mentors, who are part of this course, will be important role models to freshmen to show that there is a community of people working toward common goals and will help freshmen take part in that community."

Colleen McDonough

Assistant dean for student affairs



"This course gives us, as faculty members, the opportunity to invest in our most vulnerable students right when they declare NSM as their college home."

Allyson Fry-Petit

Assistant professor of analytical and materials chemistry

NSM WEEK 2018

MESSAGE FROM THE DEAN



In our quest to support our students on their paths to graduation, we have undertaken an effort to change the essential character of the higher education experience. We are proud to be part of a University-

wide initiative to establish a 21st-century learning environment that encourages students to explore, learn, and put what they learn into practice.

Part of this initiative also includes resources to help our students persist to earn their degrees and take advantage of meaningful careers in science and math. In the College of Natural Sciences & Mathematics, we help students make timely progress toward graduation and career readiness by providing hands-on research and experiential classroom learning, as well as access to support services like tutoring and mentoring from faculty and community and business leaders.

In August we will add one more element designed to help our students get the very best start toward their degrees. CNSM 101: Think Like Einstein is a course for NSM freshmen with a threefold goal: teach our students to think critically using math and science, give them exposure to each of our five departments, and provide ways for them to form peer connections as they gain college success skills.

This new program and our entire strategic approach to student success have a unifying component: individuals personally focused on serving students. Behind every NSM student, there's a cadre of people eager to empower that student to reach his or her goals and to be confident in their abilities to lead in a global society.

We can't do it alone. Your engagement and support of NSM directly impacts our ability to develop innovative curriculum, provide our students a top-notch education, and develop graduates who think critically in all they undertake.

Marie Johnson, Ph.D.

Dean, College of Natural Sciences & Mathematics

CELEBRATING MATHEMATICS AND SCIENCE

NSM Week 2018 was more than a break from the books for students. It also provided a public forum for the interesting research that undergraduates have accomplished this year in math, biology, geology, physics, and chemistry. The 15th annual celebration, held March 20–23, 2018, featured the NSM Inter-Club Council (ICC) carnival plus lab tours and a poster symposium.

“We had record-breaking turnouts for both presenters and attendees,” says senior Sean Zulueta, Natural Sciences & Mathematics ICC Chair. “It’s a great way to showcase the award-winning student research at the College of Natural Sciences & Mathematics.”



Turnout for NSM Week 2018 was record-breaking, with students enjoying carnival games and food as well as lab tours and a poster symposium.



Dean Marie Johnson (far left) joined the fun during NSM Week 2018.



Assistant Dean Colleen McDonough and the hardworking ICC executive board put months of work into coordinating NSM Week.



SUSAN BEST (BS '87): FROM MISSILE DEFENSE TO SATELLITE COMMUNICATIONS

Since graduating from Cal State Fullerton with a BS in physics in 1987, Susan Best has worked on some of the most advanced projects for several top aerospace companies, including Rockwell International, Boeing, and Northrop Grumman. Working with a software called Systems Tool Kit, she is able to create highly accurate three-dimensional models for anything that moves – across land or sea, through the air, in space, and through time.

Much of Best's work has focused on modeling, simulation, and analysis of satellite orbits, and how satellites communicate and relay information. This can be used for anything from missile defense systems to cell phone carriers to communicating with planes or making sure deliveries get to the International Space Station.

"Right now, I'm creating a video simulation of a capsule docking with the Space Station," says Best. "These kinds of models are critical to a successful mission because there are lots of variables that can impact the flight, and we need to be able not only to predict the path of the rocket and the capsule, but also the path of the space station and the satellites that are used to track the rocket and its payload and have them send and receive communications from the ground."

According to Best, it was the optics courses she took at CSUF that really propelled her toward a career in aerospace engineering. "One of the best things about the physics department was that it really felt like you were part of a family," she says. "Everyone was very encouraging, and they really gave you the knowledge and tools to succeed."

Having already received a BA, Best decided to stay at CSUF an extra semester to get her BS. During this time, she was given the opportunity to teach a lab class. "When you work in science or engineering, it's important to know how to present in front of an audience. You have to be able to communicate your research and ideas, and lecturing in front of a class helped prepare me to do that," she says.

In addition to her BS, Best also returned to CSUF to take night classes in C programming

through the University's Extended Education offerings. This helped her better apply the knowledge she had gained and opened up more career opportunities.

"I would always encourage continued learning, especially when it comes to science and technology," she says. "Many employers will even pay for these types of classes because it makes you a more valuable employee."

To students and recent graduates, she offers this advice: Always keep an active mind and a positive attitude. Sometimes, it can take time to find the right fit, whether it's in your studies or when looking for a job. And if you need an extra year to complete your degree, take it. You'll be better off in the long run if you don't try to take on more than you can handle, and focus on mastering the material being taught. ●

FACULTY FOCUS



Veronica Jimenez, assistant professor of biological science, was featured in a Univision newscast for her research on the “kissing bug.” With several undergraduate and graduate students, she is researching a drug therapy for Chagas disease, which already has affected 300,000 people in the United States alone.



Maria Linder, professor of chemistry and biochemistry, was recently recognized by Cal State Fullerton for Outstanding Contributions to Student Success. Linder has served students and the University for four decades and has been honored with the University’s Outstanding Professor award, the L. Donald Shields Excellence in Scholarship and Creativity award, and the California State University Wang Family Excellence Award.



Jocelyn Read, assistant professor of physics, who played a key role in the international research effort that detected the first gravitational waves produced from colliding neutron stars 130 million light years from Earth, was recognized as one of Orange County’s 2018 “Game Changers” by the Orange County Business Council.

Math Cuajungco, professor of biological science, and **Cherie Ichinose**, associate professor of mathematics, were honored at the May Academic Senate meeting. Cuajungco received the L. Donald Shields Excellence in Scholarship and Creative Activity Award for his ongoing externally funded student research program. Ichinose was awarded the Carol Barnes Excellence in Teaching Award in recognition of her multiyear efforts to improve mathematics education at all levels. This is the highest campus honor given to a Cal State Fullerton faculty member for teaching.



In recognition of her impactful research, **María Soledad Ramírez**, assistant professor of biological science, recently received

both the Titan on the Rise: Early Career Investigator Award from Cal State Fullerton’s Office of Research and Sponsored Projects and the College of Natural Sciences & Mathematics Outstanding Research Award. Ramirez was also awarded a National Institutes of Health (NIH) grant – totaling more than \$425,000 over four years – to conduct research identifying host human factors responsible for the natural transformation of antibiotic resistance traits in *Acinetobacter baumannii*, which poses a significant threat to human health.

Jolene Fleming, a full-time lecturer in the Department of Mathematics actively involved with graduate teaching associates and part-time faculty in developing mathematical and pedagogical skills, recently received a Cal State Fullerton Outstanding Lecturer Award.



IN MEMORIAM

In March, Cal State Fullerton said goodbye to **Margaret S. Woyski**, emeritus professor of geological sciences and associate dean of the School of Natural Sciences & Mathematics, who passed away at age 96. Woyski joined the campus in 1967 and served 25 years in several positions, including associate dean and acting director of academic advisement and chair of what was formerly called the Department of Earth Science.

STUDENT SPOTLIGHT



A CSUF Graduate Readiness and Access in Mathematics (GRAM) program research scholar, CSUF President's Scholar, and 2017 research scholar in the Louis Stokes Alliances for Minority Participation program, **Cameron Hooper** recently received a Mathematical Association of America (MAA) Outstanding Poster Award for his undergraduate research. Hooper uses mathematical methods to identify atmospheric aerosol particles that might influence climate change.

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CELEBRATING MATHEMATICS AND SCIENCE



Costumed Geology Club members added some dino-mite fun to the festivities.



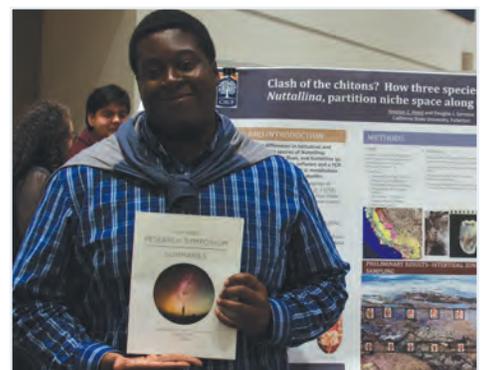
NSM student **Ken Rios** and NSM graduate assistant **Cheyanne Ramon** gave away hot dogs and smiles during the carnival.



YOUR OPPORTUNITY TO SUPPORT STUDENT RESEARCH

Hands-on lab and field research is an important part of the NSM undergraduate experience. And NSM Week is an opportunity to showcase that research and share the excitement. The research featured during this year's NSM Week was possible because of generous donors who responded to last year's NSM Undergraduate Research Gift Challenge, sponsored by the Black Family Trust. Together, they raised over \$100,000 to fund more than 50 student researchers.

If you're interested in establishing a research fellowship, professorship, or scholarship to enhance our students' research pursuits, please contact Michael Karg, Senior Director of Development, at mkarg@fullerton.edu or 657-278-3348.



Newton Hood was one of 110 student researchers with poster presentations on display during the NSM Week symposium.



CALIFORNIA STATE UNIVERSITY
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College of Natural Sciences & Mathematics
P.O. Box 6850
Fullerton, CA 92834-6850



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Michael Karg, Senior Director of Development
657.278.3348 | mkarg@fullerton.edu



CONGRATS TO OUR GRADS!



The College of Natural Sciences & Mathematics celebrates the achievements of our newest graduates! We are excited to see the positive impacts you will make in your fields, in your communities, and in the world.