DoDEA Pacific students take deep "Tsukuba" dive into STEM at science and research center

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TSUKUBA SCIENCE CITY, Japan — Particle colliders, electrophoresis machines, landscape simulators and mass spectroscopy were all tools of the trade for 60 Department of Defense Education Activity (DoDEA) Pacific high school students during the Far East STEM and Research Academy (SARA) held Sept. 24-28 in Tsukuba Science City, Japan.

The event featured intensive, hands-on learning for the students who were led by professors, scientists and researchers in the areas of science, technology, engineering and mathematics (STEM). By pairing DoDEA Pacific students with local Japanese students from Meikei Science High School into academic teams, SARA offered ample opportunities for academic and cultural connections. Each team experienced a two-day scholarly exploration into various STEM fields of interest. The teams worked alongside Tsukuba University senior research faculty and graduate students who introduced the aspiring scientists, mathematicians, engineers, chemists and industry innovators to advanced technologies and the latest research. Students conducted experiments at the university labs with the assistance of the faculty and graduate students.

The student teams of 3-5 students attended "steminars" which included the study of earth and space sciences (tectonics), environmental science (city planning), engineering (material science), physics and astronomy (acoustics), medicine and health (epidemiology), genetics, behavioral science (psychology), life sciences (molecular biology), green technology, bioengineering, robotics, gaming technology (gaming programming) and applied mathematics (management).

In addition to each of the two-day steminars, students attended half to full day hands-on field experiences at several national institutes and labs located throughout Tsukuba Science City. The field experiences were hosted by leading research institutes including the High Energy Accelerator Research Organization (KEK); Ibaraki Nature Museum; National Institute of Agrobiological Sciences (NIAS); National Institute for Material Science (NIMS); National Research Institute for Earth Science and Disaster Prevention (NIED); and the Kasumigaura Environmental Science Center. The visits to each site were led by renowned researchers and staff and involved activities such as the extraction of DNA from plant life, learning how to make metals magnetic, proper methods for fossil excavations, and conducting particle collision experiments.

University of Tsukuba Robotics Engineering Professor Yasuhisa Hasegawa and his graduate assistants demonstrate robot technology developed through Hasegawa's extensive research projects.

Photo courtesy of Robert Tiffany

In addition to being paired with students from the local Meikei Science High School while at Tsukuba University, DoDEA Pacific students also visited nearby Tscuhiura Second High School. While there, students were treated to a spirited choral performance and took part in after school activities such as a Japanese tea ceremony and calligraphy and were invited to watch traditional after school clubs such as archery, table tennis, kendo, and marital arts.

SARA was first developed in 2010 by a cadre of DoDEA Pacific educators as an Advanced Placement level event focused on scientific inquiry and rigorous research. SARA also represents DoDEA Pacific's contribution to a broader national effort designed to boost student interest and participation in STEM fields. The Department of Defense, White House and leading U.S. universities and businesses have all made clear in recent years the urgent need to draw more students into STEM studies as a matter of national security and global competitiveness.

DoDEA Pacific Far East Student Activities Coordinator Todd Kirby said the purpose of SARA is to further develop the students' understanding of the interconnectedness of the scientific, technological, engineering and mathematic fields. Those connections set the stage for students to apply their knowledge and expertise in meaningful ways such as collaboration and research that yield breakthrough solutions to complex, real-world problems.

If the reaction from DoDEA Pacific students and teachers who attended SARA is any indication, the students are more motivated than ever to pursue research careers in STEM-related fields.

"In the past week, I have seen things most people have never seen. I saw autonomous robots, artificial intelligence, robots that function by contracting metal, and even a swimming one. It showed me just how integrated science and math really are," said Kubasaki HS senior Nick Page, who took part in the robotics program.

Equally amazed was Bryan Corn, also from Kubasaki High School, who said "we synthesized nanoparticles…who does that?" During SARA, Corn participated in the physics and astronomy group.

Following interactive discussions, hands-on experiments, field experiences and cultural events, the student teams spent the final day preparing, presenting and defending what they learned in a peer-review setting with the University of Tsukuba faculty and graduate students. Each presentation lasted 8 minutes with an additional four minute question and answer session that challenged students to articulate how they can further their studies through application of their newfound knowledge and experience.

"Every day you learn something new," said Kubasaki HS student Breanna Beers who took part in the life sciences group, "but with SARA, every day is a new adventure, new experience, and you learn ten new things."

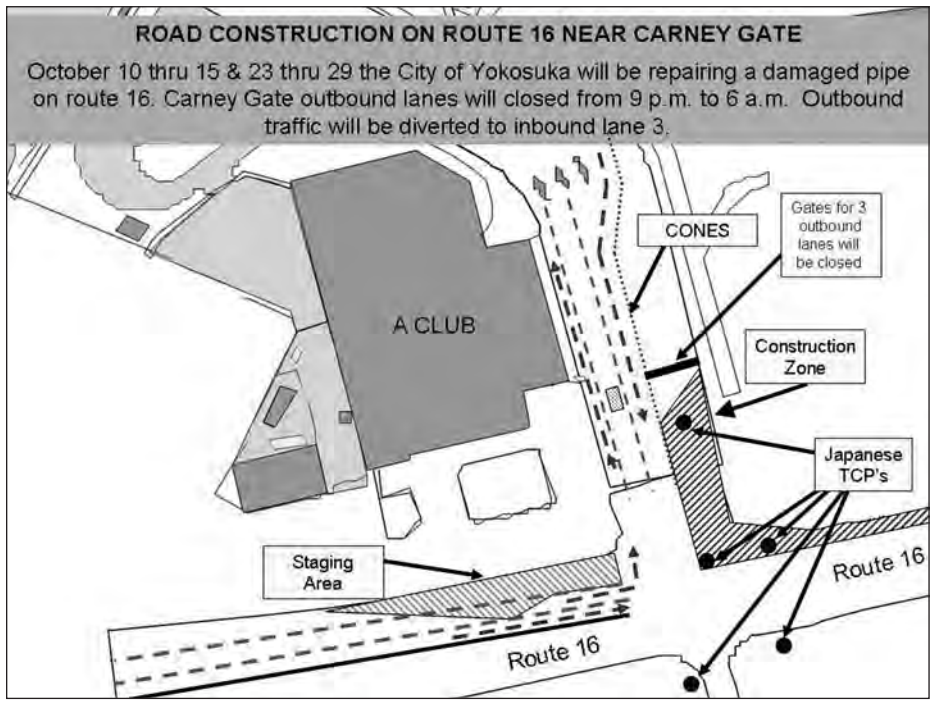
"The best experience was working hands-on in the labs. It gave me a look at what I might hopefully be doing in the future" said Bethany Andrade, a student at Kadena HS who was a member of an engineering team. "[SARA] Steminars was full of moments that made you stop and say… only at an academic Far East" she said.

Joining the students were 11 DoDEA teachers from across the Pacific who attended several courses throughout the week at the university and also participated in field experiences with students.

"The flight home was enjoyable, not simply because we were 'going home', but because of the experiences my students kept sharing with me and with each other. These kids really enjoyed the experience" said Karl Ackermann, an industrial technology teacher at Edgren High School in Misawa, Japan.

Kirby said the experience has already made a lasting impression on students and teachers alike.

"One teacher told me that he wanted to be a student next time, and that the teachers should sit alongside the kids in the courses in fields other than their own. That was an important discovery for both students and teachers who can now share their love of learning through the power of STEM interconnectedness back in their schools," said Kirby.

Although Far East SARA was challenging and exhausting, students still managed to have fun and forge new friendships. "I'm really glad I got to come and meet new people. Not only did I grow closer with kids from my school but I met fun and neat people from all over the pacific" said Emma Olds from Kadena HS.

In reflecting on the experience, Jordan Cole of Kubasaki HS said, "Being able to spend time with professors at the university was an amazing experience. I learned a lot from them and got to use technology that most people only dream of using. I will take these experiences with me into college and my workplace." Cole spent his time at the university in the gaming technology course and proudly noted, "Whoever said 'nerds don't have fun' was sadly mistaken!"