



# STEM-ester in Review

## Kaput Center Newsletter

### Welcome

We are excited to share our Spring 2019 Newsletter with you. Spring was busy – we hosted the largest-ever STEM4Girls event, went to a few local STEAM days, presented our research at a variety of conferences, and made plans for future endeavors. For this newsletter, we wanted to give everyone a flavor of STEM4Girls, so we are sharing articles from different perspectives about the event.

As always, you can email us at [kaputcenter@umassd.edu](mailto:kaputcenter@umassd.edu) or check us out at our website <http://kaputcenter.org>. We also have Facebook and Twitter accounts: <http://facebook.com/kaputcenter> and <https://twitter.com/kaputcenter>

### New People

The Kaput Center is delighted to welcome Ram Bala and Beth Cullen to our Executive Board. We look forward to our work together!



## Participation doubled at 8th Annual STEM4Girls Day

**By Kym Welty, Grant Support Specialist**

On Saturday, March 30th, the Kaput Center held its 8th annual community outreach event called “STEM4Girls Day” at the University of Massachusetts Dartmouth. This free event was open to all girls in grades 3-8 who want to learn marabout and engage in Science, Technology, Engineering and Mathematics (STEM). This year, our participation doubled - nearly 250 girls from the SouthCoast area registered for the event, including students from Our Sisters’ School and Irwin Jacobs Elementary in New Bedford, and Atlantis & Argosy Collegiate charter schools in Fall River. Our keynote speaker, Dean Jean VanderGheynst from UMass

Dartmouth's College of Engineering, shared her experiences in STEM with the audience, including what she loves most about her work - food sustainability. The keynote address was followed by a skit performed by a group of students from Our Sisters' School. The girls then attended STEM workshops, followed by lunch and an opportunity to play with Photons or (insert physics demo here). The event wrapped up with a guest panel of women working in STEM fields and a question & answer session. At one point, the lines on both sides of the auditorium to ask questions was 25 girls deep!

We hosted 23 STEM workshops (up from 16 last year) led by experts who volunteered their time. Presenters included UMassD faculty and graduate students from the College of Engineering, the School of Nursing, the School of Marine Science and Technology (SMAST) and the STEM Education and Teacher Development department. In addition, workshops were led by faculty from Tufts University and Stonehill College, local middle and high school teachers from Bourne, Dartmouth, Fairhaven and New Bedford, as well as people from other STEM organizations and industries. The success of our STEM4Girls day was made possible by the additional support of over 50 volunteers from UMassD faculty, staff and students, as well as community members who wanted to help.

Chandra Orrill, Director of the Kaput Center, was quoted as saying "We're introducing [the girls] to STEM ideas and giving them a good, positive experience on a college campus, and we're trying to empower to show them women can work in STEM fields...We want them to accomplish feeling like there's a place in STEM for them." Orrill concluded "We hope they learned a bit about STEM, but we really wanted them to leave feeling like they can do this and know it's really exciting."

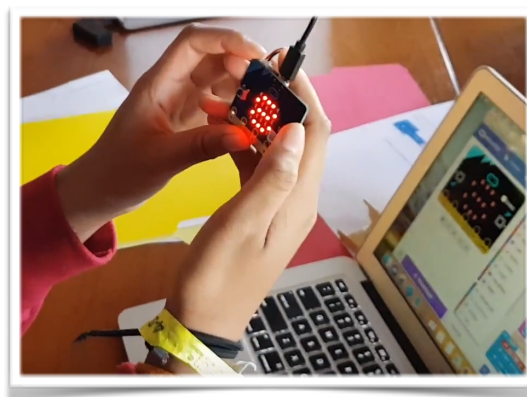
## Randomness at STEM4Girls Day

**By: James Burke, Post Doctoral Fellow**

Year after year, STEM4Girls is a rewarding experience and unique opportunity for STEM educators and practitioners to share powerful, fun ideas and activities with an enthusiastic and engaged group of middle and elementary school girls. This year, an exceptional number of girls attended. Several buildings at UMassDartmouth came alive with young women solving problems, thinking mathematically, asking questions and seeing how they could use and build technology.

In the workshop I designed and led, girls considered the question: "What is random?" Girls offered great definitions from their own experiences: random is weird, random is unexpected, random is freckles, random is...just, you know – random!

We discussed formal mathematical definitions of randomness, while the girls experimented with choosing random numbers vs. rolling random numbers on dice with different numbers of



sides. Then the girls applied a computer language “random” function on a tiny Micro:Bit device to simulate the “Magic 8 Ball” fortune telling toy, but with their own customized responses.

As we finished up the workshop, we were able to connect randomness back to one of the girls’ definitions. Randomness is used in motion pictures to create natural looking freckles on the skin of computer generated characters. The girls found that, in randomness, mathematics is yet another part of their world.



## Inside Look: STEM<sub>4</sub>Girls from a volunteer’s perspective

**By: Akira Harper, Doctoral Student**

My name is Akira Harper, and I am a first-year doctoral student in the STEM Education program at UMass Dartmouth, and I had the privilege of volunteering at STEM<sub>4</sub>Girls. The focus of this annual event is to empower girls, starting at a young age, and shift the narrative of who can be

successful in the STEM fields. The volunteers included annual event planners, like Chandra Orrill, guest speakers, teachers in the community and students at the University.

My role as a volunteer was to assist in the science room where students were exposed to learning about live animals. In our classroom, these girls got to learn about and play with crabs, hermit crabs, whale teeth and more! As a volunteer, I was fortunate enough to connect with these girls and share my story, as most of the girls who participated in the event came from the same background as I did. As a minority who comes from a non-affluent single-parent household, being a doctoral student in STEM, I am not the image that these students are typically exposed to. Being able to discuss topics that revolved around STEM over lunch and interact with STEM toys, like the Photon Robots (where students are introduced to entry level coding) made learning about STEM a more interesting and positive experience for myself and the girls included.

## Dr. Kristy Daniel shares research experiences on representational competence with interdisciplinary Kaput Center audience

By Stephen Witzig, Associate Professor



On April 19, Dr. Kristy Daniel, Associate Professor of Biology from Texas State University, visited the Kaput Center for a research talk focusing on how scientists communicate their work in ways that makes science accessible. Dr. Daniel works from a framework of representational competence, which she has recently published in an edited book with Springer (Daniel, 2018), *Towards a Framework of Representation Competence*. This framework focuses on how people use and interpret visual diagrams to share understandings about science concepts.

During her visit, she met in small groups with Biology faculty and doctoral students, as well as STEM Education faculty and doctoral students – disciplines that she seamlessly navigates between as a biology educator. When meeting with Biology doctoral students, she noted how she was able to develop new collaborations connected to her research agenda, “I was able to introduce her [a doctoral student in Biology] to one of my current doctoral students in Texas. The two of them shared several interests and are planning on working together to collect data from Boston that will help inform a science communication project on which we are currently working.” Much of her interactions while on campus were with students in the PhD program in STEM Education. Dr. Daniel shared, “I think the STEM Education doctoral students at UMass Dartmouth are fortunate to be able to have such a supportive and dedicated cohort to help them through the doctoral journey. These students demonstrated loads of potential as science educators and I wish them all the best.”

Dr. Daniel’s seminar drew a truly interdisciplinary audience, including faculty and students from programs in STEM Education, Biology, Physics, Engineering, and Mathematics. “I found it rewarding to speak to a diverse group of researchers that were clearly engaged with thinking about ways we can push knowledge boundaries and expand how we typically think about science education and communication” Dr. Daniel noted, adding, “I loved the interactive nature of the Kaput Center seminar. People asked thoughtful questions that promoted deeper thinking and interesting discussions about the topic at hand.” The Kaput Center colloquium series was designed to be both interdisciplinary and interactive, so it was encouraging that these aspects stood out to Dr. Daniel during her visit.

For more information on Kaput Center colloquium series, email [kaputcenter@umassd.edu](mailto:kaputcenter@umassd.edu), or visit <http://kaputcenter.org/events/>.



## Do Black Women and Girls Belong in Mathematics? A Colloquium by Dr. Nicole Joseph

**By: Chandra Orrill**

On May 6th, the Kaput Center hosted Dr. Nicole Joseph a mathematics educator from Vanderbilt University. Dr. Joseph spent the day making new connections with faculty and doctoral students in the Kaput Center, and then presented on her research. Her presentation, I DO (NOT) Belong: Experiences of Black Women and Girls in Mathematics Education challenged the audience to think about why Black girls may or may not go into mathematics as a career path.

In her interactive presentation, Dr. Joseph asked the audience to review data about Mathematical Sciences Doctorates conferred since 2004. The data, from the National Science Foundation, showed that while between 508 and 948 Ph.D.'s were conferred nationwide, less than 1/3 of those were earned by women of any background, and 2% or fewer were earned by Black women.

To these sobering statistics, Dr. Joseph added quotes from Black women from several research studies conducted by herself and others about Black women in STEM fields. The quotes paint a picture of isolation and frustration, as well as highlighting the burden the women feel because they perceive that if they fail, their failure will be seen by others as their entire race failing. The audience discussed these ideas in small groups and as a whole group.

Dr. Joseph ended the session on a high note showing the audience a slide filled with photos of Black women who are rising stars or who paved the way for others. We appreciate Dr. Joseph helping us identify the hurdles Black women face and challenging us to be better.

For more information on Kaput Center colloquium series, email [kaputcenter@umassd.edu](mailto:kaputcenter@umassd.edu), or visit <http://kaputcenter.org/events/>.

## SouthCoast@ KaputCenter CoderDojo continues through the summertime

**By: Hamza Malik, Doctoral Student**

CoderDojo, an international organization based in Ireland, is made up of 58,000 Ninjas who are being creative with technology with the help of 12,000 volunteers in 109 countries. It is a global movement led by volunteers to organize a community-based programming club for young people. The Kaput center launched its own CoderDojo chapter on November 3<sup>rd</sup>, 2018 with an objective of providing opportunities for students to learn and explore coding in an informal, creative and social environment. The main aim of these sessions is to provide students an opportunity to engage with coding to create their own projects and/or explore different coding languages. The Center hosts a Dojo every first Saturday of the month, from 10 am to noon on the UMass Dartmouth campus since its inception from November 2018 and to date, we have hosted 67 students in total, nearly half of whom have come back more than once.

I work as a mentor with South Coast @ Kaput Center-UMass Dartmouth CoderDojo and my role is to help students learn to code using Python. During the session, students get a chance to code in different languages as well such as Scratch, Python, and HTML. Students are encouraged to follow three simple sets of rules; One rule for kids: be cool, ask three then me and if you made it, you can play it. These sessions not only help the students in learning to code, but they also helped me as a mentor to understand how kids come up with out of the box and creative ideas when it comes to computer coding if given an opportunity such as CoderDojo sessions.



***Special Thanks to our Volunteer Mentors  
this spring: James Burke, Melissa Cieto, Tobey  
Eugenio, Paul Fredette, Tatyana Frost, Krushita  
Kothari, Miraj Mahmood, Hamza Malik, Temple  
Mitchell, Chandra Orrill & Kym Welty***

# Girl Power in Making Presentation to Multidisciplinary Seed Fund Program

**By: Charlemya Erasme, Doctoral Student**

On April 29th, members of our *STEAM Language, Learning and Identity* research lab, led by Dr. Shakhnoza Kayumova (Kaput Center Research Scientist), UMass Dartmouth administrators, and faculty (including Dr. Walter Stroup, Kaput Center Research Scientist) presented *Girl Power in Making: Understanding Trajectories of Identification with STEM Disciplines Among Diverse Adolescent Girls in Making, Coding, and Robotics Infused Science Classes* to the Multidisciplinary Seed Funding (MSF) Program. The Girl Power in Making research project is dedicated to understanding the positive science identity development of bilingual and multilingual youth, particularly at-risk girls, by examining their perceptions about science, who can or cannot do science; learning by making STEM curriculum approaches & norms of interaction that either support or hinder girls' full participation in STEM curriculum. The presentation discussed the project's objectives and goals, outlined preliminary findings and introduced areas for future research. We offered counter narratives to deficit perspectives that often surround minority youth regarding their ability to participate in STEM subjects. Our research showed that students, when given access to robust STEM through instructors & instruction; curriculum; tools; peers or on their own took on complex and robust identities. Special thank you to all those involved and to the MSF program!



STEAM Language, Learning, and Identity

Research Lab

## Research Activity

While much of our newsletter is dedicated to our outreach and education activities, the Kaput Center remains a thriving research center. In 2018-2019, our research scientists published 21 papers. Take a look at the list below and see what might be of interest to you! (Note: Research scientist's names are in bold)

Bazzul J., & **Kayumova, S.** (2018). The ethical subject of science education: Toward different ethico-political frontiers for twenty-first century science education. In Reis G., Mueller M., Gisewhite R., Siveres L., Brito R. (Eds.), *Sociocultural perspectives on youth ethical consumerism. Cultural Studies of Science Education* (pp. 101-114). Springer: Dordrecht, Netherlands. [https://doi.org/10.1007/978-3-319-65608-3\\_7](https://doi.org/10.1007/978-3-319-65608-3_7)

Bazzul, J., Tolbert, S., & **Kayumova, S.** (2019). New materialisms and science classrooms: Diagramming ontologies and critical assemblies. In *Material practice and materiality: Too long ignored in science education* (pp. 117-130). Springer: Cham, Switzerland..

Brady, C. E., **Stroup, W. M.**, Petrosino, A. J., & Wilensky, U. (2018, August). Group-based simulation and modelling: technological supports for social constructionism. Presented at *Constructionism Conference*, Vilnius, Lithuania

Brown, R. E., **Orrill, C. H.**, & Park, J. F. (2018). Knowledge resources for proportional reasoning in dynamic and static tasks. In T. E. Hodges, G. J. Roy, & A. M. Tyminski (Eds.), *Proceedings of the 40th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 488-491). Greenville, SC: University of South Carolina & Clemson University.

deAraujo, Z., **Orrill, C. H.**, & Erikson, J. (2018). Designing communication-rich problem-centered mathematics professional development. *International Journal of Mathematical Education in Science and Technology*, 49(3), 323-340. doi: 10.1080/0020739X.2017.1373153

Emre-Akdoğan, E., **Güçler, B.**, & Argün, Z. (2018). The development of two high school students' discourses on geometric translation in relation to the teacher's discourse in the classroom. *Eurasia Journal of Mathematics, Science and Technology Education*, 14(5), 1605-1619. <https://doi.org/10.29333/ejmste/84885>

Emre-Akdoğan, E., **Güçler, B.**, & Argün, Z. (2018). One high school student's discursive development on reflection in relation to instruction from a commognitive perspective. Full research paper published in the online proceedings of the first *International Commognitive Workshop*, Haifa, Israel: The Technion.



- Emre-Akdoğan, E., **Güçler, B.**, & Argün, Z. (2018). One student's discursive development on rotation in relation to instruction from a commognitive perspective. In Bergqvist, E., Österholm, M., Granberg, C., & Sumpter, L. (Eds.). *Proceedings of the forty-second annual meeting of the International Group for the Psychology of Mathematics Education* (Vol. 2, pp. 403-410). Umeå, Sweden: PME.
- Jacobson, E., Lobato, J., & **Orrill, C. H.** (2018). Middle school teachers' use of mathematics to make sense of student solutions to proportional reasoning problems. *International Journal of Science and Mathematics Education*, 16(8), 1541-1559. doi: 10.1007/s10763-017-9845-z
- Kayumova, S.**, & Bazzul, J. (2019). The ethical and sociopolitical potential of new materialism for science education. In *Material practice and materiality: Too long ignored in science education* (pp. 51-64). Springer: Cham, Switzerland.
- Kayumova, S.**, Avraamidou, L., & Adams, J. D. (2018). Science education: Diversity, equity and the big picture. In *Critical Issues and Bold Visions for Science Education* (pp. 285-297). Brill Sense.
- Kayumova, S.**, McGuire, C. J., & Cardello, S. (2019). From empowerment to response-ability: rethinking socio-spatial, environmental justice, and nature-culture binaries in the context of STEM education. *Cultural Studies of Science Education*, 14(1), 205-229. DOI: 10.1007/s11422-018-9861-5.
- Kayumova, S.**, & Tippins, D. (2018). Obsessed with accountability? Science teachers under the microscope. In L. Bryan & K. Tobin (Eds.), *Thirteen questions in science education*. Peter Lang: New York, NY.
- Kayumova, S.**, Zhang, W., & Scantlebury, K. (2018). Displacing and disrupting colonizing knowledge-making-practices in science education: Power of graphic-textual illustrations. *Canadian Journal of Science, Mathematics and Technology Education*, 18(3), 257-270.
- McGuire, C. J., & **Kayumova, S.** (2018). Increased exposure to environmental hazards: An opportunity for science, technology, engineering, and math education. *Environmental Justice*, 11(5), 198-201.
- Orrill, C. H.**, & Brown, R. E. (2018). Examining teacher knowledge resources for proportional reasoning visually. In T. E. Hodges, G. J. Roy, & A. M. Tyminski (Eds.), *Proceedings of the 40th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 504-507). Greenville, SC: University of South Carolina & Clemson University.

- Orrill, C. H.**, & Hill, J. R. (2019). Maya Thomas. In P. A. Ertmer, J. Quinn, & K. Glazewski (Eds.) *The ID casebook: Case studies in instructional design* (5th ed.) (pp. 57-63). New York: Routledge.
- Orrill, C. H.**, & Millett, J. (2018). In-service teachers' abilities to make sense of fixed number of variable sized parts tasks. In T. E. Hodges, G. J. Roy, & A. M. Tyminski (Eds.), *Proceedings of the 40th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 508-511). Greenville, SC: University of South Carolina & Clemson University.
- Petrosino, A. J., Sherard, M. K., Harron, J. R., & **Stroup, W. M.** (2018). Using collaborative agent-based computer modeling to explore tri-trophic cascades with elementary school science students. *Creative Education*, 9(4), 615-624.
- Santavicca, N., Bazzul, J., & **Witzig, S.** (2019). Camping science education: A trip to camp Wilde and the queer nature of nature. In W. Letts & S. Fifield (Eds.), *STEM of desire: Queer theories in science education* (pp. 289-305). Leiden, Netherlands: Brill - Sense Publishers
- Weiland, T., **Orrill, C. H.**, Brown, R. E., & Nagar, G. G. (2019, online). Mathematics teachers' ability to identify situations appropriate for proportional reasoning. *Research in Mathematics Education*. doi: 10.1080/14794802.2019.1579668

**Have a great summer!**

**We are looking forward to Fall 2019 when we hope to engage in even more outreach, including creating a hands-on event for teachers to try out technologies they may not have seen before, improving our CoderDojo, and continuing our efforts to reach across campus to create an interdisciplinary research and outreach center.**