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CENTER FOR MATHEMATICS EDU

JANET WALKOE is in the first year of a five-year NSF CAREER project in which she is exploring ways to support teachers in leveraging children's algebraic resources. Children gain a wealth of resources as they interact with the world. Many of these can be leveraged when learning formal algebra. For instance, children have experience with the idea of "balance." These experiences can be leveraged when thinking about equality and the equal sign. Janet is also continuing work funded by the US Department of Education, along with colleagues and the District of Columbia Public Schools to design and implement curricula that supports math and computational thinking. The lessons involve programming small robots (sphero.com) in 4th and 5th grade math classrooms.

CARO WILLIAMS-PIERCE is an assistant professor in the College of Information Studies, and affiliated with the Center for Mathematics Education. She is currently working on publications about mathematical play and generalizing (learning), coordinating the Embodied Mathematical Imagination and Cognition website and virtual events (www.embodiedmathematics.com), and contributing to two ongoing research labs with students. Her lab, tech.math.play, is working on a literature review of problem-solving in videogames; and her joint lab with Amber Simpson (University of Binghamton, SUNY), mmPlay, is examining representational fluency, gestures, and mathematical learning in robotics makerspaces. She regularly teaches classes on user-centered design, as well as a graduate course on Games as Emergent Experiences (which will be relevant and useful to anyone interested in learning in digital media).

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CENTER FOR MATHEMATICS EDUCATION (MathEd)

Collaborating with local school districts is essential to the mission and work of the Center for Mathematics Education. Our mission is grounded in work with local schools. We work alongside our school partners, learning from their expertise and experiencing their challenges. We have built a number of relationships through our multiple projects in surrounding districts

There are two primary ways we have engaged in meaningful work with surrounding districts. One way involves the work of practicing teachers. For instance, the Sphero project integrates computational thinking into the mathematics classroom, with the goal of exploring ways computational thinking and mathematical thinking can be mutually supportive. Part of this work involves designing lessons, with an eye toward grade-level mathematics objectives, that involve programming a Sphero robot (sphero.com). CfME faculty and students work alongside inservice teachers to design lessons for 4th and 5th grade students. This creates a nice learning experience for both teachers and CfME faculty and students. This is a professional development opportunity for teachers, while CfME faculty and students can see how teachers integrate certain tools into their classrooms. Another example is the collaboration at Paint Branch HS, between Kayla White, Willy Viviani, and Daniel Chazan, around creating formative assessments that help pre-Calculus and Calculus teachers identify the concept images and concept definitions students hold for key curricular concepts. This collaboration is supported by Kayla's position as a Terrapin Teachers Master Teacher and provided Dan and Willy as members of CfME an opportunity to engage with Kayla on instruction for her students.

A second way involves the work with prospective teachers. In Terrapin Teachers, for example, prospective teachers gain early fieldwork experience. This year involved virtual experiences to allow undergraduate students to better understand learning in schools. In the middle school program prospective teachers also have internships that are an immersion experience. In this newsletter, we highlight the work of Angela Stoltz, who is the Coordinator for the Professional Development Schools in the middle grades program. Another illustration of our partnerships is the field work experience at Buck Lodge Middle School in which math and science middle school prospective teachers get to work with students in an after-school program. Prospective teachers gain insight into students' interest and learning, while students get rich experiences focused on positive rich mathematics experiences. Collaborations between schools and universities are a fertile ground for creating the sorts of innovative and transformative work that is desperately needed in mathematics education.

As a Center we also have multiple celebrations. Congratulations to Dr. Janet Walkoe for having received tenure and promotion to the rank of associate professor, as well as the launch of her NSF CAREER grant on Teacher Noticing of Students' Multimodal Algebraic Thinking. Another new NSF grant is the Together Math grant to support a partnership with bilingual families. Monica Anthony successfully defended her dissertation and will be starting a tenure track position at Georgia Gwynette College. Congratulations Dr. Anthony! Tarik Buli was awarded the Wylie Dissertation Fellowship for 2021-22. Welcome our newest doctoral fellows Peter Moon, Matthew Wilson, and Michael Krell (2020), as well as Ayala Nuriely, Rachel Tabak, Veronica Carlan, and Milen Matthews (2021).

knowledge systems that support our connection to the land and our overall well-being and western scientific knowledge. Through this collaboration reACT, Team Maryland had the opportunity to develop and foster a relationship with local Native Americans, including the Nanticoke Indian Tribe.

She has published several journal articles with University of Maryland colleagues such as Jing Lin. Dr. Lin says, "Dr. Angela Stoltz is an amazing scholar and active agent of social change. She is incredibly knowledgeable about Indigenous Knowledge and provides great insights and brilliant scholarship into our collaborative publications on eco-justice, peace, and sustainability. Dr. Stoltz also plays a leading and instrumental role in promoting education for

ANGELA CHRISTINE STOLTZ is the newest Clinical Assistant Professor to the Center for Mathematics Education and she merges unique interests in mathematics education and environmental justice and sustainability in ways that forefront core values and world views of marginalized communities, in particular, Indigenous communities.

As the Professional Development Coordinator in the Middle School program Dr. Stoltz manages the placements of both undergraduate and graduate middle school teaching candidates, and supports them in completing assessments required by the College. Dr. Levin remarks that Dr. Stoltz is impeccably organized, conscientious, and communicates well with all stakeholders, including middle school faculty. Additionally, Dr. Stoltz is the secondary, P12 programs (Physical Education, Art, TESOL, etc.) and Middle School Mathematics Science PDS point person. She organizes mentor, intern, and supervisor orientations; serves as a liaison; and works to foster community and capacity building for the group..

Her passion for environmental justice and commitment to Native American local tribes is evident in her leadership in multiple initiatives. Dr. Stoltz is collaborating with tribal members who serve on the Maryland Commission on Indian Affairs at the Governor's Office to jointly increase recruitment, representation, and retention of Native American students at UMD across multiple units and colleges on campus. She was the Solar Decathlon Competition team's student leader for client relations in 2017, which designed a house using innovative techniques to create an energy-efficient, solar-powered SmartHouse such as rainwater capture, waste reuse and passive heat capture that preheats air and water and supports the solar appliances. These innovations connect indigenous Native Americans. She is leading the Maryland Indigenous Higher Education Alliance (MIHEA). She and the MIHEA were actively involved in the networking that led to the university's adoption of the name, Yahentimitsi, as well as the event itself.

Without a doubt, Dr. Stoltz is an incredible asset to the Center for Mathematics Education!

WHAT IS A TANGENT? The answer may depend on what math class you're in. Dr. Daniel Chazan and CfME doctoral candidate William Viviani are working with Terrapin Master Teacher Kayla White to understand how students' working definitions change from previous classes to calculus, and thus to better understand and work with student thinking on different concepts.

Tangents are normally introduced in geometry as "a line that touches a circle at exactly one point," Willy explains, "but for calculus, this kind of thinking translates to students arguing that a tangent to a function may not cross the function at any other point, may not be tangent at any other point, and/or may not cut through the function, like an inflection point. Students who make those arguments may be in the process of transitioning to a calculus definition, but still hold onto the geometric definition."

Identifying and responding to these inevitable sites of conflict is critical for teachers looking to help students adapt their definitions to new classes and new concepts in mathematics. In their work, Daniel, Willy, and Kayla use the Seeing The Entire Picture (STEP) platform designed by the University of Haifa's Center for Mathematics Education Research and Innovation, which provides students with immediate and helpful feedback on their work on tasks and allows teachers to organize and filter student responses. "Teachers can use STEP to gauge how a class may be thinking as a whole, and zoom in on specific student responses and track changes in their thinking over time," Kayla, who's been using the STEP platform in her BC Calculus class at Paint Branch High School for the past 4 years, explains. "Using student responses from STEP, teachers are then able to make decisions on how to advance student thinking and facilitate classroom discussion by highlighting specific student responses that represent both common and unique student thinking and using those responses to facilitate student discourse."

In the virtual context of this past school year, STEP has been particularly important in building class relationships. "The STEP platform has helped me feel a connectedness to students and their learning," says Kayla. "By engaging in these tasks throughout the year, students are able to engage in content rich tasks that push their thinking and reasoning past just procedural understanding."

Over the past four years, the research team has continually rebuilt their tasks in STEP, hoping to make tasks that "best provide students with the learning opportunity they're hoping for while giving teachers enough information to make some claims about what students are thinking, and then make tasks that will advance that thinking further," says Kayla. "These kinds of nuanced problems provide instructors ways to engage students in rich discussions that would otherwise be pretty superficial," Willy adds. This tool and the developed tasks

WITH THE GROWING PRESENCE OF TECHNOLOGY IN OUR WORLD, children's preparation in computing and computational thinking is essential. These skills might not just be useful for computer science learning, but also in other subjects like mathematics. However, many learners—particularly students in under-resourced schools—have relatively little opportunity to engage in meaningful computational learning early in their academic careers.

The Sphero.Math