

Temple University

Cognition & Learning Lab

# Newsletter

## Fall 2019



We hope everyone has had a wonderful Summer! With the new school year already underway, we wanted to send the teachers, administrators, and staff we work with, a big THANK YOU for all you do! We are extremely grateful to you, and to the students and parents who participate in our studies — without you, we could not answer these fascinating research questions. The Temple Cognition & Learning Lab hopes you find the information in this newsletter both interesting and useful!

This past year has been a busy and exciting one. We have been conducting research studies on how children develop mathematical skills, including research on number word learning, understanding of decimals, and more. In this issue of our newsletter, we've included information on who we are, some of the research we've done in the past year, and events we've participated in this past Summer.

If you have any questions, want to get involved, or just want to reach out, please see our contact information at the end of this newsletter. We wish you the best this school year and hope to see you soon!

**Liz Gunderson, Ph.D.**

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**Associate Professor of Psychology,  
Temple University**

## Teacher Work Circle

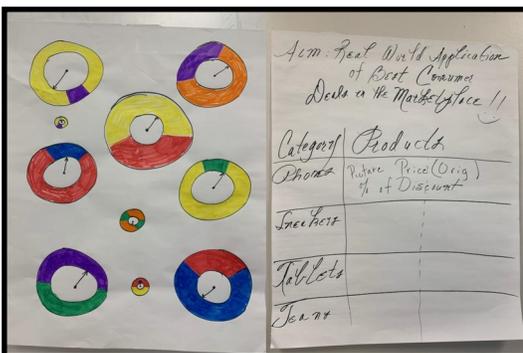
On August 9, 2019, the Temple University Cognition & Learning Lab met with Philadelphia elementary and middle school teachers for our second annual Teacher Work Circle. Short presentations on cutting edge research were interleaved with round table discussions, all focused on challenges that students commonly face in the math classroom and innovative ways to address them.



The day centered on proportion, fraction, and decimal learning, reviewing common errors that students make when working with these concepts. Specifically, these include overemphasis on the parts of a fraction, decimal, or proportion (rather than on the part-whole relationship), not understanding that fractions and decimals are numbers, and taking incorrect shortcuts when comparing items. To facilitate understanding of these topics, Dr. Liz Gunderson and Dr. Jing Tian presented current research findings from the Temple University Cognition & Learning Lab, along with other, similar labs. Findings presented centered on providing multiple and varying examples of items, using the number line to illustrate fraction or decimal magnitudes, and preventing students from using incorrect “counting” strategies.

Each section of the Work Circle closed with a group conversation, where teachers shared strategies they have implemented to improve their students’ understanding and engagement. For younger grades, using continuous items (something not countable) and emphasizing estimation helped students to use less automatic “counting strategies” and to focus on the part-whole relationship. As students age, teachers mentioned that using real life examples of fractions and decimals (e.g., discounts, money, and food amounts) increased student interest and allowed integration of students’ prior knowledge in these areas to the new concepts they were learning.

At the end of day teachers and lab members worked together to integrate past classroom experiences and the current research into concrete, grade appropriate lesson plans. Early grades (K-4) combined craft projects with proportion learning. These included a Kindergarten project centered on teaching students about halves and fourths through folding and cutting sentence strips. For students in 3rd-4th grades, we worked on a spinner design project aimed at teaching the important aspects of a proportion. 5th-8th grade teachers designed plans emphasizing the use of fractions, decimals, and percentages in everyday life, implementing projects where students had to transition between these different notations in activities including comparing discounts across items and using statistics to design a fantasy hockey team.



Please join us for our next Teacher Work Circle in 2020! We hope it will be a great opportunity for teachers, administrators, and researchers to meet, collaborate, and discuss math education. If you have any questions, suggestions, or would like to be notified when next year’s event is planned, please contact Vicki Bartek at [victoria.bartek@temple.edu](mailto:victoria.bartek@temple.edu).



## Research Profiles

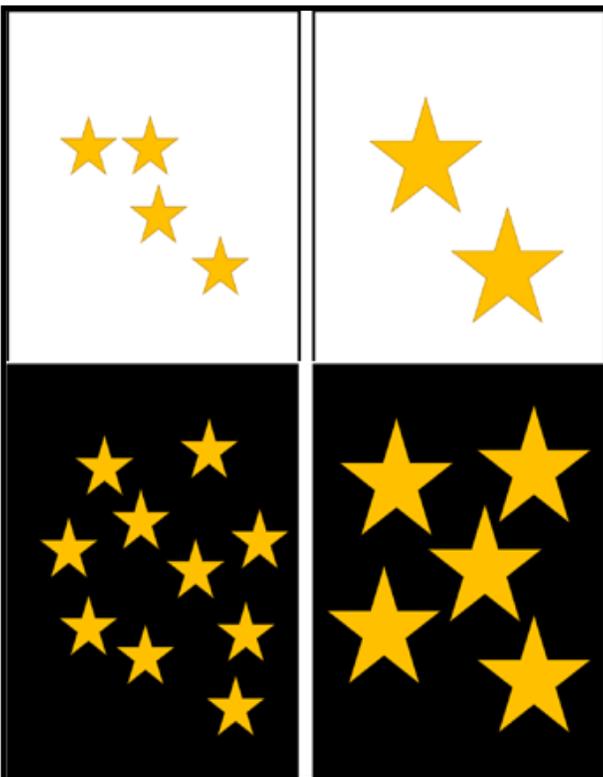
### Flexible Attention to Magnitude and Its Relation to Math Achievement

Yiqiao Wang

How do young children learn about number and size? In preschool, children often have difficulty focusing on number when it conflicts with size. For example, they might not understand that 3 elephants are fewer in number than 9 mice since the elephants are larger in size.

We propose that a unique challenge young children face in early math is to disentangle numerical magnitudes (e.g., number of items) from spatial magnitudes (e.g., size or surface area) and to know which types of magnitude are relevant in a given situation. We call this ability *flexible attention to magnitudes* or *FAM*. In our study, we examined how children develop this ability and how it relates to children's math achievement.

At the beginning and end of the school year, we assessed preschool-aged children on measures designed to tap their FAM ability, mathematical skills, executive functioning skills, and language skills. In the FAM ability task, children were shown two boxes that contained stars. One box always contained bigger but fewer stars and the other box always contained smaller but more stars. A researcher first asked children to choose which of two boxes contained bigger stars. Then, after choosing the box with bigger stars six times, we asked children to switch rules and choose which of two boxes contained more stars. Finally, the researcher asked children to switch back and forth between choosing which box contained bigger stars and which box contained more stars (we called these "mixed trials").



We first verified that distinguishing numerical magnitude from spatial magnitude and flexibly shifting between the two is a unique challenge in early childhood. We found children's performance on mixed trials - when they had to flexibly shift between choosing bigger stars or more stars - was significantly worse than when they only had to choose the bigger stars or when they only had to choose more stars. Most importantly, we found that FAM ability was a significant predictor of children's math achievement, above and beyond age, family income, language, and executive functioning skills.

We think that distinguishing numerical magnitudes from spatial magnitudes and using each appropriately to solve problems is an important skill in preschool. Our further work will investigate how we can improve FAM ability through exposure to specific numerical experiences.

## Meet the Lab



### Dr. Elizabeth Gunderson

Elizabeth Gunderson, Ph.D., is an Associate Professor in the Department of Psychology at Temple University and director of the Temple University Cognition & Learning Lab. She received her Ph.D. in Developmental Psychology from the University of Chicago in 2012 and her B.A. in Computer Science & Psychology from Yale University in 2005. Dr. Gunderson's research focuses on the cognitive and socio-emotional factors that affect young children's academic achievement, especially in the domain of



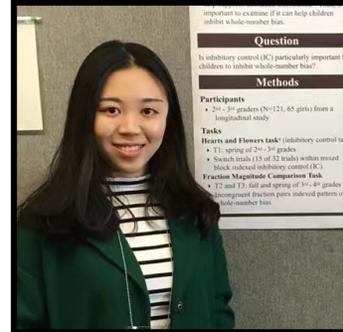
### Dr. Jing Tian

Jing is a post-doctoral researcher in the Department of Psychology at Temple University. Jing completed her Ph.D. in Psychology at Carnegie Mellon University in 2018 and received her B.S. in Chemistry and Psychology from Peking University in 2013. Jing is interested in children's learning, especially in the area of mathematics. Her research focuses on understanding difficulties children experience during learning and aims to provide insights for more effective instruction.

## Meet the Lab

### Cathy (Kexin) Ren

Cathy is a doctoral student in Psychology at Temple University, concentrating in Developmental Psychology. She received her B.S. in psychology at Sun Yat-sen University in China. She is interested in children's numerical learning, especially difficulties they have in learning rational numbers. By doing research in this field, she hopes to find a way to help both children and teachers to better learn and teach mathematics.



### Grace Bennett-Pierre

Grace is pursuing her doctoral degree in Developmental Psychology at Temple University, after completing her B.A. in Psychology at Wellesley College in 2016. She has previously studied the development of young children's understanding of difficulty and its use in decision-making as a lab manager for Dr. Hyowon Gweon. In the Temple Cognition & Learning Lab, she is excited to explore how children form domain-specific concepts of difficulty and how these conceptions influence their achievement motivation.



### Nadia Tavassolie

Nadia is a doctoral student in Developmental Psychology at Temple University. She received her B.A. at George Washington University double majoring in Anthropology and Human Services & Social Justice. She is interested in how children develop math knowledge, with a focus on social factors that influence academic motivation and achievement in math. She hopes to apply this research towards identifying the most important skills for later math achievement, and to develop tools that can be used at home or in school to cultivate those skills.



## Meet the Lab

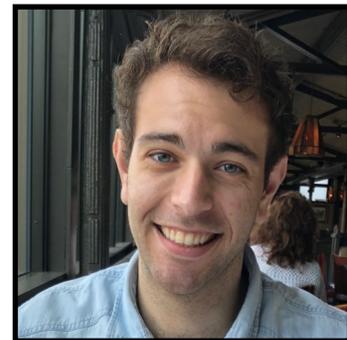


### Vicki Bartek

Vicki is a full-time lab manager in the Temple University Cognition & Learning Lab. She received her B.A. in Psychology 2015 from The College of New Jersey and her M.S. in Experimental Psychology in 2017 from Seton Hall University. In her previous work she studied errors in memory recall with Dr. Marianne Lloyd, and the event related potentials correlated with recall and familiarity with Dr. Andrew Leynes. She hopes to examine the role of early spatial skills and parent and child interactions on mathematical performance.

### Jorge Carvalho Pereira

Jorge is a full-time lab manager in the Temple University Cognition & Learning Lab. He received his B.A. in Psychology in 2015 from the University of Delaware and then attended the M.A. in Psychology program at Rutgers University–Camden. His research focuses on the coalescence of nature and influence of early experiences in children's long-term development. In particular, Jorge's focus is centered on understanding the contributions of early parent-child interactions for children's later development along cognitive domains such as mathematical reasoning.



### Yiqiao Wang

Yiqiao is a full-time lab manager in the Temple Cognition & Learning Lab. She received her B.S. in Developmental Psychology from the University of California, San Diego in 2018. In her previous work, she studied the early development of children's numerical understanding and its relation to natural language with Dr. David Barner. Her current research interests include young children's numerical learning and factors that contribute to individual differences in the math skills of young children.

## Meet the Lab



Madyson Kolbes  
Undergraduate Intern  
B.A. expected Fall 2019  
Major: Psychology



Su (Ngoc) Dam  
Undergraduate Intern  
B.A. expected Spring 2020  
Majors: Psychology &  
Political Science



Dianna Wambach  
Undergraduate Intern  
B.A. expected Spring 2020  
Major: Psychology  
Minors: Cognitive Neuroscience &  
Education



Nadhia Engle  
Undergraduate Intern  
B.A. expected Spring 2020  
Major: Psychology



Maya Rahman  
Undergraduate Intern  
B.S. expected Fall 2020  
Major: Biology  
Minor: Health Psychology



Paula Ueki  
Undergraduate Intern  
B.A. expected Spring 2021  
Major: Psychology  
Minor: Cognitive Neuroscience



Khushi Sibal  
Undergraduate Intern  
B.A. expected Spring 2022  
Major: Psychology



Congratulations Class of 2019! This summer we said goodbye to another group of graduating undergraduate research assistants. We wish them all the best and will miss them here in the TUCL Lab!

Summer 2019 TUCL Lab (from left to right): Dianna Wambach, Vicki Bartek (Lab Manager), Dr. Elizabeth Gunderson, Su (Ngoc) Dam, Cathy (Kexin) Ren (Graduate Student), Yiqiao Wang (Lab Manager), Madyson Kolbes, Jane Benum-Paolantonio, & Jorge Carvalho Pereira (Lab Manager).

## Contact Information

If you would like more information about our research, or are interested in participating, please contact us via e-mail or phone.

Email: [tucl@temple.edu](mailto:tucl@temple.edu)

Phone: +1 (215) 204 - 9175

Check us out on the web!

<https://sites.temple.edu/cognitionlearning/>



This research is funded by:

NSF CAREER DRL-1452000

NSF ECR-1760144

James S. McDonnell Foundation Award #220020546

