Temple University

Cognition & Learning Lab

Newsletter

Fall 2020

This year of 2020 has come with many challenges and changes. In response to the ongoing pandemic, our lab has shifted all of our studies from being fully in-person to fully online. We miss seeing children in person and working with our school partners! At the same time, we are excited that we can now work with children and families across the whole country (and even outside the U.S.!).

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 how our lab now conducts online research with children. We have been conducting research studies on preschoolers' understanding of sizes and numbers, 4th-8th-graders' understanding of fractions and decimals, and more. We are extremely grateful to the students, parents, and schools who participate in our studies — without you, we could not answer these exciting research questions.

The Temple Cognition & Learning Lab hopes you find the information in this newsletter both interesting and useful! 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 year and hope to see you soon!

Liz Gunderson, Ph.D.

Associate Professor of Psychology,
Temple University

Research Profiles

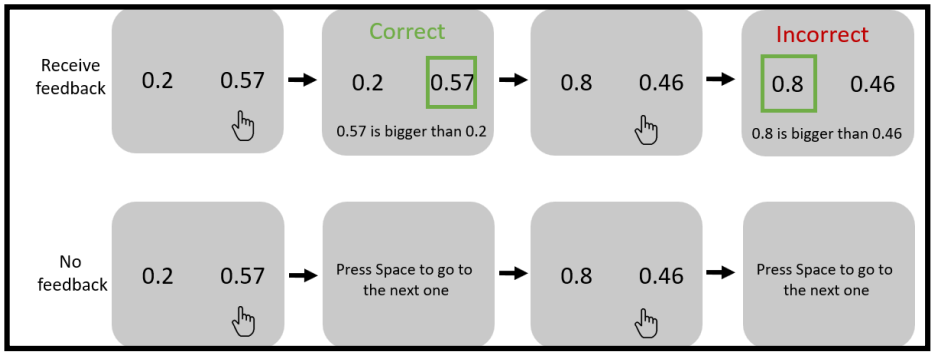
How Students Change Their Strategies After Receiving Feedback in Comparing Decimals

Cathy Ren

If you ask kids how they compare 0.26 and 0.8, they might give you very different answers. Some might say that 0.26 is the bigger number because they think in terms of whole numbers - that 26 is bigger than 8. Some might say that 0.8 is the bigger number, but the reason they give is that 1/8 is bigger than 1/26 in fractions. Others might choose 0.8 because they compare the digits after the decimal point in order (as they should!). As we can see, kids have different strategies in comparing two decimals. As educators, we want them to use correct strategies for decimals instead of incorrectly applying strategies they developed from learning other number concepts such as whole numbers and fractions. In this study, we aimed to examine the effect of feedback provided immediately after students made a decision in comparing decimals. We asked 6th- to 8th-graders to choose a bigger decimal in a series of decimal pairs. On each problem, students had to compare a two-digit decimal to a one-digit decimal. Half the time, the one-digit decimal was the right answer, and half the time, the two-digit decimal was the right answer. One group of students received feedback indicating whether they were correct after each decision, whereas another group of students did not receive feedback (see the picture below). After completing these decimal comparisons, both groups compared a series of decimal pairs (including one-digit, two-digit, and three-digit decimals such as 0.26 vs. 0.8, 0.7 vs. 0.634, and 0.978 vs. 0.46) without getting feedback; these follow-ups were completed later in the same day, and again after a two-week period.

We first analyzed students' strategy use during the decimal comparisons with feedback and found they predominantly started by choosing the decimal that had more digits as the bigger one. This reflects the use of the strategy they learned for comparing whole numbers. However, students who received feedback after each decision quickly adapted to choosing the correct decimals (which had bigger tenths digits), whereas students who did not receive feedback failed to make the switch from the incorrect to the correct decimal strategy. We then analyzed students' performance on the decimal comparisons without feedback and found that students who received feedback before were more likely to use a correct decimal strategy on all types of decimal comparisons (including three-digit decimals, which they had not received feedback on). They performed better on decimal comparison problems both immediately and two weeks later, compared to students who did not receive feedback.

Our study provides clear practical implications for educators and has the benefit of being easy to deploy in the classroom settings. For example, teachers can assign decimal comparison practice items that are inconsistent with students' prior whole-number (e.g., 0.34 vs. 0.7) and fraction knowledge (e.g., 0.4 vs. 0.96), in order to address students' strategy misapplications while providing feedback.



Research Profiles

Teaching Improper Fractions with the Number Line and the Area Model

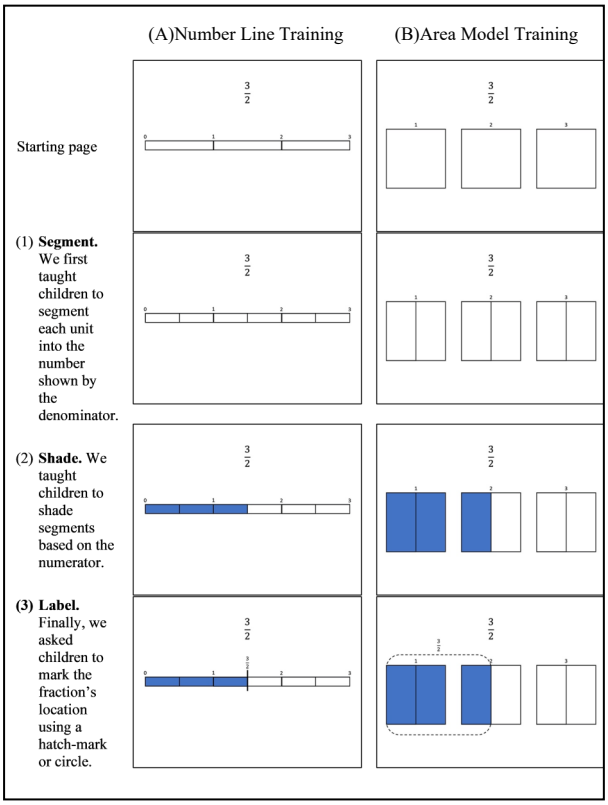
Jing Tian, Ph.D.

Prior research from our lab shows that the number line helps 2nd and 3rd graders learn proper fractions more effectively than the area model. Is the number line a more effective tool than the area model to teach improper fractions as well?

In this study, we assigned 4th and 5th graders to three groups. All three groups completed the same pretest, immediate posttest, and delayed posttest two weeks after the training session. On the pretest and posttests, children estimated fractions on number lines and on area models; compared pairs of fractions; and judged whether fractions are greater than, equal to, or less than one. All tasks involved both proper and improper fractions. Between the pretest and the immediate posttest, the three groups completed different activities in a one-on-one session with a researcher:

- Number Line Training Group: Children learned to represent proper and improper fractions on 0-3 number lines by segmenting, shading, and labeling the number line. Each child first watched the researcher demonstrating the procedure. Children then practiced representing a few fractions and received feedback from the researcher. The training lasted about 15 minutes. (See Figure, column A)
- Area Model Training Group: Children learned to represent proper and improper fractions on area models, following the same procedure as those in the Number Line Training.
- Control Group: Children worked on crossword puzzles for about 15 minutes. Performance of this group on the pretest and posttests serves as a baseline of children who did not receive any training of fractions. (See Figure, column B)

On the posttest immediately after the training, children in the area model training group performed better than the other two groups at estimating fractions on the area model, suggesting that they learned what we taught them. This learning was sustained for at least two weeks, as shown by the area model training group's performance on the delayed posttest. However, children in the number line training group performed similarly to the other two groups at estimating fractions on the number line at posttests. Unlike our prior studies, in this study, our brief training session was not successful in helping children to show fractions more accurately on the number line.

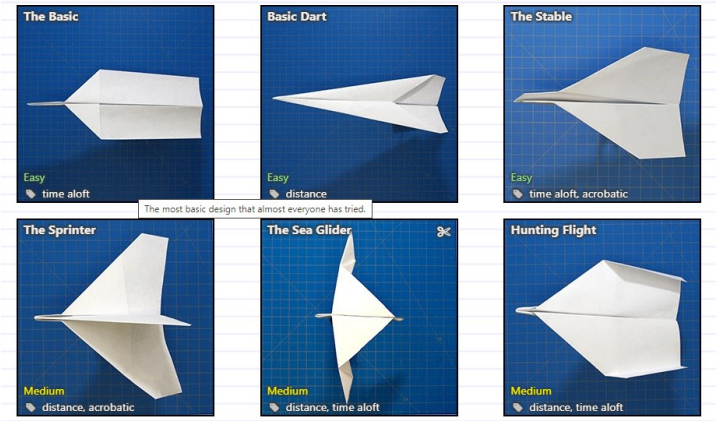


We then examined whether the area model training also led to better fraction knowledge on tasks other than what they learned in the training. Unfortunately, it did not: children in the area model training condition did not perform better than the other two groups on other tasks at posttests (comparing fractions to each other, and comparing fractions to 1). These findings suggest that teaching children to represent proper and improper fractions on the area model is easier than teaching them to do so on the number line. However, knowing how to represent fractions on the area model may not lead to better fraction knowledge in general.

At-Home Activities!

At the Temple University Cognition Lab, we run lots of exciting studies with children and adults every day! A big THANK YOU to all of you who contribute by answering some of our most complex questions on mathematical development. In response to COVID-19, we have transitioned to remote studies exclusively. We value your continued effort to help us with our research projects, and we hope to have the opportunity to work with you during this exceptional time.

Since we know many of you are also at home more than usual, we gathered activities parents and kids can do from home that support spatial, math, and verbal skills! Below are a few of our favorite spatial activities, **to see more check out our spreadsheet of activities here**



Make Paper Airplanes!

One way to practice using your spatial skills is to follow directions and build models! You can try making a few different types of these paper airplanes. Which ones fly the straightest? Which ones fly the farthest?

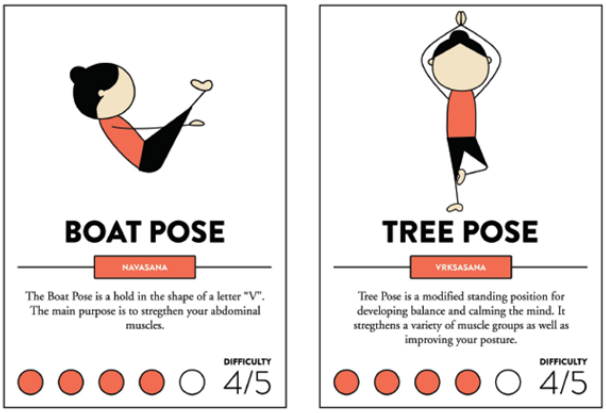
Makes some planes!

Textile Crafts

Textile crafts may be a hands-on way to practice spatial skills. If you don't have crochet or knitting needles, finger knitting is an easy way to get introduced to working with yarn.

Tutorial on Finger knitting

Learn to Crochet



Yoga

One way you can practice spatial skills is through taking the spatial perspective of someone else. This deck of cards gives students the opportunity to do so, by replicating many different yoga moves. Pay attention to which leg, arm, or side of the body is engaged on the card.

Yoga Exercise Cards

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 mathematics.

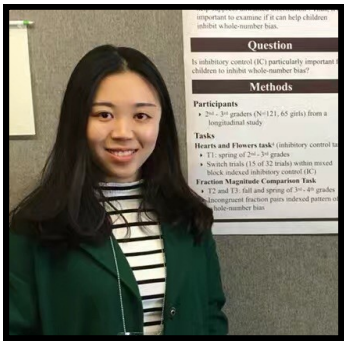
Dr. Jing Tian

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.

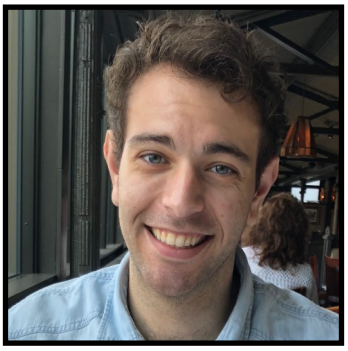
Meet the Lab

Vicki Bartek

Vicki is a part-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.



Melissa Mildort

Melissa received her B.A. in Psychology from Florida Atlantic University in 2019. As a Lab Manager for Dr. Gizelle Anzures, she studied developmental factors that influence face perception, specifically P100 and N170 responses to own- and other-race faces in children and adults. More recently, Melissa spent a year in France teaching English to middle school students. She is interested in the effects of early parent-child interactions on children's language and spatial skill development.

Meet the Lab

Khushi Sibal

Undergraduate Intern

B.A. expected Spring 2022

Major: Psychology

Minor: Cognitive Neuroscience

Paula Ueki

Undergraduate Intern

B.A. expected Spring 2021

Major: Psychology

Minor: Cognitive Neuroscience

Rawan Altamimi

Undergraduate Intern

B.A. expected Fall 2021

Major: Psychology

Kimberly Bohl

Undergraduate Intern

B.A. expected Spring 2021

Major: Psychology

Lexi Sylverne

Undergraduate Intern

B.A. expected Spring 2021

Major: Psychology

Minor: Gender, Sexuality, & Women's Studies

Congratulations Class of 2020! 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!

Fall 2020 TUCL Lab (*from top left to bottom right*): Vicki Bartek (Lab Manager), Dr. Elizabeth Gunderson, Jorge Carvalho Pereira (Lab Manager), Nadia Tavassolie (Graduate Student, Grace Bennett-Pierre (Graduate Student), Kimberly Bohl, Melissa Mildort (Lab Manager), Dr. Jing Tian, Dr. Marsha Weinraub, & Cathy (Kexin) Ren (Graduate Student)

Contact Information

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

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Check us out on the web!
https://sites.temple.edu/cognitionlearning/

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