

# ELENA MARIE SILLA

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## EDUCATION

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**Ph.D. in Education** Expected Spring 2026  
Specialization: Learning Sciences  
University of Delaware  
Advisor: Dr. Christina Barbieri

**M.Ed. in Elementary Education (K-6)** May 2019  
University of Notre Dame  
Alliance for Catholic Education  
*Elementary Teaching Certification in the State of Indiana*

**B.A. in Psychology, magna cum laude** May 2017  
Minors: Education, Schooling, and Society; Business Economics  
University of Notre Dame  
Thesis: *Does Arithmetic Instruction in Classrooms Promote an Understanding of Math Equivalence?*  
Advisor: Dr. Nicole McNeil

## RESEARCH INTERESTS

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Mathematical cognition, learning, and instruction; development of mathematical problem-solving strategies and flexibility; students' mathematical motivation, identity, and sense of belonging; developing partnerships between researchers and practitioners

## AWARDS AND HONORS

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### UNIVERSITY OF DELAWARE

**Graduate Paper Award, First Place** [\$600] April 2023  

- Awarded for my submission of "Examining Variation in Procedural Flexibility Using Latent Profile Analysis" at the Steele Symposium held by the College of Education and Human Development at the University of Delaware

**Graduate Student Travel Award** [\$1,500] Spring 2022  

- Funded travel to the Mathematical Cognition and Learning Society Conference in Spring 2022

**Unidel Distinguished Graduate Scholar Award** [\$170,000] Spring 2021-present  

- Competitive graduate fellowship awarded to 12 students annually, based on academic achievement; covers tuition and stipend for 5 years

**Fontana Family Graduate Tuition Scholarship** [\$33,000] Spring 2021-present  

- Graduate scholarship awarded to students whose research aims to improve educational practices in the United States; provides summer funding

## UNIVERSITY OF NOTRE DAME

*President's Circle Summer Funding* [\$2,000]

Spring 2015

- Funded summer research opportunity at the Social Cognitive Development Lab

*Dean's List*

Spring 2014-Spring 2017

## GRANTS

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*Improving Literacy and Social Skills through Drama-Based Education* [\$700], awarded Spring 2019 through the Alliance for Catholic Education Football Playoff Foundation Grant for Educators

*Incorporating Culturally Diverse Literature in the Classroom* [\$1,200], awarded Spring 2018 through the Alliance for Catholic Education Football Playoff Foundation Grant for Educators

*How is Math Equivalence Taught in Classrooms?* [\$230], awarded Fall 2017 through the Undergraduate Research Opportunity Program Grant at the University of Notre Dame

*How does Approximate Number Training Work?* [\$1,704], awarded Spring 2014 through the Undergraduate Research Opportunity Program Grant at the University of Notre Dame

## PUBLICATIONS

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Silla, E. M., Barbieri, C. A., & Newton, K. J. (in press). Procedural flexibility in fraction arithmetic and word problems predicts middle-schoolers' differential algebra skills. *Journal of Educational Psychology*.

Barbieri, C. A., & Silla, E. M. (2023). Evoking learning by examples through reducing misconceptions and highlighting procedures. *The Journal of Experimental Education*. DOI: [10.1080/00220973.2023.2227969](https://doi.org/10.1080/00220973.2023.2227969)

## MANUSCRIPTS UNDER REVIEW

Barbieri, C. A., Clerjoste, S. N., Silla, E. M., & Chawla, K. (under review). Leveraging common mathematical errors to improve mathematical understanding of students with math difficulties.

## MANUSCRIPTS IN PREPARATION

Silla, E. M., Newton, K. J., & Barbieri, C. A. (in preparation). Examining profiles of flexibility and their relationship to algebraic readiness [working title].

Jansen, A., Silla, E. M., & Collier, C. (in preparation). Developing Rough Draft Math through teacher voice [working title].

Silla, E. M., Viegut, A. A., Redican, E., Jordan, N. C., Newcombe, N. S., Resnick, I., & Barbieri, C. A. (in preparation). Profiles of early symbolic and non-symbolic fraction knowledge [working title].

## PEER-REVIEWED CONFERENCE PROCEEDINGS

- Silla, E. M.** (2022). How do multi-digit multiplication problems promote procedural flexibility? An analysis of two fourth grade textbooks. In A. E. Lischka, E. B. Dyer, R. S. Jones, J. Lovett., J. Strayer, & S. Drown (Eds.), *Proceedings of the forty-fourth annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. Nashville, TN: Middle Tennessee State University.
- Vest, N. A., **Silla, E. M.**, Bartel, A. N., Nagashima, T., Alevén, V., & Alibali, M. W. (2022). Self-explanation of worked examples integrated in an Intelligent Tutoring System enhances problem solving and efficiency in algebra. In J. Culbertson, A. Perfors, H. Rabagliati, & V. Ramenzoni (Eds.), *Proceedings of the 44<sup>th</sup> Annual Meeting of the Cognitive Science Society*. Toronto, Canada: Cognitive Science Society.
- Nagashima, T., Ling, E., Zheng, B., Bartel, A., **Silla, E. M.**, Vest, N., Anthony, L., Alibali, M. W., & Alevén, V. (2022). How does sustaining and interleaving visual scaffolding help learners? A classroom study with an Intelligent Tutoring System. In J. Culbertson, A. Perfors, H. Rabagliati, & V. Ramenzoni (Eds.), *Proceedings of the 44<sup>th</sup> Annual Meeting of the Cognitive Science Society*. Toronto, Canada: Cognitive Science Society.
- Bartel, A. N., **Silla, E. M.**, Vest, N. A., Nagashima, T., Alevén, V., & Alibali, M. W. (2021). Reasoning about equations with tape diagrams: Insights from students and math teachers. In E. de Vries, J. Ahn, & Y. Hod (Eds.), *15th International Conference of the Learning Sciences–ICLS 2021* (pp. 685-688). International Society of the Learning Sciences, 2021 [virtual due to COVID-19].
- Nagashima, T., Bartel, A. N., Yadav, G., Tseng, S., Vest, N. A., **Silla, E. M.**, Alibali, M. W., & Alevén, V. (2021). Using anticipatory diagrammatic self-explanation to support learning and performance in early algebra. In E. de Vries, J. Ahn, & Y. Hod (Eds.), *15th International Conference of the Learning Sciences–ICLS 2021* (pp. 474-481). International Society of the Learning Sciences, 2021 [virtual due to COVID-19].
- Nagashima, T., Bartel, A. N., Tseng, S., Vest, N. A., **Silla, E. M.**, Alibali, M. W., & Alevén, V. (2021) Scaffolded self-explanation with visual representations promotes efficient learning in early algebra. In T. Fitch, C. Lamm, H. Leder, & K. Teßmar-Raible (Eds.), *43rd Annual Meeting of the Cognitive Science Society* (pp. 1858-1864). Cognitive Science Society [virtual due to COVID-19].
- Silla, E. M.**, Hornburg, C. B., & McNeil, N. M. (2020). Research-based teaching practices for improving students' understanding of mathematical equivalence have not made it into elementary classrooms. In S. Denison, M. Mack, Y. Xu, & B. C. Armstrong (Eds.), *Proceedings of the 42nd Annual Conference of the Cognitive Science Society* (pp. 2937-2943). Austin, TX: Cognitive Science Society [virtual due to COVID-19].

Nagashima, T., Bartel, A. N., **Silla, E. M.**, Vest, N. A., Alibali, M. W., & Alevan, V. A. (2020). Experimental survey for diagrammatic self-explanations. In M. Gresalfi & I. S. Horn (Eds.), *Proceedings of International Conference of the Learning Sciences, International Society of the Learning Sciences* (pp. 35-43). Nashville, TN: International Society of the Learning Sciences [virtual due to COVID 19].

Nagashima, T., Yang, K., Bartel, A. N., **Silla, E. M.**, Vest, N., Alibali, M. W., & Alevan, V. (2020). Pedagogical Affordance Analysis: Leveraging Teachers' Pedagogical Knowledge for Eliciting Pedagogical Affordances and Constraints of Instructional Tools. In M. Gresalfi & I. S. Horn (Eds.), *Proceedings of International Conference of the Learning Sciences, International Society of the Learning Sciences* (pp. 1561-1564). Nashville, TN: International Society of the Learning Sciences.

## **CONFERENCE POSTERS AND PRESENTATIONS**

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\* Denotes undergraduate mentee

### **NATIONAL AND INTERNATIONAL CONFERENCES**

**Silla, E. M.**, Newton, K. J., & Barbieri, C. A. (accepted). *Using latent profile analysis to examine variability in procedural flexibility* [Research Report]. Accepted for presentation at the Annual Meeting of the National Council for Teachers of Mathematics (NCTM) Research Conference, Washington, D.C.

**Silla, E. M.**, Morra, G., & Barbieri, C. A. (accepted). Learning from errors through one-on-one training for students at risk for mathematics learning disabilities. In H. Smith (Chair), *Incorporating Qualitative Data in Education Research: Across Contexts* [Symposium]. Accepted for presentation at the Northeastern Education Research Association Conference, Trumbull, CT.

**Silla, E. M.**, Clerjoste, S. N., & Barbieri, C. A. (2023, June). *Cognitive science principles to support the teaching and learning of mathematics* [Poster]. Presented at the Policy and Practice Institute 2023 Annual Meeting, Dover, DE.

**Silla, E. M.**, Barbieri, C. A., & Newton, K. (2023, April). *The relationship between procedural flexibility with fraction arithmetic and word problems and algebra skills* [Round Table]. Presented at the American Educational Research Association (AERA) 2023 Annual Meeting, Chicago, IL.

Barbieri, C. A., & **Silla, E. M.** (2023, April). *Evoking learning by examples through reducing misconceptions and highlighting procedures* [Paper Session]. Accepted for presentation at the American Educational Research Association (AERA) 2023 Annual Meeting, Chicago, IL.

**Silla, E. M.**, Barbieri, C. A., & Newton, K. (2022, June). *Arithmetic and word problem-based procedural flexibility measures as predictors of middle-schoolers' differential algebra*

*skills* [Poster]. The 4<sup>th</sup> Annual Mathematics Cognition and Learning Society (MCLS) Conference, Antwerp, Belgium.

**Silla, E. M.**, Vest, N. A., Bartel, A. N., Nagashima, T., Alevén, M., & Alibali, M. W. (2022, June). *Middle-school students' preferences for visual features of tape diagrams and their relation to symbolizing equations* [Poster]. The 4<sup>th</sup> Annual Mathematics Cognition and Learning Society (MCLS) Conference, Antwerp, Belgium.

Bartel, A. N., **Silla, E. M.**, Vest, N. A., Nagashima, T., Alevén, V., & Alibali, M. W. (2022, June). *Do tape diagrams in explanations of worked examples foster conceptual understanding? Evidence from early algebra* [Poster]. The 4<sup>th</sup> Annual Mathematics Cognition and Learning Society (MCLS) Conference, Antwerp, Belgium.

**Silla, E. M.**, & Barbieri, C. A. (2022, April). *Underlying mechanisms of benefits of varying worked example types on algebra learning* [Poster]. The 2022 Cognitive Development Society (CDS) Biennial Meeting, Madison, WI, USA.

**Silla, E. M.**, Vest, N. A., Nagashima, T., Bartel, A. N., Anthony, L. E., Alevén, V., & Alibali, M. W. (2022, February). *Efficacy of tape diagrams: Evidence from an Intelligent Tutoring System* [Presentation]. The 3<sup>th</sup> Annual Mathematics Cognition and Learning Society (MCLS) Conference [virtual due to COVID-19].

Vest, N. A., **Silla, E. M.**, Bartel, A. N., Nagashima, T., Alevén, V. A., & Alibali, M. W. (2021, April). *Evidence from worked examples: Conceptually rich explanations predict conceptual gains on posttest* [Poster]. The 2021 Virtual Biennial Meeting of the Society for Research in Child Development [virtual due to COVID-19].

Bartel, A. N., **Silla, E. M.**, Vest, N. A., Nagashima, T., Tang, Y.\*, Alevén, V. A., & Alibali, M. W. (2020, September). *Do tape diagrams promote a focus on conceptual principles? Evidence from equation solving with an Intelligent Tutoring System* [Presentation]. The 2<sup>nd</sup> Annual Meeting of the Mathematical Cognition and Learning Society Conference [virtual due to COVID-19].

Bartel, A. N., **Silla, E. M.**, Vest, N. A., Nagashima, T., Vincent, V. A., & Alibali, M. W. (2020, August). *Reasoning about equations with tape diagrams: Do differing visual features matter?* [Poster]. The 42<sup>nd</sup> Annual Virtual Meeting of the Cognitive Science Society [virtual due to COVID-19].

Palaguachi, C. \*, Bartel, A., **Silla, E.**, & Alibali, M. (2020, November). *Incorporating interventions in intelligent tutoring systems to enhance conceptual knowledge of mathematics* [Poster]. The Annual Biomedical Research Conference for Minority Students 2020 [virtual due to COVID-19].

**Silla, E.** (2019, March). *Helping students find their voices: The power of Socratic seminars* [Oral presentation]. The Indiana Council for Teachers of English, Indianapolis, Indiana, United States.

Ahl, R., **Silla, E.**, & Dunham, Y. (2015, October) *Givers and keepers: Children expect greater giving from resource-rich than resource-poor individuals* [Poster]. The Biennial Meeting of the Cognitive Development Society, Columbus, OH.

O'Rear, C., McNeil, N.M., Fuhs, M., & **Silla, E.** (2015, October) *Approximate number system (ANS) acuity training in preschoolers from low-income homes* [Poster]. The Biennial Meeting of the Cognitive Development Society, Columbus, OH.

### **DEPARTMENTAL AND UNIVERSITY-WIDE CONFERENCES**

**Silla, E. M.**, Newton, K. J., & Barbieri, C. A. (2023, April 28). *Examining variation in procedural flexibility using latent profile analysis* [Paper Session]. Delaware Day, Newark, DE, USA.

**Silla, E. M.**, Barbieri, C. A., & Newton, K. J. (2023, March 3). *Procedural flexibility on fraction computation problems predicts algebra readiness skills* [Poster]. Delaware Day, Newark, DE, USA.

**Silla, E. M.**, Collier, Z., & Barbieri, C. A. (2022, April 29). *The relationship between peer relations, math identity, and math achievement in elementary-aged students* [Poster]. Steele Research Symposium at the University of Delaware, Newark, DE, USA.

**Silla, E. M.**, Tommasi, T.\*, Vest, N. A., Bartel, A. N, Buehler, Z., Manhart, H., Petersdorff, M.\*, Nagashima, T., Aleven, V., & Alibali, M. W. (2021, April). *Fostering conceptual understanding of equation solving via an intelligent tutoring system* [Poster]. The Wisconsin Center for Education Research Poster Fair [virtual due to COVID-19]

**Silla, E.**, Bova, M., Martin, J., & Welsh, M. [co-authors] (2018, July). *Hands-on learning: Giving ELLs the tools for success* [Oral presentation]. The ACE Teaching Fellows Conference, Notre Dame, Indiana, United States.

**Silla, E. M.**, O'Rear, C., McNeil, N.M., & Fuhs, M. (2015, May). *Unraveling the relationship between the approximate number system and math achievement* [Poster]. The University of Notre Dame Undergraduate Scholars Conference, Notre Dame, IN.

### **INVITED TALKS**

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**Silla, E. M.** (2022, December 7). How do multi-digit multiplication problems promote procedural flexibility? An analysis of two fourth grade textbooks. Colloquium Presentation for the School of Education, University of Delaware.

**Silla, E. M.** (2022, July 15). The relationship between procedural flexibility and algebra skills. SOURCE Presentation, University of Delaware.

**Silla, E. M. & Barbieri, C. A.** (2022, March 6). Underlying mechanisms of benefits of varying worked example types on algebra learning. Delaware Day, University of Delaware.

## **PRACTIONER-FOCUSED PUBLICATIONS**

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**Silla, E. M.** (2019). One step at a time: A traditional school's journey into personalized learning [Whitepaper].

## **RESEARCH EXPERIENCE**

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**Graduate Research Assistant**, University of Delaware August 2021-present  
Mathematical Cognition and Instruction Lab, Dr. Christina Barbieri

- Lead materials and protocol design for within-subjects classroom study to investigate benefits of learning from errors in the context of worked examples
- Develop coding scheme for students' strategies when solving problems to inform Qualifying Study
- Current projects include examining the differential predictive effects of using word problems versus arithmetic problems as a measure of students' flexibility; modeling students' strategic profiles when problem solving; and modeling the relationship between students' math identities, belonging, and math achievement

**Graduate Research Assistant**, University of Delaware June 2022-May 2023  
Rough Draft Math Project, Dr. Amanda Jansen

- Analyzed coding data for emergent profiles to describe teachers' enactments of and motivations for using rough draft math in their classrooms
- Applied inductive coding scheme to 32 transcripts to detect patterns in teachers' enactments of and motivations for rough draft math
- Continuing to work on this project as a collaborator and co-author on upcoming publications

**Project Manager**, University of Wisconsin-Madison July 2019-August 2021  
Cognitive Development & Communication Lab, Dr. Martha Alibali

- Managed an NSF-funded project that investigated whether activating conceptual knowledge via an Intelligent Tutoring System improves algebra performance
- Coordinated collaboration across universities, wrote IRB protocol, designed stimuli and materials, mentored and trained undergraduates, recruited and worked with participants, and assisted with writing and data analysis

**Undergraduate Research Assistant**, University of Notre Dame January 2014-May 2017  
Cognition, Learning, and Development Lab, Dr. Nicole McNeil

- Conducted a senior thesis to investigate the presence of research-based practices in the classroom during arithmetic instruction

- Designed a study, recruited schools, collected observational data, analyzed data, and disseminated results to participating schools

***Undergraduate Summer Research***, Yale University Summer 2014  
Social Cognitive Development Lab, Dr. Yarrow Dunham

- Investigated how children perceived wealth and resource distribution in other children
- Developed stimuli, collected and analyzed data from over 300 children and adults, designed a comprehensive coding system, and presented results at a lab meeting

## **TEACHING EXPERIENCE**

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***EDU 60455, Developmental and Moral Education in Childhood and Adolescence***, University of Notre Dame Summer 2023  
Instructor of Record

- Led a seminar-style class for 25 in-service teachers to develop their understanding of developmental and moral psychology and their importance with regards to classroom practices
- As a summative assessment, had teachers conduct research on a developmental psychology topic of their choice and create a 20 minute presentation geared towards practitioners as well as write an APA-style research paper on their topic
- Developed syllabus, instructional activities, and rubrics for the class

***EDUC 205, Human Development***, University of Delaware Spring 2023  
Graduate Teaching Apprentice

- Assisted with lesson and materials development, grading, instruction, and facilitating discussion with 30 undergraduate preservice teachers
- Led instruction on lessons related to Language Development and Motivation in Education

***EDUC 856, Introduction to Statistics***, University of Delaware Spring 2022  
Course Co-Designer

- Assisted with development of supplemental materials for class activities (R scripts, instructional PowerPoints)

***Fourth Grade***, St. Cornelius Catholic School Fall 2017-Spring 2019  
Lead teacher in a self-contained classroom

- Implemented classroom activities and interventions based on cognitive science research to instruct fourth graders in multiple subject areas
- Designed curricular materials in line with Common Core State Standards

***Academic Tutor for Student Athletes***, University of Notre Dame Spring 2014-Spring 2015  
Tutored student athletes in Chemistry, Spanish, and Economics

## **ADDITIONAL TRAINING AND PROFESSIONAL DEVELOPMENT**

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**NUMBERS Conference**, Kent State University

May 2022

- NSF-funded conference for selected mentors and mentees studying mathematical learning
- Two days of professional development and collaboration with other researchers studying mathematics cognition and learning

**METHODOLOGICAL TRAINING**

*Regression and Structural Equation Modeling*, Instructor: Dr. Zachary Collier

*Advanced Structural Equation Modeling*, Instructor: Dr. Zachary Collier

*Mixed Methods in Social Science Research*, Instructor: Dr. Elizabeth Farley-Ripple

**TRAINING IN DATA WRANGLING AND VISUALIZATION**

*Data Visualizations Using R*, Instructor: Dr. Kieran Healy

**STATISTICS AND RESEARCH SOFTWARE**

R and R Studio; Mplus; Dedoose; FileMaker; Temi; Qualtrics

**MENTORSHIP**

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*SOURCE Mentor*

Summer 2022, 2023

- Mentored undergraduate students on their independent study projects through supporting her knowledge of statistical software (R), data analysis, interpretation, writing, presentation, and professional development

**SERVICE TO THE PROFESSION**

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*University Service*

*Education Graduate Association*, University of Delaware

- President and Communications Co-Chair
- Secretary and Communications Committee

Winter 2023-present

Winter 2022-Winter 2023

*Learning Sciences Liaison for Delaware Day (Ph.D. Recruitment)*

March 2022, 2023

*Service to the Field/Professional Development*

*Ad Hoc Reviewer for Conference Submissions*

- Psychology for Mathematics Education – North America
- Mathematical Cognition and Learning Society
- International Society of the Learning Sciences

**PROFESSIONAL AFFILIATIONS**

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American Educational Research Association

Cognitive Development Society

Mathematical Cognition and Learning Society  
Cognitive Science Society

## **REFERENCES**

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### **Dr. Christina Barbieri**

Current Academic Advisor/Mentor

Assistant Professor, Education, Statistics, and Research Methods and Learning Sciences

University of Delaware

16 W. Main Street

Newark, DE 19716

[barbieri@udel.edu](mailto:barbieri@udel.edu)

### **Dr. Martha Alibali**

Current Collaborator, director of the Cognitive Development and Communication Lab

Vilas Distinguished Achievement Professor, Psychology and Educational Psychology

University of Wisconsin-Madison

1202 W. Johnson Street

Madison, WI 53796

[mwalibali@wisc.edu](mailto:mwalibali@wisc.edu)

### **Dr. Nicole McNeil**

Current Collaborator, Undergraduate Mentor

Professor of Psychology, Alliance for Catholic Education College Professor

University of Notre Dame

Corbett Family Hall

Notre Dame, IN 46556

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