Caroline Byrd Hornburg, Ph.D.

Department of Human Development and Family Science
Virginia Polytechnic Institute and State University
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EDUCATION

2017 Ph.D. in Psychology; Minor in Quantitative Psychology
University of Notre Dame
Dissertation: *Optimizing Problem Format to Facilitate Children's Understanding of Math Equivalence*

2014 M.A. in Psychology
University of Notre Dame
Thesis: *Gesturing May Not Always Make Learning Last*

2011 B.S. in Psychology, *summa cum laude*; Minor in Mathematical Decision Sciences
University of North Carolina at Chapel Hill
Honors Thesis: *The Socialization of Children's Memory: The Impact of Maternal Reminiscing Style*

PROFESSIONAL POSITIONS

08/2019 – present Assistant Professor, Department of Human Development and Family Science
Virginia Tech

04/2023 – present Affiliate Faculty, School of Education, Virginia Tech

12/2022 – present Affiliate Faculty, Department of Psychology, Virginia Tech

11/2020 – present Affiliate Faculty, Adaptive Brain and Behavior Destination Area, Virginia Tech

06/2020 – 08/2023 Director, Childhood Pre-Education Major
Department of Human Development and Family Science, Virginia Tech

07/2017 – 07/2019 Postdoctoral Research Associate, Cognition and Learning Lab
Department of Psychological Sciences, Purdue University

EXTRAMURAL GRANTS FUNDED

2023-2026 Co-Principal Investigator (PI: Erin Ottmar)
Examining the Effects of Perceptual Cues on Middle School Students' Online Mathematical Reasoning and Learning
National Science Foundation
[$667,617; Total budget directly responsible for: $157,962]

2022-2024 Co-Investigator (PI: Sunwook Kim)
Development of Machine Learning Methods to Support Collaboration in a Neurodiverse Team at Work
National Institutes of Health
[$141,992; Total budget directly responsible for: $579]

2020-2023 Principal Investigator
My Math Stories: Taking My Place in Our Mathematical World
EF+Math Program, NewSchools Venture Fund & Advanced Education Research and Development Fund (AERDF)
[$2,018,750; Total budget directly responsible for: $278,375]

2020 Co-Principal Investigator (PI: David Purpura)
Refining Understanding of the Home Math Environment in the Early Years: An Interdisciplinary Working Conference
National Science Foundation
[$99,284]

INTRAMURAL GRANTS FUNDED

2023-2024 Co-Principal Investigator (PI: Koeun Choi)
Storybook Reading with an AI Voice Assistant to Promote Preschoolers' Mathematics Learning
Virginia Tech Institute for Creativity, Arts, and Technology Jones/Center for Educational Networks and Impacts SEAD Grant
[$3,000]

2019-2021 Principal Investigator
Examining the Effectiveness of Interventions for Specific Mathematics Skills in Early Childhood
Virginia Tech, College of Liberal Arts and Human Sciences Niles Research Grant
[$5,000]

EXTRAMURAL PROPOSALS PENDING REVIEW

2023-2025 Principal Investigator

Our Mathematical World: Development and Evaluation of Activities to Build Children's Math Identity, Executive Function, and Problem-Solving Skills
EF+Math Program, Advanced Education Research and Development Fund (AERDF)
[$1,301,196; Total budget directly responsible for: $825,076]

2024-2027 Consultant (PI: Sara Schmitt)
Co-Designing Accessible Research Driven Games Advancing Mathematics and Executive Function Skills
Spencer Foundation
[$485,735; Total budget directly responsible for: $1,000]

PUBLICATIONS

[U]Undergraduate Student Author; [G]Graduate Student Author; [P]Postdoctoral Scholar Author

Refereed Journal Articles

Purpura, D. J., [P]O'Rear, C. D., Ellis, A., Logan, J. A. R., [G]Westerberg, L. E., [G]Ehrman, P. C., [P]King, Y. A., [G]Vander Tuin, M., [G]Nordgren, I., Anderson, K., Cosso, J., [P]Zippert, E., Napoli, A. R., **Hornburg, C. B.**, Schmitt, S. A., & Dobbs-Oates, J. (in press). Unique and combined effects of mathematical language and numeracy instruction within a picture book intervention. *Journal of Educational Psychology.*

[P]Devlin, B. L., **Hornburg, C. B.**, & McNeil, N. M. (2023). Kindergarten predictors of formal understanding of mathematical equivalence in second grade. *Developmental Psychology*. Advance online publication. https://doi.org/10.1037/dev0001559

Davenport, J. L., Kao, Y. S., Johannes, K. N., **Hornburg, C. B.**, & McNeil, N. M. (2022). Improving children's understanding of mathematical equivalence: An efficacy study. *Journal of Research on Educational Effectiveness.* Advance online publication. https://doi.org/10.1080/19345747.2022.2144787

[P]Lee, J.-E., **Hornburg, C. B.**, [P]Chan, J. Y.-C., & Ottmar, E. (2022). Perceptual and number effects on students' initial solution strategies in an interactive online mathematics game. *Journal of Numerical Cognition*, *8*(1), 166-182. https://doi.org/10.5964/jnc.8323

Hornburg, C. B., [G]Devlin, B. L., & McNeil, N. M. (2022). Earlier understanding of mathematical equivalence in elementary school predicts greater algebra readiness in middle school. *Journal of Educational Psychology*, *114*(3), 540-559. https://doi.org/10.1037/edu0000683

Hornburg, C. B., [P]Borriello, G. A., Kung, M., Lin, J., Litkowski, E., [G]Cosso, J., [P]Ellis, A., [G]King, Y. A., [P]Zippert, E., Cabrera, N. J., Davis-Kean, P., Eason, S. H., Hart, S. A., Iruka, I. U., LeFevre, J.-A., Simms, V., Susperreguy, M. I., Cahoon, A., Chan, W. W. L., Cheung, S. K., Coppola, M., De Smedt, B., Elliott, L., Estévez-Pérez, N., Gallagher-Mitchell, T., Gardner-Neblett, N., Gilmore, C., Leyva, D., Maloney, E. A., Manolitsis,

G., Melzi, G., Mutaf-Yıldız, B., Nelson, G., Niklas, F., Pan, Y., Ramani, G. B., Skwarchuk, S.-L., Sonnenschein S., & Purpura, D. J. (2021). Next directions in measurement of the home mathematics environment: An international and interdisciplinary perspective. *Journal of Numerical Cognition*, *7*(2), 195-220. https://doi.org/10.5964/jnc.6143

Purpura, D. J., Schmitt, S. A., Napoli, A. R., Dobbs-Oates, J., [G]King, Y. A., **Hornburg, C. B.**, [G]Westerberg, L., [P]Borriello, G. A., [G]Bryant, L. M., Anaya, L. Y., Kung, M., Litkowski, E., Lin, J., & [G]Rolan, E. (2021). Engaging caregivers and children in picture books: A family-implemented mathematical language intervention. *Journal of Educational Psychology*, *113*(7), 1338-1353. https://doi.org/10.1037/edu0000662

Hornburg, C. B., Brletic-Shipley, H., Matthews, J. M., & McNeil, N. M. (2021). Improving understanding of mathematical equivalence. *Mathematics Teacher: Learning and Teaching PreK-12*, *114*(1), 16-26. https://doi.org/10.5951/MTLT.2020.0109

Purpura, D. J., [G]King, Y. A., [G]Rolan, E., **Hornburg, C. B.**, Schmitt, S. A., Hart, S. A., & Ganley, C. M. (2020). Examining the factor structure of the home mathematics environment to delineate its role in predicting preschool numeracy, mathematical language, and spatial skills. *Frontiers in Psychology*, *11*, 1925. https://doi.org/10.3389/fpsyg.2020.01925

[U]Gaylord, S. M., [G]O'Rear, C. D., **Hornburg, C. B.**, & McNeil, N. M. (2020). Preferences for tactile and narrative counting books across parents with different education levels. *Early Childhood Research Quarterly*, *50*(3), 29-39. https://doi.org/10.1016/j.ecresq.2018.07.010

McNeil, N. M., **Hornburg, C. B.**, Brletic-Shipley, H., & Matthews, J. M. (2019). Improving children's understanding of mathematical equivalence via an intervention that goes beyond nontraditional arithmetic practice. *Journal of Educational Psychology*, *111*(6), 1023-1044. https://doi.org/10.1037/edu0000337

McNeil, N. M., **Hornburg, C. B.**, Devlin, B. L., Carrazza, C., & McKeever, M. O. (2019). Consequences of individual differences in children's formal understanding of mathematical equivalence. *Child Development*, *90*(3), 940-956. https://doi.org/10.1111/cdev.12948

Hornburg, C. B., Schmitt, S. A., & Purpura, D. J. (2018). Relations between preschoolers' mathematical language understanding and specific numeracy skills. *Journal of Experimental Child Psychology*, *176*, 84-100. https://doi.org/10.1016/j.jecp.2018.07.005

Hornburg, C. B., Wang, L., & McNeil, N. M. (2018). Comparing meta-analysis and individual person data analysis using raw data on children's understanding of equivalence. *Child Development*, *89*(6), 1983-1995. https://doi.org/10.1111/cdev.13058

Hornburg, C. B., [U]Rieber, M. L., & McNeil, N. M. (2017). An integrative data analysis of gender differences in children's understanding of mathematical equivalence. *Journal of Experimental Child Psychology*, *163*, 140-150. https://doi.org/10.1016/j.jecp.2017.06.002

Fuhs, M. W., **Hornburg, C. B.**, & McNeil, N. M. (2016). Specific early number skills mediate the association between executive functioning skills and mathematics achievement. *Developmental Psychology*, *52*(8), 1217-1235. https://doi.org/10.1037/dev0000145

Byrd, C. E., McNeil, N. M., Chesney, D. L., & Matthews, P. G. (2015). A specific misconception of the equal sign acts as a barrier to children's learning of early algebra. *Learning and Individual Differences*, *38*, 61-67. https://doi.org/10.1016/j.lindif.2015.01.001

Chesney, D. L., McNeil, N. M., Matthews, P. G., **Byrd, C. E.**, Petersen, L. A., [U]Wheeler, M. C., Fyfe, E. M., & Dunwiddie, A. E. (2014). Organization matters: Mental organization of addition knowledge relates to understanding math equivalence in symbolic form. *Cognitive Development*, *30*, 30-46. https://doi.org/10.1016/j.cogdev.2014.01.001

Book Chapters & Refereed Publications in Proceedings

Hornburg, C. B., [G]Kim, J., [U]D'Ercole, K. E., & [U]Berry, C. A. (2023). Considering new measures of children's and parents' math attitudes and their associations with math performance. *Proceedings of the 45th Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, Reno, NV.

[U]Silla, E. M., **Hornburg, C. B.**, Kloser, M., & 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). Cognitive Science Society. https://cognitivesciencesociety.org/cogsci20/papers/0732/0732.pdf

Johannes, K., Davenport, J., Kao, Y., **Hornburg, C. B.**, & McNeil, N. M. (2017). Promoting children's relational understanding of equivalence. In G. Gunzelmann, A. Howes, T. Tenbrink, & E. Davelaar (Eds.), *Proceedings of the 39th Annual Conference of the Cognitive Science Society* (pp. 600-605). Cognitive Science Society. https://mindmodeling.org/cogsci2017/papers/0121/paper0121.pdf

McNeil, N. M., **Hornburg, C. B.**, Fuhs, M. W., & O'Rear, C. D. (2017). Understanding children's difficulties with mathematical equivalence. In D. C. Geary, D. B. Berch, R. Ochsendorf, & K. Mann Koepke (Eds.), *Mathematical cognition and learning: Vol. 3. Acquisition of complex arithmetic skills and higher-order mathematics concepts* (pp. 167-195). Elsevier Academic Press. https://doi.org/10.1016/B978-0-12-805086-6.00008-4

Byrd, C. E., McNeil, N. M., D'Mello, S. K, & Cook, S. W. (2014). Gesturing may not always make learning last. In P. Bello, M. Guarini, M. McShane, & B. Scassellati (Eds.) *Proceedings of the 36th Annual Conference of the Cognitive Science Society* (pp. 1982-1987). Cognitive Science Society. https://mindmodeling.org/cogsci2014/papers/347/paper347.pdf

Published Data

[P]Ellis, A., [G]King, Y. A., [G]Westerberg, L., [P]O'Rear, C. D., **Hornburg, C. B.**, [P]McElveen, T. L., [P]Zippert, E. L., [G]Cosso, J., [P]Grimm, S. B., [G]Ehrman, P. C., & Purpura, D. J. (2022). *Early Home Learning Environment*. LDbase. https://doi.org/10.33009/ldbase.1644347317.4c34

Manuscripts Under Review/Revision

Hornburg, C. B., [P]King, Y. A., [G]Westerberg, L. E., Schmitt, S. A., & Purpura, D. J. (revise and resubmit). The roles of mathematical language and emergent literacy skills in the longitudinal prediction of specific early numeracy skills.

Manuscripts in Preparation

Hornburg, C. B., & McNeil, N. M. (in preparation). The role of problem format in children's learning of mathematical equivalence.

Hornburg, C. B., Napoli, A. R., Litkowski, E., Lin, J., [G]Begley, C. V., [U]Berry, C. A., [G]Valdivia, I., [G]Kim, J., Arnott, D., Gardner, A., Bradburn, I., & Purpura, D. J. (in preparation). Incorporating quantitative mathematical language into preschool classrooms.

[G]Kim, J., **Hornburg, C. B.**, [G]Grose, G. E., Levinson, T., & Fazio, L. K. (in preparation). Understanding how children's representations of mathematicians relate to gender and math anxiety across grades.

RESEARCH GRANTS, FELLOWSHIPS, & AWARDS

2022-2023	Excellence in Research and Creative Scholarship Award, College of Liberal Arts and Human Sciences, Virginia Tech ($500)
2013-2016	National Science Foundation Graduate Research Fellowship, *Are the Beneficial Effects of Gesture on Learning Due to Eye Movements?* ($98,000 over 3 years)
2016	Society for Research in Child Development Dissertation Funding Award ($2,000)
2016	Finalist, Three Minute Thesis (3MT®) Competition, University of Notre Dame ($100)
2014	Psi Chi Graduate Student Research Grant ($1,500)
2013	Institute for Scholarship in the Liberal Arts (ISLA) Graduate Student Research Award ($1,526)

PROFESSIONAL DEVELOPMENT GRANTS, AWARDS, & HONORS

2022-2023	Pathways Assessment Mini-Grant, Undergraduate Academic Affairs ($400)
2022	International Performance and Presentation Grant, College of Liberal Arts and Human Sciences ($1,500)
2020	New Faculty Mentoring Grant ($1,500)
2019	Adaptive Brain and Behavior Professional Development Award ($1,200)
2019-2021	AERA-SRCD Early Career Fellowship in Middle Childhood Education and Development
2018	Purdue Postdoctoral Supplemental Travel Grant ($400)
2018	Purdue Postdoc Association Travel Grant Award ($700)
2017	Purdue Postdoc Association Travel Grant Award ($900)
2017	Graduate School Professional Development Award, Notebaert Fund ($857)
2017	Notre Dame Graduate Student Union Conference Presentation Grant ($300)
2015	Notre Dame Graduate Student Union Conference Presentation Grant ($200)
2015	Graduate School Professional Development Award, Notebaert Fund ($643)
2013	Institute for Scholarship in the Liberal Arts (ISLA) Professional Development Award ($330)
2013	Graduate School Professional Development Award, Notebaert Fund ($620)
2013	Notre Dame Graduate Student Union Conference Presentation Grant ($300)

INVITED TALKS

Hornburg, C. B. (2017, October). Optimizing problem format to facilitate children's understanding of math equivalence. Presented at the Purdue University Cognitive Psychology Colloquium, West Lafayette, IN.

Hornburg, C. B. (2017, February). Optimizing problem format to facilitate children's understanding of math equivalence. Presented at the Association for Women in Science – University of Notre Dame Chapter STEM Luncheon, Notre Dame, IN.

Byrd, C. E. (2014, November). Gesturing may not always make learning last. Presented at the University of Chicago Goldin-Meadow Laboratory, Chicago, IL.

EVIDENCE OF IMPACT, MEDIA MENTIONS, & EXTENSION PUBLICATIONS

Advanced Education Research and Development Fund (2023, March). *Strengthening Executive Function Skills to Improve Mathematics Learning: Evidence of Promise from EF+Math's Inclusive R&D Approach*. Insights Report. https://aerdf.dspacedirect.org/items/0af77bf3-2a6f-415a-a1f7-c5c2c053ba21

Features process and preliminary results from the Our Mathematical World project (*My Math Stories: Taking My Place in Our Mathematical World*; PI: Hornburg, funded by AERDF)

Michael Pershan, Mathematics Educator Blog (2021, July). *The Change-Resistance Explanation for Why Kids Struggle So Much with Algebra.* http://notepad.michaelpershan.com/the-change-resistance-explanation-for-why-kids-struggle-so-much-with-algebra/
Features Hornburg et al. (2022)

National Council of Teachers of Mathematics Annual Conference (2021, February). Preconference workshop on "*Catalyzing Change in Early Childhood and Elementary Mathematics: Initiating Critical Conversations*" included evidence from Hornburg, Brletic-Shipley et al. (2021) and the accompanying videos for teachers.

Marshall Memo Weekly Blog (2021, January). *A Weekly Round-Up of Important Ideas and Research in K-12 Education: Understanding Mathematical Equivalence in the Elementary Grades.*
Features Hornburg, Brletic-Shipley et al. (2021)

Institute for Educational Initiatives, University of Notre Dame (2020, December). *Improving Children's Understanding of Equivalence (ICUE).* Series of videos co-created by the Institute for Educational Initiatives, McNeil, Hornburg, & O'Rear. Publicly available videos and intervention materials posted at https://icue.nd.edu/
Features McNeil, Hornburg et al. (2019); Hornburg, Brletic-Shipley et al. (2021); Davenport et al. (2022)

Maths Through Stories Blog (2020, November). *Parent Preferences for Counting Books with Tactile and Narrative Features.* https://www.mathsthroughstories.org/blog
Features Gaylord et al. (2020); written by Gaylord, O'Rear, Hornburg, & McNeil

Blog on Learning and Development (2019, January). *Understanding of the Equal Sign in Grade 2 Predicts Later Algebra Skills.* https://bold.expert/understanding-of-the-equal-sign-in-grade-2-predicts-later-algebra-skills/
Features Byrd et al. (2015)

CONFERENCE PRESENTATIONS

[U]Undergraduate Student Author; [G]Graduate Student Author; [P]Postdoctoral Scholar Author

Hornburg, C. B., Mayes, A. S., [P]McElveen, T. L., Powell, S. R., Melzi, G., Prishker, N., [U]Asad, N., [G]Valdivia, I., Andres-Salgarino, M. B., Tran, L. M., Eiland, M. D., Eason, S. H., Schmitt, S. A., & Purpura, D. J. (2023, November). *The development of storybooks supporting elementary students' math identity, executive function, and word problem solving.* Poster to be presented at the 45th Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education, Reno, NV.

Mayes, A. S., **Hornburg, C. B.**, [P]McElveen, T. L., Schmitt, S. A., Andres-Salgarino, M. B., Powell, S. R., & Purpura, D. J. (2023, June). Our mathematical world. In G. Ramani (Chair), *Equity-focused programs to measure and promote math learning and executive functioning*. Paper presented at the 6th Annual Meeting of the Mathematical Cognition and Learning Society (MCLS), Loughborough, United Kingdom.

[P]McElveen, T. L., Powell, S. R., **Hornburg, C. B.**, Mayes, A. S., [G]Kim, J., [U]Quinn, K. A., Eiland, M. D., Schmitt, S. A., Andres-Salgarino, M. B., & Purpura, D. J. (2023, June). Using PULSE to improve problem solving with the four operations. In H. Douglas (Chair), *Foundational number skills and early assessment*. Paper presented at the 6th Annual Meeting of the Mathematical Cognition and Learning Society (MCLS), Loughborough, United Kingdom.

Purpura, D. J., [P]O'Rear, C. D., Ellis, A., Logan, J. A. R., [G]Westerberg, L., [P]King, Y., [G]Vander Tuin, M., [G]Ehrman, P., [G]Nordgren, I., Anderson, K., Cosso, J., [P]Zippert, E., Napoli, A., **Hornburg, C. B.**, Schmitt, S. A., & Dobbs-Oates, J. (2023, June). Unique and combined effects of quantitative language and numeracy instruction: Findings and reflections on a Registered Report. In D. Purpura (Chair), *Look what you made me do: Registered reports on early mathematics interventions.* Paper presented at the 6th Annual Meeting of the Mathematical Cognition and Learning Society (MCLS), Loughborough, United Kingdom.

[U]Asad, N., [G]Valdivia, I., & **Hornburg, C. B.** (2023, April). *Examining the impact of a storybook series designed to strengthen math identity in Black and Latine students and students experiencing poverty.* Poster presented at the 2023 Dennis Dean Undergraduate Research and Creative Scholarship Conference, Blacksburg, VA.

Hornburg, C. B., Mayes, A. S., Letts, D., Kunze, S., & Diaz, A. (2023, April). The Our Mathematical World inclusive R&D approach: Math storytelling and storybuilding. In A. Francisco & K. Lange (Chairs), *Centering student and educator voice and expertise in inclusive, equity-centered research and development*. Paper presented at the Annual Meeting of the American Educational Research Association (AERA), Chicago, IL.

[P]McElveen, T. L., **Hornburg, C. B.**, Wilkey, E. D., [P]Ribner, A. D., Schmitt, S. A., Duncan, R. J., Miller-Cotto, D., Mayes, A. S., Andres-Salgarino, M. B., Powell, S. R., & Purpura, D. J. (2023, March). Examining classroom-based executive functioning tasks and relations to elementary students' mathematical word problem solving. In J. Finch (Chair), *Unraveling how executive functions support mathematical skills in elementary school: Consideration of measurement and mechanisms.* Paper presented at the Biennial Meeting of the Society for Research in Child Development (SRCD), Salt Lake City, UT.

[P]McElveen, T. L., **Hornburg, C. B.**, Mayes, A. S., Miller-Cotto, D., Andres-Salgarino, M. B., Schmitt, S. A., Powell, S. R., & Purpura, D. J. (2023, March). Associations between communal socialization and the math identity and performance of minoritized elementary students. In T. McElveen (Chair), *The measurement of sociocultural equity in preschool through elementary environments.* Paper presented at the Biennial Meeting of the Society for Research in Child Development (SRCD), Salt Lake City, UT.

[G]Kim, J., **Hornburg, C. B.**, [P]McElveen, T. L., [G]Grose, G. E., [U]Berry, C. A., [U]Elardo, G. C., [G]Begley, C. V., Mayes, A. S., Miller-Cotto, D., Andres-Salgarino, M. B., Powell, S. R., Schmitt, S. A., & Purpura, D. J. (2023, March). *Examining gender differences in*

children's math identity and representations of mathematicians across elementary grades. Poster presented at the Biennial Meeting of the Society for Research in Child Development (SRCD), Salt Lake City, UT.

Purpura, D. J., [P]O'Rear, C. D., [P]Ellis, A., Logan, J. A. R., [G]Westerberg, L., [P]King, Y., [G]Vander Tuin, M., [G]Ehrman, P., [G]Nordgren, I., Anderson, K., Cosso, J., [P]Zippert, E., Napoli, A., **Hornburg, C. B.**, Schmitt, S. A., & Dobbs-Oates, J. (2023, March). Quantitative language and numeracy instruction: Contrasting picture book interventions in preschool. In V. Bermudez (Chair), *Experimental mathematics interventions in classrooms and schoolyards to promote early numeracy and rational number learning.* Paper presented at the Biennial Meeting of the Society for Research in Child Development (SRCD), Salt Lake City, UT.

Hornburg, C. B., [G]Kim, J., [G]Begley, C. V., [G]McGregor, C. M., & Carrazza, C. (2022, June). Relations among caregivers' math engagement anxiety, math attitudes, math skills, and home mathematics activities with preschoolers. In L. Westerberg (Chair), *Homing in on measurement: Novel approaches to scoring, measuring, and conceptualizing the HME.* Paper presented at the 5th Annual Meeting of the Mathematical Cognition and Learning Society (MCLS), Antwerp, Belgium.

Hornburg, C. B., [P]McElveen, T. L., [P]Miller-Cotto, D., Wilkey, E. D., [P]Ribner, A. D., Prishker, N., Choe, K. W., Mayes, A. S., Andres-Salgarino, M. B., Powell, S. R., Schmitt, S. A., & Purpura, D. J. (2022, June). *Relations among sense of belonging to math, math identity, and math achievement in the late elementary grades.* Poster presented at the 5th Annual Meeting of the Mathematical Cognition and Learning Society (MCLS), Antwerp, Belgium.

[P]McElveen, T. L., **Hornburg, C. B.**, Mayes, A. S., [P]Miller-Cotto, D., Andres-Salgarino, M. B., Schmitt, S. A., Powell, S. R., & Purpura, D. J. (2022, June). *Examining the factor structure of communal socialization in mathematics and associations with elementary students' math identities.* Poster presented at the 5th Annual Meeting of the Mathematical Cognition and Learning Society (MCLS), Antwerp, Belgium.

[G]Conlon, R. A., [G]Krentz, V. L., Dasher, J. M., Merritt, K. E., Ganley, C. M., **Hornburg, C. B.**, Meyer, A., & Hart, S. A. (2022, June). Measuring math avoidance in children to better understand its relation with math anxiety and achievement. In M. C. Passolunghi (Chair), *Towards math equity for all students: The link between math anxiety, math achievement, math avoidance and career interests*. Paper presented at the 5th Annual Meeting of the Mathematical Cognition and Learning Society (MCLS), Antwerp, Belgium.

Purpura, D. J., [P]O'Rear, C. D., [P]Ellis, A., Logan, J. A. R., [G]Westerberg, L., [G]King, Y., Vander Tuin, M., [G]Ehrman, P., [G]Cosso, J., [P]Zippert, E., **Hornburg, C. B.**, Schmitt, S. A., & Dobbs-Oates, J. (2022, June). Unique and combined effects of quantitative mathematical language and numeracy instruction within a picture book intervention. In D. J. Purpura (Chair), *Registered reports on early mathematics interventions: Process, challenges, and*

key considerations. Paper presented at the 5th Annual Meeting of the Mathematical Cognition and Learning Society (MCLS), Antwerp, Belgium.

[U]D'Ercole, K. E., [U]Berry, C. A., [G]Kim, J., & **Hornburg, C. B.** (2022, April). *Relations between parents' and children's math anxiety along with children's math avoidance and math performance in elementary school.* Poster presented at the 2022 Dennis Dean Undergraduate Research and Creative Scholarship Conference, Blacksburg, VA.

[G]Grose, G. E., **Hornburg, C. B.**, & Fazio, L. K. (2022, April). *Draw a mathematician: understanding children's gender representation of mathematicians and its relation to math anxiety*. Poster presented at the Cognitive Development Society (CDS) XII Biennial Meeting, Madison, WI.

Hornburg, C. B. (2021, October). Relations among parents' and children's math anxiety, attitudes, and performance in elementary school. In M. DePascale (Chair), *Math anxiety: Examining child outcomes and contextual factors in early and middle childhood*. Paper presented at the 4th Annual Meeting of the Mathematical Cognition and Learning Society (MCLS). Meeting was conducted in a virtual format across 2021-2022 due to COVID-19.

Hornburg, C. B., & Maloney, E. A. (2021, October). *The home math environment during COVID-19*. Lightning talk presented at the 4th Annual Meeting of the Mathematical Cognition and Learning Society (MCLS). Meeting was conducted in a virtual format across 2021-2022 due to COVID-19.

Purpura, D. J., Schmitt, S. A., Napoli, A. R., Dobbs-Oates, J., [G]King, Y. A., Anaya, L. Y., Kung, M., **Hornburg, C. B.**, [G]Westerberg, L., [G]Cosso, J., [P]Borriello, G. A., [G]Bryant, L., Litkowski, E., Lin, J., & [G]Rolan, E. (2021, April). A parent-implemented mathematical language picture book intervention with Latinx dual language learners. In D. Leyva (Chair), *Using RCTs to evaluate effectiveness of strengths-based, parent-focused interventions promoting positive outcomes in Latino children.* Paper presented at the Biennial Meeting of the Society for Research in Child Development (SRCD), Virtual Meeting.

Hornburg, C. B., & [G]Johnson, S. (2021, April). Parents' experiences in supporting children's math learning during the COVID-19 pandemic. In Structured Poster Session, *Excellence in education research: Early career scholars and their work*. Poster presented at the Annual Meeting of the American Educational Research Association (AERA), Virtual Meeting.

[P]Lee, J.-E., **Hornburg, C. B.**, [P]Chan, J. Y.-C., & Ottmar, E. R. (2021, April). Perceptual and number effects on students' solution strategies in an interactive online mathematics game. In I. Thacker (Chair) Roundtable Session, *Cognition and mathematics education.* Paper presented at the Annual Meeting of the American Educational Research Association (AERA), Virtual Meeting.

[G]King, Y. A., [G]Rolan, E., **Hornburg, C. B.**, Schmitt, S. A., Hart, S. A., Ganley, C. M., & Purpura, D. J. (2020, October). *Examining the factor structure of the home mathematics environment to delineate its role in predicting preschool numeracy, mathematical language, and spatial skills.* Poster presented at the Home Mathematics Environment Virtual Conference.

Hornburg, C. B., [G]Devlin, B. L., & McNeil, N. M. (2020, June). The unique predictive role of concrete (vs abstract) understanding of mathematical equivalence for later mathematics outcomes. In C. Hornburg (Chair), *Understanding of mathematical equivalence in elementary and middle school: Predictors and implications*. Paper presented at the 3rd Annual Meeting of the Mathematical Cognition and Learning Society (MCLS). Meeting was changed to a virtual format across 2020-2021 due to COVID-19, with this presentation delivered in February 2021.

[G]Devlin, B. L., **Hornburg, C. B.**, & McNeil, N. M. (2020, June). *Young children's mental organization of arithmetic relates to specific number skills and understanding of mathematical equivalence*. Poster presented at the 3rd Annual Meeting of the Mathematical Cognition and Learning Society (MCLS). Meeting was changed to a virtual format across 2020-2021 due to COVID-19, with this poster presented in October 2020.

Hornburg, C. B., [G]O'Day, G. M., & Karpicke, J. D. (2019, November). *Examining the effectiveness of retrieval practice under performance pressure during a final test*. Poster presented at the 60th Annual Meeting of the Psychonomic Society, Montreal, CA.

Hornburg, C. B., Aue, W. R., Karpicke, S. S., & Karpicke, J. D. (2019, October). Harnessing the benefits of retrieval practice for children's learning through implementation of open-book and closed-book activities. In C. Hornburg (Chair), *Applying cognitive principles to children's learning in educational contexts*. Paper presented at the Cognitive Development Society (CDS) XI Biennial Meeting, Louisville, KY.

Purpura, D. J., & **Hornburg, C. B.** (2019, June). Longitudinal prediction of individual early numeracy skills: The relation of mathematical language and early literacy. In K. Vanbinst (Chair), *Language: A tool for learning arithmetic*. Paper presented at the 2nd Annual Meeting of the Mathematical Cognition and Learning Society (MCLS), Ottawa, ON.

[G]King, Y. A., **Hornburg, C. B.**, & Purpura, D. J. (2019, June). *Perceptions of the magnitude of mathematical language terms in preschoolers and adults*. Poster presented at the 2nd Annual Meeting of the Mathematical Cognition and Learning Society (MCLS), Ottawa, ON.

Hornburg, C. B., [G]Devlin, B. L., & McNeil, N. M. (2019, April). Grade of acquisition of understanding of mathematical equivalence in elementary school predicts algebra readiness in middle school. In T. Redick (Chair), *The influence of math cognition on academic outcomes.* Paper presented at an Invited Symposium for the 91st Annual Meeting of the Midwest Psychological Association (MPA), Chicago, IL.

Hornburg, C. B., Schmitt, S. A., & Purpura, D. J. (2019, March). *Relations between preschoolers' mathematical language understanding and specific numeracy skills*. Poster presented at the Biennial Meeting of the Society for Research in Child Development (SRCD), Baltimore, MD.

Purpura, D. J., **Hornburg, C. B.**, & Schmitt, S. A. (2019, March). The structure of mathematical language skills during preschool and its relation to numeracy skills. In M. Hurst (Chair), *Relational language and math: Variation across types of language and math activities*. Paper presented at the Biennial Meeting of the Society for Research in Child Development (SRCD), Baltimore, MD.

[G]Devlin, B. L., **Hornburg, C. B.**, & McNeil, N. M. (2019, March). *Grade of acquisition of understanding mathematical equivalence predicts algebra readiness*. Poster presented at the Biennial Meeting of the Society for Research in Child Development (SRCD), Baltimore, MD.

[G]O'Rear, C. D., [U]Gaylord, S. M., **Hornburg, C. B.**, & McNeil, N. M. (2019, March). *Features that affect parents' preferences for different counting books.* Poster presented at the Biennial Meeting of the Society for Research in Child Development (SRCD), Baltimore, MD.

Hornburg, C. B., Aue, W. R., & Karpicke, J. D. (2018, November). *Examining the effects of open-book and closed-book testing on initial performance, retention, and transfer*. Poster presented at the 59th Annual Meeting of the Psychonomic Society, New Orleans, LA.

Hornburg, C. B., Aue, W. R., Karpicke, S. S., & Karpicke, J. D. (2018, September). *Effects of open-book and closed-book activities on children's learning*. Poster presented at the 6th Biennial Meeting of the International Mind, Brain, and Education Society (IMBES), Los Angeles, CA.

Davenport, J., Johannes, K., Kao, Y., **Hornburg, C. B.**, & McNeil, N. M. (2018, April). *Testing approaches to improve second grade students' understanding of mathematical equivalence*. Poster presented at the Annual Meeting of the American Educational Research Association (AERA), New York, NY.

Hornburg, C. B., McNeil, N. M., & Wang, L. (2017, November). *Problem encoding does not always drive problem solving: Evidence from children's performance on mathematical equivalence problems*. Poster presented at the 58th Annual Meeting of the Psychonomic Society, Vancouver, BC.

Hornburg, C. B., McNeil, N. M., & Wang, L. (2017, October). *The role of encoding in children's understanding of mathematical equivalence depends on problem format*. Poster presented at the Cognitive Development Society (CDS) X Biennial Meeting, Portland, OR.

Hornburg, C. B., [U]Rieber, M. L., & McNeil, N. M. (2017, October). *An integrative data analysis of gender differences in children's understanding of mathematical equivalence*. Poster presented at the Cognitive Development Society (CDS) X Biennial Meeting, Portland, OR.

Hornburg, C. B., & McNeil, N. M. (2017, May). *The role of problem format in children's learning of mathematical equivalence*. Poster presented at the 2017 Math Cognition and Learning Conference, Nashville, TN.

Devlin, B. L., **Hornburg, C. B.**, & McNeil, N. M. (2017, April). *Kindergarteners' understanding of math language predicts response to a math intervention*. Poster presented at the Biennial Meeting of the Society for Research in Child Development (SRCD), Austin, TX.

Devlin, B. L., **Hornburg, C. B.**, McNeil, N. M., & Carrazza, C. (2016, May). *Gender differences in response to supplemental early math interventions*. Poster presented at the Annual Meeting of the Association for Psychological Science (APS), Chicago, IL.

Hornburg, C. B., McNeil, N. M., Devlin, B. L., & McKeever, M. O. (2015, October). Proficiency with number sets in kindergarten predicts understanding of math equivalence in second grade. In N. McNeil (Chair), *Math and number*. Paper presented at the Cognitive Development Society (CDS) IX Biennial Meeting, Columbus, OH.

Byrd, C. E., McNeil, N. M., Carrazza, C., Matthews, J. M., Brletic-Shipley, H., & [U]Celeste, E. (2015, April). Pilot test of a comprehensive intervention to improve children's understanding of math equivalence. In D. Francis (Organizer) and E. Bullock (Chair), *Explorations in mathematics in the elementary grades*. Paper presented at the Annual Meeting of the American Educational Research Association (AERA), Chicago, IL.

Devlin, B. L., McNeil, N. M., Carrazza, C., **Byrd, C. E.**, & McKeever, M. O. (2015, March). *Early understanding of math equivalence predicts future math achievement*. Poster presented at the Biennial Meeting of the Society for Research in Child Development (SRCD), Philadelphia, PA.

Fuhs, M. W., **Byrd, C. E.**, & McNeil, N. M. (2013, October). *Specific number sense skills mediate the association between inhibitory control and mathematics achievement.* Poster presented at the Cognitive Development Society (CDS) VIII Biennial Meeting, Memphis, TN.

Byrd, C. E., McNeil, N. M., Brletic-Shipley, H., & Matthews, J. M. (2013, September). *Development of a comprehensive intervention to improve children's understanding of math equivalence.* Poster presented at the Society for Research on Educational Effectiveness Fall Conference (SREE), Washington, D.C.

Byrd, C. E., McNeil, N. M., Chesney, D. L., & Matthews, P. G. (2013, April). *Children's "arithmetic-specific" interpretation of the equal sign constitutes risk for poor learning of*

early algebra. Poster presented at the Biennial Meeting of the Society for Research in Child Development (SRCD), Seattle, WA.

Chesney, D. L., McNeil, N. M., Matthews, P. G., **Byrd, C. E.**, Petersen, L. A., [U]Wheeler, M. C., Fyfe, E. R., & Dunwiddie, A. E. (2013, April). Organization matters: Children's mental organization of arithmetic knowledge correlates with understanding of math equivalence. In B. Rittle-Johnson (Organizer), *Representation, concepts, and problem-solving: Mathematics*. Paper presented at the Biennial Meeting of the Society for Research in Child Development (SRCD), Seattle, WA.

Ronald, A., Hudry, K., Tucker, L. A., Pasco, G., **Byrd, C. E.**, Elsabbagh, M., Charman, T., Johnson, M. H., and the BASIS Team (2011, May). *The development of a new brief measure of social and nonsocial autistic-like traits in young children*. Poster presented at the International Meeting for Autism Research (IMFAR), San Diego, CA.

Byrd, C. E., Ornstein, P. A., & Coffman, J. L. (2011, April). *The socialization of children's memory: The impact of maternal reminiscing style.* Poster presented at the North Carolina Psychological Foundation Student Poster Session, Chapel Hill, NC.

TEACHING EXPERIENCE & TRAINING

Teaching Experience

2021-present Instructor, Curriculum in Early Childhood, Department of Human Development and Family Science, Virginia Tech
Course topics: Developmental milestones, approaches to early childhood curriculum, role of teacher and classroom environment, design and implementation of curriculum

2021-present Instructor, Child Development in the Family Context (Graduate Course), Department of Human Development and Family Science, Virginia Tech
Course topics: Theories of neurobiological, cognitive, emotional, and social development, birth to adolescence, in the context of families, critical evaluation of research, developmental research methodologies, development in diverse contexts

2019-present Instructor, Human Development I: Childhood and Adolescence, Department of Human Development and Family Science, Virginia Tech
Course topics: Developmental theories, development (physical, cognitive, and social/emotional) from the prenatal period through adolescence, impact of environmental and social contexts on children's development

2019 Guest Lecturer, Mathematics in Preschool and Primary Grades, Department of Human Development and Family Studies, Purdue University
Lecture topics: Development of children's understanding of place value, methods for teaching place value, visual representations of place value

2015 Teaching Assistant (Computer Lab), Experimental Psychology I – Statistics, Department of Psychology, University of Notre Dame

Led weekly sessions about how to use the SPSS Statistical Program to conduct statistical analyses taught in lecture, taught APA format for academic writing, provided continuous feedback on student lab reports

2014 Teaching Assistant, Experimental Psychology I – Statistics, Department of Psychology, University of Notre Dame

Led weekly homework review sessions and targeted reteaching of difficult concepts, graded homework, led exam review sessions

2014 Guest Lecturer, Topics in Educational Psychology, Alliance for Catholic Education Teaching Fellows Program, University of Notre Dame

Lecture topics: Group socialization theory, interacting influences of parents, teachers, and peers

Pedagogical Training

2019 Distance Teaching Preparedness Credential, Division of Information Technology, Virginia Tech

2019 Certificate of Foundations in College Teaching, Center for Instructional Excellence, Purdue University

2017 Community Engagement Teaching Certificate, Kaneb Center for Teaching and Learning, University of Notre Dame

2016 Striving for Excellence in Teaching Certificate, Kaneb Center for Teaching and Learning, University of Notre Dame

2011 Graduate Teaching Seminar, University of Notre Dame

MENTORSHIP OF GRADUATE AND UNDERGRADUATE STUDENTS

Graduate Student Mentorship

2023-present Vanessa Diaz Benitez, *Parenting Behaviors Influence Children's Mathematical Skills: Examining Potential Mediating and Moderating Roles of Child Executive Function*

Currently mentoring at Virginia Tech, Dept. of Psychology (master's committee member)

2022-present Shirley Duong, *Exploring Multi-Dimensional Profiles of Families' Home Math Environments and the Relations to Children's Early Math Skills*

Currently mentoring while Shirley is a graduate student at the University of Pittsburgh (dissertation committee member)

2021-present Jisun Kim, *The Impact of Dialogic Storybook Reading with an Artificial Intelligence Agent on Preschoolers' Mathematics Learning*

Currently mentoring at Virginia Tech, Dept. of Human Development and Family Science (dissertation committee member)

Received 2023 Society for Research in Child Development Graduate Student Travel Award ($300), 2023 Virginia Tech Graduate School Travel Award ($300), 2023 Virginia Tech

Graduate School Graduate Research and Development Program Dissertation Award ($850)

2021-present Elena Silla, *Are Research-Based Practices Used in Elementary Math Classrooms?*
Currently mentoring while Elena is a graduate student at the University of Delaware (former undergraduate student at the University of Notre Dame)

2018-2019 Garrett O'Day, *Elaborative Learning Strategies Under Performance Pressure*
Mentored at Purdue University and Virginia Tech
Received Graduate Research Innovation Award, Department of Psychological Sciences, Purdue University

2018-2019 Yemimah King, *Perceptions of Mathematical Language*
Mentored at Purdue University and Virginia Tech

2017-2021 Sevil Orhan Özen, *Effects of Explanation Feedback on Learning*
Mentored at Purdue University (Visiting Scholar) and Virginia Tech

Undergraduate Student Mentorship

2022-2023 Ninie Asad, Learning and Development Lab, *Examining the Impact of a Storybook Series Designed to Strengthen Math Identity in Black and Latine Students and Students Experiencing Poverty*
Mentored at Virginia Tech
Nominated for the Karen Roberto Award for Research in the Social Sciences

2021-2022 Katherine D'Ercole, Learning and Development Lab, *Relations Between Parents' and Children's Math Anxiety along with Children's Math Avoidance and Math Performance in Elementary School*
Mentored at Virginia Tech

2016-2017 Shannon Gaylord, Cognition Learning and Development Lab, *Do Parents Choose Different Types of Counting Books for Girls Versus Boys?*
Mentored at the University of Notre Dame and following (when at Purdue University and Virginia Tech)

2016-2017 Elena Silla, Cognition Learning and Development Lab, *Does Arithmetic Instruction in Classrooms Promote an Understanding of Math Equivalence?*
Mentored at the University of Notre Dame and following (when at Purdue University and Virginia Tech)
Nominated for Frabutt Prize for Outstanding Community Based Research

2014-2015 Marisa Rieber, Cognition Learning and Development Lab, *Gender Differences in Second and Third Graders' Understanding of Mathematical Equivalence*
Mentored at the University of Notre Dame

2013-2014 Casey Hall, Cognition Learning and Development Lab, *Concreteness Fading in Mathematical Equivalence*
Mentored at the University of Notre Dame

SERVICE

Editorial Activities

2022-present Editorial Board Reviewer, *Developmental Psychology*
2017-present Ad Hoc Reviewer, *Child Development*, *Developmental Psychology, Early Childhood Research Quarterly*, *Education Sciences*, *Journal of Applied Research in Memory and Cognition*, *Journal of Educational Psychology*, *Journal of Experimental Child Psychology*, *Journal of Numerical Cognition, Learning and Instruction*, *Mathematical Thinking and Learning, Mathematics Teacher: Learning and Teaching Pre-K–12, Mind, Brain, and Education*

Professional Service

2021-present Vice President, New River Valley Chapter, VAAEYC (Virginia Association for the Education of Young Children)
2021-present Mentor, Mathematical Cognition and Learning Society Trainee Development Program
2022-2023 National Science Foundation Ad Hoc Reviewer
2021-2022 National Science Foundation Panel Reviewer
2020 Reviewer and Mentor in Mentor-Mentee Reviewing Program, Society for Research in Child Development Biennial Meeting
2018 Reviewer, American Educational Research Association Annual Meeting, Division C – Learning and Instruction, Section 1c: Mathematics
2016 Panelist, "Surviving Graduate School," 28th Annual Conference of the Association for Psychological Science
2016 Grant Reviewer, United Way Early Learning Panel (Funding Cycle 2016-2019)
2015 Volunteer, Society for Research in Child Development Biennial Meeting
2013-2017 Experienced Resource Person, NSF Graduate Research Fellowship Program
2013-2017 Reviewer, Student Research Awards, APS Student Caucus
2013-2017 Graduate Mentor, APS Student Caucus Mentorship Program
2013-2014 Member, Social & Outreach Committee, Association for Women in Science – University of Notre Dame Chapter
2013 Judge, Behavioral Sciences Elementary Division, Northern Indiana Regional Science & Engineering Fair

University & Departmental Service

2022-present Departmental Representative, College of Liberal Arts and Human Sciences Faculty Council, Virginia Tech
2020-2021 University Representative, Virginia Tech, SCHEV Advisory Committee for Disability Access to Higher Education, Reading and Writing Coalition
2020-2021 Departmental Representative, College of Liberal Arts and Human Sciences Faculty Council, Virginia Tech
2019-present Member, Undergraduate Curriculum Committee, Department of Human Development and Family Science, Virginia Tech

2019-present	Member, Child and Adolescent Development Area Committee, Department of Human Development and Family Science, Virginia Tech
2018-2019	Panelist, Professional Development Workshops, Purdue Postdoctoral Association, Purdue University
2016-2017	Graduate Student Representative at Faculty Meetings, Department of Psychology, University of Notre Dame
2015-2016	Co-Coordinator, Developmental Studies Group, Department of Psychology, University of Notre Dame
2014-2015	Co-Chair, Professional Development Group, Department of Psychology, University of Notre Dame
2013-2014	Program Representative, Graduate Advisory Committee, Department of Psychology, University of Notre Dame
2012-2015	Member, Professional Development Committee, Graduate Student Union, University of Notre Dame
2012-2014	Member, Quality of Life Committee, Graduate Student Union, University of Notre Dame
2012	Member, Teaching Awards Selection Committee, Graduate Student Union, University of Notre Dame

PROFESSIONAL AFFILIATIONS

Association for Women in Science
Cognitive Development Society
Mathematical Cognition and Learning Society
National Association for the Education of Young Children
Providing Opportunities for Women in Education Research (POWER)
Psi Chi International Honor Society
Society for Research in Child Development
Women in Cognitive Science