

EDUCATION

Ph.D., Education, Stanford University

(Expected) 2024

Specialization 1: Learning Sciences and Technology Design

Specialization 2: Curriculum and Teacher Education: Mathematics Education

Minor: Computational Social and Data Science

B.A., Political Science, Vanderbilt University

2010

Minor: Human and Organizational Development: Leadership and Organizations

Summa Cum Laude

RESEARCH EXPERIENCE

Opportunities for Teacher and Student Learning in Context: Mapping Access to STEM Content Expertise

Present

Dissertation Research | Committee: Dr. Hilda Borko, Dr. Victor R. Lee, Dr. Brigid Barron, & Dr. Ben Domingue

Abstract: There are spatial inequities in students' and teachers' STEM learning opportunities. Using a learning ecosystem lens and focusing on advanced secondary coursework, this research examines: (1) The geographic landscape of advanced STEM course *availability* in U.S. public schools (2) How student *success* in advanced STEM is related to community demographics and geography, and (3) The learning resources available to advanced STEM teachers within their local contexts. In stage one, the study uses geospatial analysis and quantitative modeling with Advanced Placement[®] and Project Lead the Way[®] data to address questions 1 & 2. Stage two data is collected via a professional learning resources survey instrument and analyzed using a mixed-methods geospatial approach. Initial findings from stage one reveal sizable rural/non-rural gaps in both availability of and student success in advanced STEM, which are particularly pronounced in highly technical, high math-demand fields.

Cache Code Math Research-Practice Partnership

Present

Researcher | PI: Dr. Victor R. Lee (Stanford University)

- Research practice partnership (RPP) between a university and a rural-serving public school district to implement cross-curricular math and computer science units
- Examining shifts in RPP as a result of pivot in computer science curriculum, programming language, and integrated development environment

Working Toward Equity in Rural Schools; An Online Learning Opportunity for Rural School Teams

2020-Present

Lead Researcher | PI: Dr. Janet Carlson (Stanford University)

- Developing a learning management system and designing an online professional learning experience with integrated synchronous sessions
- Online learning experience for underserved rural school teams launched Winter 2023 [Pilot] and is ongoing

Instantiations of Place in Rural-Teacher-Designed Classroom Learning Opportunities

2019-Present

Lead Researcher | Collaborator: Dr. Robin Keturah Anderson (North Carolina State University)

- Study of presentations of rural teacher grantees awarded support to enact proposed classroom learning experiences
- Analyzing instantiations of place to consider how teachers employ place across subject areas

Teacher Mathematical Thinking and Representational Engagement in Algebraic Pattern Tasks

2019-Present

Lead Researcher

- Asked teachers in two communities to think aloud while solving visual pattern algebra tasks
- Analyzing teachers' mathematical thinking and engagement with mathematical representations across communities

Manipul8 - Tangible User Interface (TUI) to Support Representational Fluency

2018-Present

Lead Researcher

- Developed Manipul8 initially as a tabletop tangible user interface (TUI) to support representational fluency in algebra
- Secured funding and working with international team using computer vision technology to create collaborative version

Who Presents Math Learning Online?

2021

Researcher | PI: Dr. Robin Keturah Anderson (North Carolina State University)

- Study of the Global Math Department (GMD) online teacher community and learning opportunities offered
- Conducted survey analysis and preparation of summary reports for the GMD organization

Refining a Model with Tools to Develop Math PD Leaders: An Implementation Study*Graduate Research Assistant | Principal Investigators: Dr. Hilda Borko & Dr. Janet Carlson (Stanford University)*

- Worked on NSF-funded project to support a research-practice partnership for mathematics professional development
- Collected, analyzed, and reported both qualitative and quantitative data and research findings for publication

PUBLICATIONS

REFEREED PUBLICATIONS

Borko, H., Carlson, J., Deutscher, R., **Boles, K. L.**, Delaney, V., Fong, A., Jarry-Shore, M., Malamut, J., Million, S., Mozenter, S., & Muro Villa, A. (2021). Learning to Lead: an Approach to Mathematics Teacher Leader Development. *International Journal of Science and Math Education*, 19 (Suppl 1), 121–143.

Anderson, R. K., **Boles, K. L.** (2020). Self-directed learning for rural mathematics teachers. In A.I. Sacristán, J.C. Cortés-Zavala & P.M. Ruiz-Arias, (Eds.). *Mathematics Education Across Cultures: Proceedings of the 42nd Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education (PME-NA) 2020*, (pp. 1906-1907). Mexico.

Boles, K. L., Jarry-Shore, M., Villa, A. M., Malamut, J., & Borko, H. (2020). Building capacity via facilitator agency: tensions in implementing an adaptive model of professional development. In Gresalfi, M. and Horn, I. S. (Eds.), *The Interdisciplinarity of the Learning Sciences, 14th International Conference of the Learning Sciences (ICLS) 2020*, Volume 5 (pp. 2585-2588). Nashville, Tennessee: International Society of the Learning Sciences.

Boles, K. L. (2020). Mathematical thinking and representational engagement of in-service secondary mathematics teachers in pattern-based algebraic growth tasks. In Gresalfi, M. and Horn, I. S. (Eds.), *The Interdisciplinarity of the Learning Sciences, 14th International Conference of the Learning Sciences (ICLS) 2020*, Volume 4 (pp. 2417-2418). Nashville, Tennessee: International Society of the Learning Sciences.

Villa, A. M., **Boles, K. L.**, & Borko, H. (2019). Teacher leader learning through participation in and facilitation of professional development addressing problems of practice. In Otten, S., Candela, A. G., de Araujo, Z., Haines, C., & Munter, C. (Eds.), *Proceedings of the 41st Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education (PME-NA) 2019*, (pp. 594-598). St Louis, MO: University of Missouri.

Boles, K. L., Macedo, L., Proctor, C., & Blikstein, P. (2018). Manipul8: An interactive experience to inspire pattern-based algebraic thinking and representational fluency. In *Proceedings of the 17th ACM Conference on Interaction Design and Children* (pp. 501-504). ACM.

Boles, K. L., & Domingue, B. W. (in preparation). Spatial inequities in Advanced Placement[®] STEM success: Investigating rural disparities in examination results.

Boles, K. L. (in preparation). Teachers' mathematical thinking and representational fluency on algebraic pattern tile tasks.

Boles, K. L., & Anderson, R. K. (in preparation). Rural teachers as designers of place-based curriculum: Examining designed instantiations and pedagogies of place.

Villa, A. M., Gómez Zaccarelli, F., Jones Mozenter, S., **Boles, K. L.**, Deutscher, R., Borko, H., & Carlson, J. (in preparation). Indicators of access and equity that led to two contrasting cases of goal orientations during mathematical group work.

NON-REFEREED PUBLICATIONS

Pea, R., Biernacki, P., Bigman, M., **Boles, K.**, Coelho, R., Docherty, V., Garcia, J., Lin, V., Nguyen, J., Pimentel, D., Pozos, R., Reynante, B., Roy, E., Southerton, E., Suzara, M., Vishwanath, A. (2023). Four surveillance technologies and challenges for education. In H. Niemi, R. Pea, & Y. Lu (Eds.), *AI in Learning: Designing the Future* (pp. 317-329). Springer Nature.

Boles, K. L., Anderson, R. K., & Carman, L. (2021). *The Global Math Department community: Webinar attendees*. The Global Math Department.

RESEARCH CONFERENCE PRESENTATIONS

Anderson, R. K., **Boles, K. L.** (2021, May 28). Self-directed learning for rural mathematics teachers: The why, what and lessons learned [Conference session]. The 42nd Annual Meeting of the Psychology in Mathematics Education Conference, Mazatlán, Sinaloa, Mexico.

Boles, K. L., Jarry-Shore, M., Villa, A. M., III, Malamut, J., & Borko, H. (2020, June 19-23). Building capacity via facilitator agency: Tensions in implementing an adaptive model of professional development [Conference canceled]. The 14th International Conference of the Learning Sciences, Nashville, TN, United States.

Boles, K. L. (2020, June 19-23). Mathematical thinking and representational engagement of in-service secondary mathematics teachers in pattern-based algebraic growth tasks [Conference canceled]. The 14th International Conference of the Learning Sciences, Nashville, TN, United States.

Villa, A. M., **Boles, K. L.**, Borko, H. (2019, Nov. 17). Teacher Leader Learning Through Participation in and Facilitation of Professional Development Addressing Problems of Practice [Conference session]. The 41st Annual Meeting of the Psychology in Mathematics Education Conference, St. Louis, MO.

Zaccarelli, F. G., Villa, A. M., Mozenter, S. J., **Boles, K. L.**, Borko, H., & Carlson, J. (2019, Apr. 8). Agency, authority, identity, and access to content during mathematical groupwork [Conference session]. 2019 American Educational Research Association Annual Meeting, Toronto, Ontario, Canada.

Villa, A. M., & **Boles, K. L.** (2019, Feb. 8). Actualizing agency, authority identity, and access to content in two contrasting cases of mathematical groupwork [Conference session]. 2019 Annual Association of Mathematics Teacher Educators Conference, Orlando, FL, United States.

Boles, K. L. (2018, Oct. 12). Tangible modeling over distance: Using computer vision to support distal collaborative professional learning [Conference session]. 2018 Learning Sciences Graduate Student Conference, Nashville, TN, United States.

Boles, K. L., Macedo, L., Proctor, C., Blikstein, P. (2018, Jun. 20). Manipul8: An interactive experience to inspire pattern-based algebraic thinking and representational fluency [Conference session]. The 17th ACM Conference on Interaction Design and Children, Trondheim, Norway.

TEACHING EXPERIENCE

HIGHER EDUCATION

Doctoral Seminar in Curriculum Research, Teaching Assistant 2021
Stanford University | *Instructor of Record: Dr. Rebecca Silverman*

- Second of two required courses for new Ph.D. students to support them in learning about/doing educational research
- Co-planned lectures, organized learning management system, provided feedback to Ph.D. students on their research

Introduction to Research in Curriculum and Teacher Education, Teaching Assistant 2020, 2021
Stanford University | *Instructor of Record: Dr. Hilda Borko*

- First of two required courses for new Ph.D. students to support them in learning about/doing educational research
- Co-designed virtual instruction model and online assignments; lectured; provided student feedback

Distance Learning, Instructor of Record, Course/Syllabus Designer 2020
Stanford University

- Master's level course required of all secondary candidates in the teacher education program
- Designed and facilitated course to interrogate models, tools, pedagogies, and equity concerns for distance learning

Introduction to Statistical Methods in Education, Co-Instructor of Record, Teaching Assistant, Section Instructor 2018-2020
Stanford University | *Co-Instructor of Record: Dr. Daniel L. Schwartz*

- Introductory Ph.D. level quantitative methods course for all students in Stanford Graduate School of Education
- Led transition to virtual instruction and educational technology selection; guest lectured; provided student feedback

Stanford Graduate School of Education Summer Math Camp – Statistics, Instructor, Curriculum Designer 2018, 2019
Stanford University

- One-week statistics seminar for incoming Ph.D. students to prepare them for quantitative methods sequence
- Designed curriculum, lectured, provided feedback, problem sets, and differentiated supplementary resources

K-12 EDUCATION

National Secondary Math Virtual Content Coach 2015- 2018
Teach For America | *Remote*

- Served as mathematics content coach for all Teach for America 1st and 2nd year math teachers (and coaches) nationwide
- Developed virtual professional learning courses (e.g., on EdX & Versal) to support new math teachers

Appalachian Technology Institute Staff 2015 – 2017

Kentucky Valley Educational Cooperative | Hazard, KY

- One of six regional staff members who delivered blended learning courses to 17 counties and 99 regional schools
- Served as region's computer science master teacher (Languages supported: JavaScript & Python)

Blended Learning Professional Action Network (PAN) Member

2015 - 2016

Kentucky Valley Educational Cooperative | Hazard, KY

- Planned and facilitated professional development for 100 regional teachers and regional staff across 17 counties
- Served on PAN to support blended learning implementation and pedagogy in regional classrooms

National AP® Statistics Exam Reader

2016

Educational Testing Service | Kansas City, MO

- Read and scored thousands of Advanced Placement® exams over week long period
- Worked with peers to develop clarity on rubric interpretations and implications for scoring item responses

Mathematics, Computer Science, & Aerospace Engineering Teacher

2011- 2017

Betsy Layne High School | Stanville, KY

- Established school's first AP® Statistics, computer science, and aerospace engineering programs
- Served as school technology specialist and professional development facilitator

SERVICE**Reviewer**

- AERA Open
- International Conference of the Learning Sciences (ICLS)
- Psychology in Mathematics Education – North American (PME-NA)
- American Educational Research Association Conference (AERA)

Conference Administration and Support

- International Commission on Mathematical Instruction (IMCI) 25: Teachers of Mathematics Working and Learning in Collaborative Groups [*Conference Administrator*]
 - Responsible for paper submission, review process, and conference proceeding publication
 - Aided in coordination of plenary speakers and panelists
- Speculative Education Conference [*Conference Administrator*]
 - Designed and supported online conference logistics and technology
 - Organized volunteers and room assignments
- So, What Are You Working On? Stanford Graduate School of Education Graduate Student Conference [*Conference Co-Chair, Director of Proposals and Registration*]
 - Established and maintained system for proposal submission, reviews, and conference registration
 - Led volunteer team of graduate students that hosted the conference

Student Body Representation

- Curriculum and Teacher Education Area Student Representative

Technology

- Facilitated workshop for faculty and Ph.D. students entitled "Creating Your Professional Website"
- Creator, Facilitator, (Re)Designing Online Classrooms for Active, Collaborative Learning Panel for Stanford IT
- Author of "Teaching Resources" for Stanford faculty during shift to online learning
- Panelist, Sharing Practices and Learning from Remote Teaching, for Stanford TEACH Symposium
- Digital Ambassador for Stanford faculty during shift to online learning

GRANTS AND FELLOWSHIPS**Stanford Diversity Dissertation Research Opportunity**

Spring 2023

- One of approximately 100 Stanford graduate students awarded grant supporting dissertations advancing diversity
- Received \$5,000 research grant

Stanford Diversifying Academia Recruiting Excellence (DARE) Fellow

2022-Present

- One of twenty-four Ph.D. candidates selected from across the university as part of efforts diversify the professoriate
- Receiving \$147,312 fellowship to cover tuition/housing costs as well as support in preparing for a faculty career

Stanford GSE Dissertation Support Grant (DSG)

Spring 2022

- One of five Stanford Graduate School of Education (GSE) students awarded financial support for dissertation work
- Received \$5,000 to support dissertation participants' honoraria

Working Toward Equity in Rural Schools

2020-Present

- Member of grant writing team for project to support rural school teams to consider equity questions in their schools
- Received \$87,000 to develop online materials, workshops, and a learning management system to support this work
- Received \$170,000 for phase 2 proposal

Technology for Equity in Learning Opportunities (TELOS) Grantee

2019

- Granted \$5,000 in financial support to develop distal tangible collaboration design interface for teachers
- Committed to centering teachers and students as co-designers and agents of the learning process

Technology for Equity in Learning Opportunities (TELOS) Grantee

2018

- Granted \$5,000 in financial support to develop online learning platform that supports distal tangible collaboration
- Focused on granting equal access to high quality professional development for practitioners in underserved rural and remote areas

Stanford Graduate Fellow (SGF) in Science and Engineering, William R. and Sarah Hart Kimball Fellow

2017 - 2022

- Granted fellowship to support doctoral work in science, technology, engineering, and mathematics (STEM) fields
- Provided \$265,000 fellowship as top Stanford math and science graduate student

K-12 CLASSROOM HONORS AND AWARDS**Statewide Winner of Verizon Wireless App Challenge**

2016, 2017

Betsy Layne High School | *Stanville, KY*

- Advised computer science students in brainstorming and creating app concept to solve community problem
- Won Best in State High School honors for two consecutive years and an award of \$10,000 for school

Learning Visit Panelist and Interviewee

2015

Gates Foundation | *Stanville, KY*

- Chosen to serve on teacher panel for Bill, Melinda, and Gates Foundation team "learning visit" to school
- Individually interviewed to understand practices of excellent instruction at a high performing, underserved rural school

Video Spotlight - Appalachian Renaissance Initiative Featured Teacher

2015

Digital Promise | *Stanville, KY*

- Featured teacher vignette in video spotlights for innovative classroom practices
- Highlighted award-winning AP[®] Statistics project and Appalachian Technology Institute Computer Science Initiative

Innovation Grant Award Winner

2015 & 2016

Kentucky Valley Educational Cooperative | *Hazard, KY*

- Selected as grant award winner for innovative classroom practices
- Granted monetary award to provide students with innovative data-gathering opportunities in AP[®] Statistics

National Dream Team Teacher

2013 & 2014

LearnZillion | *Washington, D.C.*

- One of approximately 100 teachers nationwide selected for the LearnZillion Dream Team
- Created online statistics videos, resources, and open source curriculum aligned to Common Core Math standards

Advanced Placement[®] Goal Awardee

2013

Advance Kentucky | *Louisville, KY*

- Rewarded for attaining AP[®] Statistics pass-rate goal set by Advance Kentucky for new AP[®] Statistics programs
- Surpassed Advance KY-set pass rate goal by 150%.

PROFESSIONAL ASSOCIATIONS**PROGRAMMING LANGUAGES**

American Educational Research Association (AERA)
 International Society of the Learning Sciences (ISLS)
 Association of Mathematics Teacher Educators (AMTE)
 National Rural Education Association (NREA)

C++
 Java
 JavaScript
 Python
 R