Jeffrey Bush Tayne

University of Colorado at Boulder • jeffrey.bush@colorado.edu

CURRENT POSITION

2023-present Assistant Research Professor, Institute of Cognitive Sciences, University of Colorado at Boulder

AREA OF SPECIALIZATION

I research the intersection of technology, STEM teacher learning and professional development with sub-topics of mathematics education, computational thinking, physical computing, formative assessment, complex instruction, Artificial Intelligence, user experience research, compassion, and equity.

Work at the University of Colorado's Institute for Student and AI Teaming (iSAT) focuses on creating an AI agent and associated curriculum to support collaborative learning, promote equity and uplift non-dominant student ideas. My work there focuses on curriculum development, teacher professional learning communities for co-design, and UX design.

Recently funded work focuses on creating an AI-augmented support model for algebra tutors to improve relational dynamics, equitable teaching practices and cognitive demand matching.

Before joining ICS in 2020, my research focused primarily on technology to catalyze high leverage teacher practice relating to formative assessment and equitable discourse in middle and high school mathematics classrooms.

EDUCATION

2020 University of Colorado at Boulder
Ph.D. in Education - Curriculum and Instruction - David C. Webb, Advisor

2019 University of Colorado at Boulder
M.A. in Education - Curriculum and Instruction

2010 Bowdoin College
B.A. in Environmental Studies and Geology, Mathematics Minor

RELEVANT PROFESSIONAL EXPERIENCE

2020-2023 Research Scientist (Level 1, then level 2) Institute of Cognitive Sciences, University of Colorado at Boulder

2015-2020 Graduate Research Assistant – PhET Simulations & Scalable Game Design – David C. Webb
School of Education – University of Colorado at Boulder

2016-2020 Consulting Researcher and Content Specialist
Woot Math (now Saga Education) - Boulder, CO

2017-2020 Graduate Part Time Instructor – Problem Based Instruction – Graduate Level Education Course
School of Education – University of Colorado at Boulder

2018-2019 Visiting Faculty – Mathematics for Elementary Educators
Colorado College - Colorado Springs, CO

2012-2015 High school mathematics teacher and department head
The White Mountain School - Bethlehem, NH

2011-2012 High school geology teacher
Swiss Semester - Zermatt, Switzerland

2008-2015 Certified professional wilderness expedition guide and leadership instructor for teens

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YMCA Camp Widjiwagan- Ely, MN and High Mountain Institute – Leadville, CO

PUBLICATIONS (ALL PUBLICATIONS ARE UNDER MY BIRTH NAME OF JEFFREY B. BUSH)

Journal Publications

Hennessy Elliott, C., Nixon, J., Gendrau Chakarov, A., Bush, J. B., Schneider, M. J., & Recker, M. (2024). Characterizing teacher support of debugging with physical computing: Debugging pedagogies in practice. ACM transactions on computing education, 24(4), 1-28.

Hennessy Elliott, C., Gendreau Chakarov, A., Bush, J. B., Nixon, J., & Recker, M. (2023). Toward a debugging pedagogy: helping students learn to get unstuck with physical computing systems. Information and Learning Sciences, 124(1/2), 1-24. https://doi.org/10.1108/ILS-03-2022-0051

Bush, J. B. (2021). Software-based intervention with digital manipulatives to support student conceptual understandings of fractions. British Journal of Educational Technology, 52(6), 2299-2318. https://doi.org/10.1111/bjet.13139

Biddy, Q. Gendreau Chakarov, A., Bush, J.B., Hennessy Elliott, C. Jacobs, J., Recker, M., Sumner, T., & Penuel, W. (2021). A professional development model to integrate computational thinking into middle school science through co-designed storylines. Contemporary Issues in Technology and Teacher Education, 21(1), 53-96. Retrieved from https://par.nsf.gov/biblio/10291724

Refereed Conference Proceedings

Chandler, C., Raju, R., Reitman, J.G., Penuel, W.R., Ko, M.L.M., Bush, J.B., Biddy, Q., D'Mello, S. (2025) Improving the Generalizability of Language Models for the Identification of Collaborative Discourse Across Diverse Educational Contexts In Proceedings of the 15th Learning Analytics and Knowledge Conference (pp. TBD)

Bush, J, Biddy, Q., Chakarov, A., Chang, M., Penuel, W. (2024). Curriculum Routines to Support Collaborative AI Partner Deployment in Classrooms. In CHI '24: ACM Workshop on Child-Centered AI Design, May 11, 2024, Hybrid Online. ACM, 4 pages.

Biddy, Q., Ko, M.L.M., Chang, M. A., Bush, J.B. (2024) Designing Child-Centered AI for Secondary Classroom Coll.AI.boration. In the Workshop on Child-centered AI Design (CCAI) In CHI '24: ACM Workshop on Child-Centered AI Design, May 11, 2024, Hybrid Online. ACM, 4 pages.

Booth, B. M., Jacobs, J., Bush, J. B., Milne, B., Fischaber, T., & DMello, S. K. (2024). Human-tutor coaching technology (htct): Automated discourse analytics in a coached tutoring model. In Proceedings of the 14th Learning Analytics and Knowledge Conference (pp. 725-735).

Brown, C., & Bush, J. (2024). Co-designing an AI powered tool to support collaborative and discourse-based math instruction in a high-dosage tutoring context. In Proceedings of the 18th International Conference of Computer-Supported Collaborative Learning-CSCL, Buffalo, NY, U.S.A.

Gendreau Chakarov, A., Bush, J., Biddy, Q. (2024) Lessons Learned from Co-Designing Phenomena Driven Student Centered AI Curriculum with Teachers New to AI. In Proceedings of the 18th International Conference of the Learning Sciences, Buffalo, NY, U.S.A.

Hoang, N., Bush, J.B., Dey, I. Watts, E., Clevenger, C., Penuel, W.R. (2024) MOSAIC Protocol: Analyzing Small Group Work to Gain Insights into Collaboration Support for Middle School STEM Classrooms. In Proceedings of the 18th International Conference of Computer-Supported Collaborative Learning-CSCL, Buffalo, NY, U.S.A.

Chang, M.A., Roschelle, J., Dickler-Mann, R., Bush, J.B. Using Adapted Conjecture Maps to Foster Interdisciplinary Collaboration Between Learning Scientists and Novice AI-Ed Researchers. In Proceedings of the 18th International Conference of the Learning Sciences, Buffalo, NY, U.S.A.

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Chandler, C. Breideband, T., Reitman, J.G., Chitwood, M., Bush, J.B., Howard, A., Leonhart, S., Foltz, P.W., Penuel, W.R., (2024) Computational Modeling of Collaborative Discourse to Enable Feedback and Reflection in Middle School Classrooms. In LAK24: 14th International Learning Analytics and Knowledge Conference

Perkoff, E. M., Doherty, E., Bush, J., & Hirshfield, L. (2024). Crafting a Responsible Dialog System for Collaborative Learning Environments. In AI for Education: Bridging Innovation and Responsibility at the 38th AAAI Annual Conference on AI.

Breideband, T., Bush, J.B., Chandler, C., Chang, M.A., Dickler, R., Foltz, P., Ganesh, A., Lieber, R., Penuel, W.P., Reitman, J.G., Weatherley, J., D'Mello, S. (2023) The Community Builder (CoBi): Helping Students to Develop Better Small Group Collaborative Learning Skills. In Companion Publication of the 2023 Conference on Computer Supported Cooperative Work and Social Computing (pp. 376-380).https://doi.org/10.1145/3584931.3607498

Nixon, J., Hennessy Elliott, C., Schneider, M., Bush, J.B., Bhaduri, S., Recker, M. (2023) Teachers' Learning to Support Students During Science Inquiry: Managing Student Uncertainty in a Debugging Context. In Proceedings of the 17th International Conference of the Learning Sciences, Montreal, Canada.

Elliott, C. H., Nixon, J., Bush, J. B., Chakarov, A. G., & Recker, M. (2022). "Do I Need to Know What I Am Doing if I Am the Teacher?" Developing Teachers' Debugging Pedagogies With Physical Computing. In Proceedings of the 16th International Conference of the Learning Sciences-ICLS 2022, pp. 1565-1568. International Society of the Learning Sciences.

Bush, J. B., Biddy, Q., Elliott, C. H., Chakarov, A. G., & Nixon, J. (2022). Understanding the Collaborative Learning Implementation Cycle (CLIC) for a Teacher Learning to Promote Computationally Rich Communication in a Remote STEM Classroom. In Proceedings of the 16th International Conference on Computer-Supported Collaborative Learning-CSCL 2022, pp. 359-362. International Society of the Learning Sciences.

Chakarov, A. G., Bush, J., Biddy, Q. L., Jacobs, J., Recker, M., & Sumner, T. (2021, July). Supporting Teachers to Implement Engineering Design Challenges using Sensor Technologies in a Remote Classroom Environment. In 2021 ASEE Virtual Annual Conference Content Access. https://peer.asee.org/37789

Bhaduri, S., Biddy, Q. L., Bush, J., Suresh, A., & Sumner, T. (2021, June). 3DnST: A framework towards understanding children's interaction with tinkercad and enhancing spatial thinking skills. Interaction Design and Children (pp. 257-267). IDS '21. June 24-30, 2021, Athens, Greece. https://doi.org/10.1145/3459990.3460717

Gendreau Chakarov, A., Bush, J., Biddy, Q. L., Jacobs, J., Elliott, C. H., & Sumner, T. (2021, June). Challenges and Unexpected Affordances of Physical Computing Going Remote. In Interaction Design and Children (pp. 276-282). https://doi.org/10.1145/3459990.3460711

Bush, J.B., Gilmore, M. R., & Miller, S. B. (2020). Drag and drop programming experiences and equity: analysis of a large scale middle school student motivation survey. In Proceedings of the 51st ACM Technical Symposium on Computer Science Education (pp. 664-670). https://dl.acm.org/doi/abs/10.1145/3328778.3366875

Webb, D.C., Nickerson, H., Bush, J.B., (2017). A Comparative Analysis of Online and Face-to-Face Professional Development Models for CS Education, paper presented at the *Special Interest Group of Computer Science Education (SIGCSE 2017)*, Seattle, Washington. Retrieved from https://dl.acm.org/doi/10.1145/3017680.3017784

Refereed Conference Papers, Presentations and Posters

Jacobs, J., Thomas, K., Engel, M., Bush, J.B. (2025) The Relationship Between Academically Productive Talk and Instructional Quality in Mathematics Lessons. Paper to be presented to the American Educational Research Association, Denver, Colorado.

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Chang, M.A., Biddy, Q., Bush, J.B., Penuel, W.R., Ko, M.L.M. (2025) Infrastructuring for Politicized Care: Building AI-Supported Collaboration Tools in a Long-term Research-Practice Partnership. Paper to be presented to the American Educational Research Association, Denver, Colorado.

Dey, I., Doherty, E., Zhang, R., Hoang, N., Bush, J.B., Hirshfield, L., Puntambekar, S. (2025) MOSAIC-AI: Moment of Support Analysis with AI Partners. Poster to be presented to the American Educational Research Association, Denver, Colorado.

Perkoff, M., Doherty, E., Bush, J.B., Hirshfield, L., (2024) Crafting a Responsible Dialog System for Collaborative Learning Environments Poster presented at AI4ED Workshop.

Dey, I., and Hoang, N., Bush, J.B. (2024) Analyzing Support Moments During Small Group Work. Paper presented to the American Educational Research Association, Philadelphia, PA, USA.

Hennessy Elliott, C., Nixon, J., Gendreau Chakarov, A., Schneider, M., Bush, J.B., Recker, M., (2023). Toward a Middle School Debugging Pedagogy With Physical Computing Systems. Paper presented at Annual Meeting of the American Education Research Association, Chicago, IL.

Nixon, J., Hennessy Elliott, C., Bush, J.B., Recker, M., (2023). Examining Teachers' Beliefs About 3-D Learning: The Importance of Analyzing Multiple Data Sources. Paper presented at the Annual Meeting of the American Education Research Association, Chicago, IL.

Cao, J., Dickler, R., Grace, M., Bush, J. B., Roncone, A., Hirshfield, L. M., ... & Palmer, M. S. (2023). Designing an AI Partner for Jigsaw classrooms. In Workshop on Language-Based AI Agent Interaction with Children (AIAIC'2023), Los Angeles, California.

Southwell, R., Pugh, S., Perkoff, E. M., Clevenger, C., Bush, J. B., Lieber, R., ... & D'Mello, S. (2022). Challenges and Feasibility of Automatic Speech Recognition for Modeling Student Collaborative Discourse in Classrooms. International Educational Data Mining Society. (EDM) (15th, Durham, United Kingdom, Jul 24-27, 2022)

Biddy, Q., Bhaduri, S., Bush, J.B., Hennessy Elliott, C., Recker, M., Sumner, T. (2022) Co-designing Opportunities for Rural Middle School Youth to Engage with STEM Careers and Career Pathways. Round table session for Division C of the Annual Meeting of the American Education Research Association, San Diego, CA.

Hennessy Elliott, C., Gendreau Chakarov, A., Bush, J., & Recker, M. (2022). Debugging pedagogies: Helping middle school students learn to get unstuck with physical computing systems. Paper presented at the Annual Meeting of the American Education Research Association, San Diego, CA.

Gendreau Chakarov, A., Bush, J., Biddy, Q., Jacobs, J., Sumner, T., Hennessy Elliott, C., & Recker, M. (2022). DaSH Home: Using programmable sensors to support student driven investigations during remote learning. Poster presented at the Annual meeting program American Educational Research Association, San Diego, CA.

Bush, J. B., Milne, B. Technology to Support Students' Learning Mathematics from Other Students' Work. (2018). In Kay, J. and Luckin, R. (Eds.) Rethinking Learning in the Digital Age: Making the Learning Sciences Count, 13th International Conference of the Learning Sciences (ICLS) 2018, Volume 3. London, UK: International Society of the Learning Sciences. https://doi.dx.org/10.22318/cscl2018.1705

Bush, J. B., Milne, B. Making Mathematical Thinking Visible Through Technology. (2018). In Kay, J. and Luckin, R. (Eds.) Rethinking Learning in the Digital Age: Making the Learning Sciences Count, 13th International Conference of the Learning Sciences (ICLS) 2018, Volume 3. London, UK: International Society of the Learning Sciences. https://doi.dx.org/10.22318/cscl2018.1735

Bush, J.B., and Miller, S. (2017). Analysis of Associations between Motivation and Previous Computer Science Experience, Gender, Ethnicity and Privilege as Observed in a Large Scale Survey of Middle School Students, In Proceedings of

the 2017 ACM SIGCSE Technical Symposium on Computer Science Education (pp. 705-705). https://doi.org/10.1145/3017680.3022441

Nickerson, H., Bush, J.B., and Endo, Y, C. (2016). We Have Questions: Pedagogical, Technical, and Procedural Assistance Requests in a Large Computational Thinking Curriculum Research Project, In Proceedings of the 47th ACM Technical Symposium on Computing Science Education (pp. 692-692). https://doi.org/10.1145/2839509.2850575

Other Publications

Jacobs, J., Suresh, A., Booth, B., Sumner, T., Bush, J., Brown, C. & D'Mello, S. (2024). Automating feedback from recorded instructional observations: Using AI to detect and support dialogic teaching. In S. Kelly (Ed), Research Handbook on Classroom Observation. Edward Elgar Publishing.

Benedis-Grab, G., Biddy, Q., Bhaduri, S., Bush, J.B., Jacobs, J.J., Sumner, T. (2024) Supporting Computationally-Rich Science Instruction: Conceptual Models for CT-Integrated Science Curriculum and Professional Learning. Roundtable session presented at the 2024 NARST Annual International Conference. Denver, CO. U.S.A.

Demszky, D., Bush, J.B., D'Mello, S.K., Jacobs, J., …Wentworth, L. (2023). Empowering educators via language technology. Stanford University. https://www.dorademszky.com/publications/26178-empowering-educators-via-language-technology

D'Mello, S. K., Biddy, Q., Breideband, T., Bush, J., Chang, M., Cortez, A., ... & Whitehill, J. (2024). From learning optimization to learner flourishing: Reimagining AI in Education at the Institute for Student-AI Teaming (iSAT). AI Magazine, 45(1), 61-68. DOI: 10.1002/aaai.12158

Bush, J.B., Marks, K. (2019). Technology Mediated Classroom Assessment: Co-Design of Features and Tasks for Student Response Systems and Effective Pedagogy in Algebra. Paper presented the *Third Annual NCME Special Conference on Classroom Assessment*. Boulder, Colorado.

Bush, J.B., Webb, D. C., Kress, N. E., Yang, W., & Perkins, K. K. (2018). Classroom activities for digital interactive simulations to support realistic mathematics education. In 6th International Realistic Mathematics Education Conference, Georgetown. Grand Cayman, Cayman Islands. Retrieved from https://www.researchgate.net/publication/330812204_Classroom_Activities_for_Digital_Interactive_Simulations_to_Support_Realistic_Mathematics_Education

Invited Presentations

Bush, J.B., (2024) Supporting Collaborative Learning and Metacognition with and about Artificial Intelligence. In AI Augmented Learning for All: Challenges and Opportunities – a view from the Five National AI Institutes. Presentation at the 18th International Conference of the Learning Sciences, Buffalo, NY, U.S.A.

Watts, E., Bush, J.B., Benedis Grab, G., Hoang, N. (2024) Supporting Collaborative Learning and Metacognition with and about Artificial Intelligence. Presentation at the Rocky Mountain Computer Science Conference for P-12 Educators

Hoang, N., Bush. J.B., Benedis Grab, G. (2024) Using Physical Computing to Drive Student Learning, Thinking and Action Presentation at the Rocky Mountain Computer Science Conference for P-12 Educators

Jacobs, J.J., Bush, J.B., Brown, C., Engel, M., Martin, J., Sumner, T. (2023) A Tutoring Analytics and Professional Support Model (TAPS) for improving the Work and Professional Growth of Tutors. Presented by Bush and Jacobs at the NSF Future of Work at the Human-Technology Frontier Principal Investigators Meeting Boston, MA.

Bush, J.B. (2023) *AI to Augment Human to Human Interactions, Co-Designing a Feedback Tools to Improve Discourse and Collaboration.* Colorado Department of Education's Teaching and Learning CoLab

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Bush, J.B. (2023) *Catalyzing High Leverage, Student-Centered Instruction with Free Interactive Mathematics Simulations.* Colorado Department of Education's Teaching and Learning CoLab

Chang, M.A., Bush, J.B. (2023). *Building out Expansive Dreams with Feasible AI.* Conference on Ethical and Responsible Design in the National AI Institutes, Georgia Institute of Technology

Bush, J.B. (2023) "SchoolWide Labs: Programmable Sensors, Artificial Intelligence and Storylined Curriculum to Promote Collaborative Learning and Equity in STEM Education" CS4All Accelerator Program, Remote

Bush, J.B. (2019). *Supporting Collaboration and Discourse in Mathematics with Interactive, Digital Tools.* Presentation at the Annual Conference of the Colorado Council of Teachers of Mathematics, Denver, CO.

McGarry A., and Bush, J.B. (2017). *Implement Effective Math Teacher Practices Using Interactive Simulations* Colorado Council of Teachers of Mathematics Annual Meeting Denver, CO

Miller, S., Bush, J.B. (2016). *Active Learning Methods? Let me count the ways! Integrating Computational Thinking and Number Sense in Mathematics.* White House Office of Science and Technology Policy, Active Learning in STEM Education Symposium, Washington D.C.

Conference Presentations and Workshop Papers

Chang, M. A., Roschelle, J., Dickler, R., & Bush, J. (2024). Designing for expansive, sociotechnical futures: Conjecture maps as boundary objects between learning scientists and computer scientists. The role of emergent technologies in equitable futures: Navigating between entrenched injustices and expansive possibilities. Paper presented at Symposium "The Role of Emergent Technologies in Equitable Futures: Navigating Between Entrenched Injustices and Expansive Possibilities" at the Annual Meeting of the American Education Research Association. Philadelphia, PA.

Morales-Navarro, L., Kafai, Y., Brennan, K., … Bush, J.B.,… (2023) Productive Designs for Successful Failure: Constructionist Perspectives on Supporting Personally Meaningful and Culturally Empowered Learning and Teaching. Symposium at the Constructionism / FabLearn 2023 Conference.

Weatherley, J., Dickler, R., Foltz, P. W., Srinivas, A. B., Pugh, S., Krishnaswamy, N., Whitehill, J., Bodzianowski, M., Perkoff, M., Wouthwell, R., Bush, J., Chang, M., Hirshfield, L., Showers, D., Ganesh, A., Li, Z., Danilyuk, El., He, X., Khebour, I. K., Dey, I., & D'Mello, S., (2023). The iSAT Collaboration Analytics Pipeline. Workshop on Collaboration Analytics organized as part of the 13th International Learning Analytics and Knowledge Conference (LAK 2023), Arlington, Texas.

Bush, J.B., Dey, I., and Hoang, N., Reflective, Iterative and Interdisciplinary Design of a Situated Coding Scheme for Classroom Collaborative Work. Paper presented to the Collaborative Analytics Workshop at the 13th International Learning Analytics and Knowledge Conference Arlington, TX. March 14, 2023

Bush, J.B., Dey, I., Chang, M.A., Perkoff, M. (2022) Envisioning a Classroom AI as a Community Builder. Short paper presented at the workshop "Interdisciplinary Approaches to Getting AI Experts and Education Stakeholders Talking" at the 23rd International Conference, AIED 2022, Durham, UK, July 27–31, 2022

Dickler, R., Foltz, P., Krishnaswamy, N., Whitehill, J., Weatherly, J., Bodzianowski, M., Perkoff, M., Southwell, R., Pugh, S., Bush, J., Chang, M., Hirshfield, L., Showers, D., Ganesh, A., Li, Z., Danilyuk, E., He, X., Khebour, I. K., Dey, I., Puntambekar, S., & D'Mello, S.K. (2022). iSAT speech-based AI display for small group collaboration in classrooms. Interactive event at the Artificial Intelligence in Education Conference (AIED 2022), Durham, England. Awarded "Best Interactive Event."

Bush, J.B., McGarry A., Perkins, K., and Webb, D. (2019). *Teaching and Learning Algebraic Thinking Across Middle Grades: A Research-based Approach Using PhET Interactive Simulations.* The Center for STEM Learning's 11th Annual Symposium. Boulder, CO.

McGarry A., Perkins, K., and Bush, J.B. (2017). *PhET Interactive Simulations: Making STEM More Accessible.* The Center for STEM Learning's 9th Annual Symposium. Boulder, CO

Bush, J.B., Marks, K., Milne, B. (2017). Design Considerations for a Web-Based Formative Assessment tool to Support Collaborative Learning in Mathematics. Presentation at *the International Society for Design and Development in Education Conference*. Berkeley, California.

Bush, J.B., McGarry A., Webb, D.C. (2017). Co-Design of Activities for PhET Simulations, Balancing Reform and Reality. Presentation at the *International Society for Design and Development in Education Conference*. Berkeley, California.

CURRENT RESEARCH SUPPORT

Hybrid Human-Agent Tutoring (HAT) Platform to Accelerate Middle School Math Achievement for Low Income Students
Source of Support: Private foundation funding
Role: Co-PI
Total Award Amount: $9,700,000

Human Tutoring Augmented by Artificial Intelligence (AI): Tutoring Analytics and Performance Support (TAPS)
Source of Support: National Science Foundation (NSF# 2222647)
Role: Co-PI
Total Award Amount: $1,800,000

NSF National AI Institute for Student-AI Teaming (iSAT)
Source of Support: National Science Foundation (NSF# 2019805)
Role: Senior Personnel (theme lead)
Total Award Amount: $19,993,294

Developing a model of teacher learning to support computationally rich communication in science classroom
Source of Support: James S. McDonnell Foundation
Role: Senior Personnel
Total Award Amount: $2,500,000

Collaborative Research: DTI: STEM Career Connections:
A model for preparing economically-disadvantaged rural youth for the future workforce
Source of Support: National Science Foundation (ITEST NSF 19-583)
Role: Senior Personnel
Total Award Amount: $599,660

Collaborative Research: SchoolWide Labs: A real-time sensing platform for integrating computational thinking into middle school STEM curricula
Source of Support: National Science Foundation (NSF #1742053, #1742046)
Role: Senior Personnel
Total Award Amount: $2,123,801

COMPLETED RESEARCH SUPPORT

To conduct research and development of technology-enabled approaches in middle years math that could lead to dramatic impact on student learning.
Source of Support: Bill and Melinda Gates Foundation, awarded to Woot Math in 2018
Role: Senior Personnel
Total Award Amount: $460,755

A Novel Platform for High-Quality Formative Assessment in Mathematics

Source of Support: Institute of Educational Sciences, Phase I and Phase II
Role: Senior Personnel
Total Award Amount: $150,000 and $900,000

Teaching and Learning Algebraic Thinking Across the Middle Grades: A Research-based Approach Using PhET Interactive Simulations
Source of Support: National Science Foundation DRK12
Role: Graduate Research Assistant
Total Award Amount: $2,199,109

A Question of Numbers: Numeracy, Learning, and Learning about Learning
Source of Support: National Science Foundation SBIR Phase I and Phase II
Role: Graduate Research Assistant and Consulting Researcher
Total Award Amount: $150,000 and $1,275,000

oDREAMS: Promoting Computational Thinking through Game & Simulation Design and iTEST (Innovative Technology Experiences for Students and Teachers) scale up
Source of Support: National Science Foundation
Role: Graduate Research Assistant
Total Award Amount: $1,920,020
Source of Support: Google Computer Science for High School (CS4HS)

PUBLICATIONS IN PROGRESS

Bush, J.B., Jones, K. (2025) Juxtaposing the World Making of Magical Learning Environments and Theories of Learning in Fantasy Literature: A Cross-Case Comparison. long paper submitted to ISLS 2025

Bush, J.B., Quentin Biddy, Michael Chang, Gregory Benedis Grab, Thomas Breideband, Tamara Sumner, William Penuel, John Weatherly, Tilak Singh and Sidney D'Mello. (2025) Community-Building in K12 Classrooms with a Collaborative AI Agent and Associated Curriculum Routines. long paper submitted to CSCL 2025

Bush, J.B., Dey, I., Hoang, N. (2025) Investigating teacher support for collaboration: lessons from a mixed-methods study in middle-school CS classrooms. long paper submitted to CSCL 2025

Dey, I. Emily Doherty, Rui Zhang, Nga Hoang, Jeffrey Bush, Leanne Hirshfield and Sadhana Puntambekar (2025) Examining support moments with a conversational AI partner. long paper submitted to CSCL 2025

Breideband, T., Bush, J., Chandler, C., Chang, M. A., Hirshfield, L., von der Wense, K., Penuel, W. R., Reitman, J. G., Rose, S., Weatherley, J., & D'Mello, S. (under review). CoBi: An AI to Support Development of Collaboration Skills and Community Building in Classrooms.

Breideband, T., Jeffrey Bush, Chelsea Chandler, Michael Chang, Rachel Dickler, Peter Foltz, Ananya Ganesh, Leanne Hirshfield, Rachel Lieber, William Penuel, Jason Reitman, John Weatherley, D'mello, S. An AI Community Builder to Support Collaborative Learning in Classrooms. Paper submitted to CHI 2024

Biddy, Q., Bhaduri, S., Jacobs, J., Recker, M., Nixon, J., Bush, J.B., Sumner, T. (2024) From co-design to co-adaptation: The evolution of teacher professional learning across a long-term research practice partnership. Paper submitted to International Journal of STEM Education

Bush, J.B. Bhaduri, S., Rummel, M., Chang, M., Biddy, Q., (2023) Computing for OUR future: multiple case study analysis of STEM mentor influence on youth's experience using sensor technology to address personally relevant community issues. Submission to International Journal of Child-Computer Interaction. Manuscript in review

Bush, J.B. (2023) Student Response Systems to Facilitate Formative Assessment: Linking Representations, Student Ideas and Discourse in Algebra Classrooms. Manuscript in preparation.

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Bush, J.B., Webb, D.C., Perkins, K. (2023) Simulations as an Instructional Catalyst: A Study of Change in Middle Grades Mathematics Teacher Practice. Manuscript in preparation for JMTE.

Nixon, J., Potvin, A., Hennessy Elliott, C., Bush, J.

COURSES TAUGHT AND TEACHER PROFESSIONAL LEARNING FACILITATED

Self-Driving Cars: How autonomous vehicles keep us safe, make fair decisions and get us where we need to go.
Teacher Professional Learning – 4 day summer course with ongoing mid-year sessions

Sensor Immersion: Using Programmable Sensors to Conduct Locally Relevant Scientific Investigations
Teacher Professional Learning – 4 day summer course with ongoing mid-year sessions
Sensor Immersion Curriculum taught to over 10,000 students to date

Problem Based Instruction in Secondary Mathematics
Graduate level university course

Mathematics for Elementary School Educators
Undergraduate level college course

Teaching and Learning K-12 Statistics and Probability
Graduate level university course

Teaching and Learning K-12 Algebraic Thinking
Graduate level university course

Introduction to teaching CS with AgentCubes Online
Teacher Professional Learning - 4 day summer course

AP Calculus
High school year-long course

Algebra II
High school year-long course

Environmental Geology
High school semester-long course

Robotics for Beginners
Middle school week-long summer intensive course

SERVICE

British Journal of Education Technology – Reviewer
Transactions on Computing Education –Reviewer
American Education Research Association – Reviewer
Computer Supported Collaborative Learning Conference – Reviewer
International Conference on the Learning Sciences – Reviewer
International Conference of Computer-Supported Collaborative Learning – Reviewer
SIGCSE Conference – Reviewer
iSAT Trainee Grant Committee – NSF National AI Institute for Student-AI Teaming: 2022-present
Executive Committee – NSF National AI Institute for Student-AI Teaming: 2021-present
Volunteer Bike Mechanic – Community Cycles, Boulder, CO: 2022-present

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United Government of Graduate Students – School of Education assembly representative: 2016-2019
Volunteer Tutor – I Have A Dream Foundation of Boulder County: 2018-2019