

Office Address

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Chemistry education researcher who seeks to improve education, research, and practice by understanding the cognitive underpinnings of chemistry learning and applying this knowledge to classroom environments.

Formal Education

PhD	Anticipated Spring 2027, Educational Psychology, University of Wisconsin–Madison. Doctoral minor: Curriculum and Instruction Dissertation: “From Phenomena to Particles: How can Grounded and Embodied Learning Support Chemical Reasoning.” Co-advisors: Mitchell J. Nathan (Educational Psychology) and Samuel Pazicni (Chemistry).
MS	Educational Psychology, University of Wisconsin–Madison, Fall 2022
MA	Teaching, University of Saint Francis, Fort Wayne, IN, USA, 2017
BA	Psychology, Wabash College, Crawfordsville, IN, USA, 2014

Honors and Awards

2026	School of Education Travel Award
2025-2026	Graduate Research Scholars – School of Education Fellow
2025	Educational Psychology Departmental Travel Award
2024	Educational Psychology Departmental Travel Award
2024	Scientific Conference and Meeting Support from the ACS WI Local Section
2019-2020	Graduate Research Scholars – School of Education Fellow

Grants and Funding

2026	Experiment.com crowdfunded research campaign — dissertation study “From phenomena to particles: How can grounded and embodied learning support chemical reasoning?” Principal researcher. Fully funded: \$2,825 raised toward a \$2,825 goal from, January 27 – February 27, 2026.
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Publications (N.B. * Student mentee co-authors)*Manuscripts in Preparation for Journals and Conference Proceedings*

- i. **Beier, J. P., & Pazicni, S.** When applying “knowledge-in-pieces” in chemistry education, is the goal for this knowledge to “transfer in pieces”? [Manuscript in preparation].
- ii. **Beier, J. P., Rau, M. A.** How students use representations during impasses within a chemistry community-specific problem-solving activity. [Manuscript in preparation].

- iii. Arestakesyan, V., **Beier, J. P.**, Peng, L., & Zhang, I. Y. Physically performing solute–solvent mixings improves novice learners’ performance on visual questions about solute–solvent interaction. [Manuscript under review].

Manuscripts in Peer Reviewed Journals

1. Rau, M. A. & **Beier, J.** (2023). Exploring the effects of gesture-based collaboration on students’ benefit from a perceptual training. *Journal of Educational Psychology*, 115(2), 267-289. <https://doi.org/10.1037/edu0000774>

Manuscripts in Peer Reviewed Conference Proceedings

2. **Beier, J. P.**, *Salman, L., Pazicni, S., Swart, M. I., Nathan, M. J. (2026). Evaluating for ideas: A method for scoring fine-grained analyses in chemistry assessment. In *Proceedings of the 20th International Conference of the Learning Sciences-ICLS 2026*, pp 1197-1201. International Society of the Learning Sciences
3. Xia, F., Kim, C., **Beier, J. P.**, Swart, M. I., Schenck, K. E., & Nathan, M. J. (2025). Embodied transfer of mathematical ideas through gestural replay. In *Proceedings of the 19th International Conference of the Learning Sciences-ICLS 2025*, pp. 917-925. International Society of the Learning Sciences.
4. Kim, C., Xia, F., **Beier, J. P.**, Swart, M. I., Schenck, K. E., & Nathan, M. J. (2025). How students ground mathematics through distributed gestures: Designing computer-supported collaborative embodied learning. In *Proceedings of the 18th International Conference on Computer-Supported Collaborative Learning-CSCL 2025*, pp. 355-359. International Society of the Learning Sciences.
5. Kim, C., Swart, M. I., **Beier, J. P.**, Xia, F., Grondin, M. M., Kim, D., & Nathan, M. J. (2025). Doctoral Colloquium—A comparison of teachers and students in categorizing and representing geometric conjectures using AR simulations. In *Immersive Learning Research-Academic*, 168-175.
6. **Beier, J. P.**, Swart, M. I., Pazicni, S., & Nathan, M. J. (2024). Connecting chemistry understanding: An integrated framework for concretizing abstract visual representations. In *Proceedings of the 18th International Conference of the Learning Sciences-ICLS 2024*, pp. 242-249. International Society of the Learning Sciences.
7. **Beier, J. P.**, & Rau, M. A. (2022). Embodied learning with physical and virtual manipulatives in an intelligent tutor for chemistry. In V. Dimitrova, N. Matsuda, & M. M. D. T. Rodrigo (Eds.), *Artificial Intelligence in Education. AIED 2022. Lecture notes in computer science* (pp. 103-114). Springer.
8. **Beier, J. P.**, & Rau, M. A. (2022). The role of visual representations in impasses during collaborative problem solving in undergraduate chemistry. In Chinn, C., Tan, E., Chan, C., & Kali, Y. (Eds.). *Proceedings of the 16th International Conference of the Learning Sciences - ICLS 2022* (pp. 1888-1889). International Society of the Learning Sciences.

Peer-Reviewed Presentations with Unpublished Proceedings

9. **Beier, J. P.**, Pazicni, S., (2026). Assessing and Evaluating Students’ Assets. In Biennial Conference on Chemical Education 2026.
10. **Beier, J. P.**, Pazicni, S., (2026). Modeling Students’ Reasoning Structures: Establishing Trustworthiness in a Network-Based Analysis of Open Responses. In Biennial Conference on Chemical Education 2026.

11. **Beier, J. P.**, Pazicni, S., (2026). Assessing for ideas of observable phenomena: Theory, tool, and evaluation. In American Chemical Society Spring Meeting 2026.
12. **Beier, J. P.**, Pazicni, S., Rau, M. A., (2024). Complementing computer-based learning activities with physical experiences. In Biennial Conference on Chemical Education 2024.
13. **Beier, J. P.**, Pazicni, S., Rau, M. A., (2024). A semiotic approach to studying students' representational use during collaborative impasses. In Biennial Conference on Chemical Education 2024.
14. Sangha, A., **Beier, J. P.**, Pazicni, S., Popova, M., (2024). Investigating inorganic chemistry students' strategies when characterizing symmetry of geometric shapes. In Biennial Conference on Chemical Education 2024.
15. **Beier, J. P.**, & Rau, M. A. (2023). Haptic experiences with virtual and physical manipulatives in chemistry. In the Annual Meeting of the American Educational Research Association. AERA 2023.

Other Scholarly Presentations

16. *Lewis, J., **Beier, J. P.**, *Li, E., *Salman, L., *Bennett, J., Pazicni, S., (2026). Shifts in Particle-Level Reasoning: How Different Representations Elicit Different Student Models. UW–Madison Department of Chemistry Undergraduate Research Symposium
17. *Bennett, J., **Beier, J. P.**, Pazicni, S., (2026). Observational Study of Assessment Outcomes at an Undergraduate and High School Level. UW–Madison Department of Chemistry Undergraduate Research Symposium
18. **Beier, J. P.**, Pazicni, S., (2026). On the development of a cognitive model for students' reasoning about gas phenomena. UW–Madison Teachers' Tea
19. *Lewis, J., & **Beier, J. P.**, (2025). Physical or Blended Manipulatives in Chemistry: A Comparison of Their Impact on Students' Reasoning and Understanding. UW–Madison Undergraduate Symposium
20. *Li, E. & **Beier, J. P.**, (2025). The Nature of Chemical Understanding After a Lesson in an Intelligent Tutoring System. UW–Madison Undergraduate Symposium
21. *Garcia-Vidal, D., *Bailey, K., **Beier, J. P.**, (2023). Haptic Experiences with Manipulatives in Chemistry. UW–Madison Undergraduate Symposium
22. *Guan, Y., **Beier, J. P.**, (2023). Physical Manipulatives in Chemistry: What Parts of Physical Manipulatives are Most Important to Students? UW–Madison Undergraduate Symposium

Research Experience

2020-2023	Project Assistant: Intelligent Blending of Physical and Virtual Representations
2020	<i>Intelligent Blending of Virtual & Physical Manipulatives: Effects of Sequencing</i> . Poster presentation
2014	Undergraduate Research Conference, Short Talk (Butler University)
2013	Undergraduate Research Assistant, Psychology, Wabash College

Teaching Experience

Higher Education

Fall 2026	Chemistry 109 (Advanced General Chemistry) TA Lead two discussion sections and one laboratory section in an accelerated one-semester general chemistry course covering atomic and molecular structure, chemical equilibrium, acid-base chemistry, thermodynamics, kinetics, and electrochemistry; part of an introductory chemistry program serving approximately 3,500 students annually.
2023-2025	Educational Psychology 301 (How People Learn) Instructor of record Presents foundational theories of learning, perspectives on knowing, relation between learning theory and application, and implications for teaching and the design of learning environments.
Summer 2023	Educational Psychology 301 (How People Learn) TA
2022-2025, 2019-2020	Undergraduate Research Scholar (URS) Mentor Facilitate early scholar education and interdisciplinary training through hands-on research experience and skill development in a year-long project in their field.

Secondary Education

2015-2019	Chemistry Teacher, Bishop Dwenger High School
2018-2019	Administrator in Training, Bishop Dwenger High School
2017-2019	USATF Certified Head Track Coach, Bishop Dwenger High School
2016-2019	Assistant Football Coach, Bishop Dwenger High School
2015-2017	Science Olympiad Mentor, Bishop Dwenger High School
2014-2015	Science Teacher, Agua Fria Union High School

Undergraduate Research Mentorship (23)

(N.B. *Indicates Educational Psychology; +Indicates URS; #Indicates Chemistry; ‡Indicates Computer Science)

Kevin Lee^{*}; Isabel Sabor^{*}; Isa Butz⁺; Eileen Hoang^{*}; Julia Chait^{*}; Alexa Hoffman^{*}; Alex Polyakov^{*}; Amisha Talati^{*}; Chris Wang^{*}; Emma Cushman^{*}; Isaac King^{*}; Marni Schneider^{*}; Nurhayati Ali^{*}; Reed Weston^{*}; Thomas Markou^{*}; Mathilda (Yifei) Guan⁺; Katelyn Bailey^{*}; Diana Garcia-Vidal^{*}; Julia Bennett^{*}; Laura Salman^{*}; Evelyn Li⁺⁺; Joey Lewis^{+#}; ‡Neil Pendyala

Professional Experience

2025-2026	Committee Organizer: Learning Sciences Area: Graduate Student Campus Visit Day
2024	Reviewer: Chemistry Education Research and Practice
2024-2026	Reviewer: International Conference of the Learning Sciences
2023	SIG Reviewer: American Educational Research Association, Learning Sciences
2022	Committee Member: Learning Sciences area: Graduate Student Campus Visit Day
2020-2021	Committee Member: Learning Sciences Graduate Student Conference
2019-2020	Organizing Committee Member: Learning Sciences Graduate Student Conference

Media and Public Scholarship

- 2026 “Joel Beier.” Student Features, University of Wisconsin–Madison Graduate School, March 31, 2026. <https://grad.wisc.edu/2026/03/31/joel-beier/>
- 2023 Beier, J. P. “Where should EV charging stations go, and how can they benefit businesses? Yash Babar looks to big data for answers.” UW–Madison Office of Sustainability, Experts Database series, September 7, 2023.