Brian Douglas Gane

CONTACT INFORMATION

ATLAS
University of Kansas
Lawrence, KS 66045 USA

Phone:+1–785–964–7093
E-mail: bgane@ku.edu
Orcid: 0000-0002-4454-569X

RESEARCH INTERESTS

assessment, alternate assessments, STEM education, quantitative modeling, validity, psychometrics, learning communities, instructional design, educational technology, skill acquisition, practice schedules, task analysis

EDUCATION

Georgia Institute of Technology, Atlanta, GA USA

Ph.D., Engineering Psychology (2011)

- Specialization: Cognitive
- Minor: Quantitative
- Thesis: *A framework for demonstrating practice schedule effects in skill acquisition*
- Advisor: Dr. Richard Catrambone

M.S., Engineering Psychology (2006)

- Thesis: *Can modular examples and contextual interference improve transfer?*
- Advisor: Dr. Richard Catrambone

The University of Texas at Austin, Austin, TX USA

B.A., Psychology (2001)

- Psychology with Honors
- Minor: Computer Science
- Thesis: *Exploring a dual-process account of metaphors*
- Advisor: Dr. Bradley C. Love

ACADEMIC RESEARCH EXPERIENCE

Research Project Director 2022–Present

Accessible Teaching, Learning, and Assessment Systems (ATLAS)
University of Kansas

Research Assistant Professor 2019–2022

Learning Sciences Research Institute
University of Illinois at Chicago

Visiting Research Assistant Professor 2014–2019

Learning Sciences Research Institute
University of Illinois at Chicago

Postdoctoral Research Associate 2013–2014

Learning Sciences Research Institute
University of Illinois at Chicago

Postdoctoral Fellow 2012–2013

Center for Education Integrating Science, Mathematics, & Computing
Georgia Institute of Technology

Research Awards

Collaborative research: Improving multi-dimensional assessment and instruction: Building and sustaining elementary science teachers' capacity through learning communities
Discovery Research PreK-12, National Science Foundation (#1813737) 2018–2024
Principal Investigator: James Pellegrino $1,650,521
Co-Principal Investigator: **Brian Gane**

Journal Publications

Gane, B. D., Gaur, D., Arnold, S., & Damelin, D. (2024). Multidimensional science assessment: Design challenges and technology affordances. *Educational Designer, 4*(16). http://www.educationaldesigner.org/ed/volume4/issue16/article62/

Luo, F., Israel, M., & **Gane, B.** (2022). Elementary computational thinking instruction and assessment: A learning trajectory perspective. *ACM Transactions on Computing Education, 22*(2), 1–26. https://dl.acm.org/doi/10.1145/3494579

Gane, B. D., Israel, M., Elagha, N., Yan, W., Luo, F., & Pellegrino, J. W. (2021). Design and validation of learning trajectory-based assessments for computational thinking in upper elementary grades. *Computer Science Education, 31*(2), 141–168.[1] https://doi.org/10.1080/08993408.2021.1874221

Gane, B. D., Zaidi, S. Z., & Pellegrino, J. W. (2018). Measuring what matters: Using technology to assess multidimensional learning. *European Journal of Education, 53*(2), 176–187. https://doi.org/10.1111/ejed.12269

Jorion, N., **Gane, B. D.**, James, K., Schroeder, L., DiBello, L. V., & Pellegrino, J. W. (2015). An analytic framework for evaluating the validity of concept inventory claims. *Journal of Engineering Education, 104*(4), 454–496.[2] https://doi.org/10.1002/jee.20104

Lyons, K., Starner, T., & **Gane, B. D.** (2006). Experimental evaluations of the Twiddler one-handed chording mobile keyboard. *Human-Computer Interaction, 21*(4), 343–392. https://doi.org/10.1207/s15327051hci2104_1

Book Chapters

Gane, B. D., Severance, S., & Krajcik, J. (2024). Creating assessment tasks for NGSS classrooms: An overview of the design process. In C. J. Harris, J. Krajcik, & J. W. Pellegrino (Eds.), *Creating and using instructionally supportive assessments in NGSS classrooms* (pp. 19-44). Richmond, VA: NSTA Press. https://my.nsta.org/resource/130346

Douglas, K., A., **Gane, B. D.**, Neumann, K., & Pellegrino, J. W., (2020). Contemporary methods of assessing integrated STEM competencies. In C. C. Johnson, M. Mohr-Schroeder, T. Moore, L. Bryan, & L. English (Eds.) *Handbook of research on STEM education* (pp. 234–254). New York, NY: Routledge. https://doi.org/10.4324/9780429021381

DiBello, L. V., Pellegrino, J. W., **Gane, B. D.**, & Goldman, S. R. (2017). The contribution of student response processes to validity analyses for instructionally supportive assessments. In K. Ercikan & J. W. Pellegrino (Eds.), *Validation of score meaning in the next generation of assessments* (pp. 85–99). New York, NY: Routledge. https://doi.org/10.4324/9781315708591-8

Conference Proceedings

Gane, B. D., Lehman, E., Bates, M., Zaidi, S., Lee-Hassan, A., Gaur, D., Madden, K., & Pellegrino, J. (2020). Building a professional learning community around science assessment: Designing and using assessment tasks to support multi-dimensional

[1] Reprinted in D. Weintrop, D. W. Rutstein, M. Bienkowski, & S. McGee (Eds.) (2024), *Assessing computational thinking: An overview of the field*, New York, NY: Routledge.

[2] Received Honorable Mention for the 2016 William Elgin Wickenden Award of the American Society for Engineering Education.

instruction. In M. Gresalfi and I. S. Horn (Eds.), *The Interdisciplinarity of the Learning Sciences, 14th International Conference of the Learning Sciences (ICLS) 2020, Volume 4* (pp. 2357–2358). Nashville, TN: International Society of the Learning Sciences.

Gane, B. D., Elagha, N., Luo, F., Liu, R., Yan, W., Strickland, C., Franklin, D., Rich, K., Pellegrino, J., & Israel, M. (2020). Developing computational thinking assessments for elementary students: Connecting cognition, observation, and interpretation. In M. Gresalfi and I. S. Horn (Eds.), *The Interdisciplinarity of the Learning Sciences, 14th International Conference of the Learning Sciences (ICLS) 2020, Volume 3* (pp. 1781–1782). Nashville, TN: International Society of the Learning Sciences.

Luo, F., Israel, M., Liu, R., Yan, W., **Gane, B.**, & Hampton, J. (2020). Understanding students' computational thinking through cognitive interviews: A learning trajectory-based analysis. In *Proceedings of the 51st ACM Technical Symposium on Computer Science Education (SIGCSE '20)* (pp. 919–925). New York, NY: Association for Computing Machinery. https://doi.org/10.1145/3328778.3366845

Anderson, C. W., **Gane, B.**, Hmelo-Silver, C. E., Mohan, L., & Vo, T. (2019). CCCs as epistemic heuristics to guide student sense-making of phenomena. In S. J. Fick, J. Nordine, & K. W. McElhaney (Eds.), *Proceedings of the Summit for Examining the Potential for Crosscutting Concepts to Support Three-Dimensional Learning.* Charlottesville, VA: University of Virginia. Retrieved from http://curry.virginia.edu/CCC-Summit.

Nordine, J., Barh-Cohen, L., **Gane, B.**, McKenna, T. J., & Vo, T. (2019). Looking forward to setting an agenda for research into crosscutting concepts. In S. J. Fick, J. Nordine, & K. W. McElhaney (Eds.), *Proceedings of the Summit for Examining the Potential for Crosscutting Concepts to Support Three-Dimensional Learning.* Charlottesville, VA: University of Virginia. Retrieved from http://curry.virginia.edu/CCC-Summit.

Pellegrino, J. W., **Gane, B. D.**, Zaidi, S. Z., Harris, C. J., McElhaney, K. W., Alozie, N., Haugabook-Pennock, P., Severance, S., Neumann, K., Fortus, D., Krajcik, J., Nordine, J., Furtak, E. M., Briggs, D., Chattergoon, R, Penuel, B., Wingert, K. Van Horne, K. (2018). The challenge of assessing "knowledge in use": Examples from three-dimensional science learning and instruction. In J. Kay and R. Luckin (Eds.), *Rethinking Learning in the Digital Age: Making the Learning Sciences Count, 13th International Conference of the Learning Sciences (ICLS) 2018, Volume 2* (pp. 1211–1218). London, UK: International Society of the Learning Sciences.

Vaishampayan, G. A., Price, A., Kauffman, K., Messersmith, P., Rico-Beck, L., & **Gane, B. D.** (2018). Examining the role of unpacking 3-Dimensional teaching and learning in museum-based professional development. In J. Kay and R. Luckin (Eds.), *Rethinking Learning in the Digital Age: Making the Learning Sciences Count, 13th International Conference of the Learning Sciences (ICLS) 2018, Volume 3* (pp. 1495–1496). London, UK: International Society of the Learning Sciences.

Wink, D. J., **Gane, B. D.**, Ko, M., George, M., Zeller, L., Goldman, S. R., Pellegrino, J. W., & Kang, R. (2018). Developing interdisciplinary competencies for science teaching and learning: A teacher-researcher professional learning community. In J. Kay and R. Luckin (Eds.), *Rethinking Learning in the Digital Age: Making the Learning Sciences Count, 13th International Conference of the Learning Sciences (ICLS) 2018, Volume 3* (pp. 1521–1522). London, UK: International Society of the Learning Sciences.

Gane, B. D., Denick, D., Jorion, N., DiBello, L. V., Pellegrino, J. W., Streveler, R. A., & Miller, R. L. (2015). Continuous improvement of a concept inventory: Using evidence centered design to refine the Thermal and Transport concept inventory. In *Proceedings of the 2015 American Society for Engineering Education Annual Conference and Exposition* (electronic). American Society for Engineering Education.

Jorion, N., **Gane, B. D.**, DiBello, L. V., & Pellegrino, J. W. (2015). Developing and validating a concept inventory. In *Proceedings of the 2015 American Society for Engineering Education Annual Conference and Exposition* (electronic). American Society for Engineering Education.

Usselman, M., Ryan, M., Rosen, J. H., Stillwell, F., Robinson, N. F., **Gane, B. D.**, & Grossman, S. (2013). Integrating K-12 engineering and science: Balancing inquiry, design, standards and classroom realities. In *Proceedings of the 2013 American Society for Engineering Education Annual Conference and Exposition.* American Society for Engineering Education.

Gane, B. D. & Catrambone, R. (2011). Extended practice in motor learning under varied practice schedules: Effects of blocked, blocked-repeated, and random schedules. In *Proceedings of the Human Factors and Ergonomics Society 55th Annual Meeting* (pp. 2143–2147). Santa Monica, CA: Human Factors and Ergonomics Society.

Ryan, M., **Gane, B. D.**, & Usselman, M. (2011). Comparison of two curriculum models for mapping engineering core concepts to existing science and mathematics standards. In *Proceedings of the 2011 American Society for Engineering Education Annual Conference and Exposition.* American Society for Engineering Education.

Gane, B. D. & Catrambone, R. (2010). Order effects in categorization: Identifying "the nuts" in poker [Abstract]. In S. Ohlsson & R. Catrambone (Eds.), *Proceedings of the 32nd Annual Conference of the Cognitive Science Society* (p. 713). Austin, TX: Cognitive Science Society.

Gane, B. D. & Catrambone, R. (2010). Learning to categorize word problems: Effects of practice schedule. In K. Gomez, L. Lyons, & J. Radinsky (Eds.), *Proceedings of the 9th International Conference of the Learning Sciences - Volume 2, Short Papers, Symposia, and Selected Abstracts* (p. 322–323). Chicago, IL: International Society of the Learning Sciences.

Gane, B. D. & Catrambone, R. (2007). Ordering worked examples to promote categorization. In D. S. McNamara & J. G. Trafton (Eds.), *Proceedings of the 29th Annual Conference of the Cognitive Science Society* (pp. 1019–1024). Austin, TX: Cognitive Science Society.

Kientz, J. A., Patel, S. N. Tyebkhan, A. T., **Gane, B.**, Wiley, J., & Abowd, G. D. (2006). Where's my stuff? Design and evaluation of a mobile system for locating lost items for the visually impaired. In *Proceedings of the Eighth International ACM SIGACCESS Conference on Computers and Accessibility* (pp. 103–110). New York: ACM Press.

Gane, B. D. & Catrambone, R. (2006). Give learners questions to answer while they watch animated examples. In S. A. Barab, K. E. Hay, & D. T. Hickey (Eds.), *Proceedings of the 7th International Conference on Learning Sciences* (pp. 922–923). Mahwah, NJ: Erlbaum.

Lyons, K., **Gane, B.**, Starner, T., & Catrambone, R. (2005). Improving novice performance on the Twiddler one-handed chording keyboard. In O. Herzog, M. Lawo, P. Lukowicz, & J. Randall (Eds.), *Proceedings of the Second Annual International Forum on Applied Wearable Computing* (pp. 145–160). Berlin, Germany: VDE VERLAG.

Technical Reports & White Papers

Gane, B. D. & Clark, A. K. (2023). Parent feedback on DLM score reports (Research Synopsis 23-01). University of Kansas, Accessible Teaching, Learning, and Assessment Systems. https://dynamiclearningmaps.org/sites/default/files/documents/publication/Parent_Feedback_Score_Reports_RS_23-01.pdf

Gane, B. D. & Hendricks, C. C. (January, 2014). Evaluating the performance of pretests and posttests developed to assess science learning in the SLIDER curriculum: Results from academic year 2012–2013. CEISMC-TR-1401.

Hendricks, C. C. & **Gane, G. D.** (September, 2013). SLIDER curriculum enactment report for AY 2012–2013.

Gane, B. D. & Hendricks, C. C. (July, 2013). Creating pretests and posttests for the SLIDER curriculum: A procedure for mapping and aligning AAAS Project 2061 items to an inquiry-based science curriculum. CEISMC-TR-1301.

Educational Artifacts & Resources

Everyday Computing

- http://everydaycomputing.org/
- Integrated math + computational thinking instructional lessons and assessments designed for use in Grade 3 and Grade 4

Mi-STAR

- https://mi-star.mtu.edu/
- NGSS-aligned, middle school science curriculum and assessments for Grades 6, 7, & 8

Next Generation Science Assessment

- https://ngss-assessment.portal.concord.org/
- Technology-enhanced assessment tasks for elementary and middle school science
- Multi-dimensional assessments, aligned to the Next Generation Science Standards

Science Learning Integrating Design, Engineering, & Robotics

- http://slider.gatech.edu/
- Middle school physical science instructional units that adopt a project-based learning approach
- Students use LEGO robotics to engineer solutions to community problems
- **Gane, B.**, Grossman, S., Newsome, N. A., Rosen, J., Ryan, M., Sonnenberg-Klein, J., & Usselman, M. (2012). *SLIDER Accident Challenge: Learning Set 2.*
- **Gane, B.**, Grossman, S., Newsome, N. A., Rosen, J., Ryan, M., Sonnenberg-Klein, J., & Usselman, M. (2012). *SLIDER Accident Challenge: Learning Set 1.*
- **Gane, B.**, Grossman, S., Newsome, N. A., Rosen, J., Ryan, M., & Usselman, M. (2011). *SLIDER Launcher Unit Learning Set 2: Nuclear Reactor Challenge.*
- Ryan, M., Rosen, J., **Gane, B.**, Usselman, M., Grossman, S., & Newsome, N. A. (2011). *SLIDER Launcher Unit Learning Set 1: Accident Challenge.*

Conference Presentations

Gane, B. D., Clark, A., K., & Adkins, D. (2024, April). *Understanding parents' interpretation and use of individual student score reports.* Paper presented at the 2024 National Council on Measurement in Education annual meeting, Philadelphia, Pennsylvania.

Lehman, E. M., **Gane, B. D.**, & Zaidi, S. Z. (2022, July). *Multidimensional assessment tasks and a virtual learning community for elementary science teachers.* Presentation at the 2022 NSTA National Conference on Science Education, Chicago, Illinois.

Gane, B., Arnold, S., Gaur, D., & Damelin, D. (2021, October). *Designing technology-enhanced science assessment tasks for students to demonstrate knowledge-in-use.* Poster presented at the 2021 NCME Classroom Assessment Conference (virtual).

Bluth, G., **Gane, B.**, Gonczi, A., Huntoon, J., Tubman, S., & McIntyre, B. (2021, October). *Balancing tensions between the NGSS vision and realities of classroom assessment.* Paper presented at the 2021 NCME Classroom Assessment Conference (Virtual).

Gane, B. D. (2021, September). Knowledge-in-use in science and implications for the design of learning environments. In Kubsch, M. (Chair), *Understanding How Students Learn to Apply Science Ideas – Many Models Thinking as a Unified Approach?* Symposium at the 14th Conference of the European Science Education Research Association (Virtual).

Hapgood, S., Czerniak, C., Gotwals, A., Wright, T., Fulmer, G., Hand, B., Lehman, E., **Gane, B.**, Songer, N., & Newstadt, M. (2021, April). *Opportunities and challenges of facilitating educator's understanding and use of the Next Generation Science Standards.* Symposium at the NARST Annual International Conference (Virtual).

Gane, B. D., Zaidi, S. Z., Zhai, X., & Pellegrino, J. W. (2020, April). Using machine learning to score tasks that assess three-dimensional science learning. In X. Zhai (Chair), *Applying Machine Learning in Next-Generation Science Assessment.* Symposium at the American Educational Research Association annual meeting, San Francisco, CA. (Conference canceled)

Gane, B. D., Elagha, N., Luo, F., Liu, R., Yan, W., Strickland, C., ..., & Israel, M. (2020, April). *Developing computational thinking assessments from learning trajectories: Design approach and preliminary validity evidence.* Paper at the 2020 American Educational Research Association annual meeting, San Francisco, CA. (Conference Canceled)

Weiser, G., **Gane, B. D.**, Harris, C., J., Pellegrino, J., Zaidi, S. Z. (2020, March). *Understanding external expert review of design artifacts in design-based research: A guide for the perplexed.* Paper at the NARST Annual International Conference, Portland, OR. (Conference canceled)

Wink, D., **Gane, B.**, Ko, M., Goldman, S., Pellegrino, & J., Zeller, L. (2019, April). *Developing three-dimensional assessment literacy for science teaching and learning: A teacher-researcher professional learning community.* Presentation at the 2019 NSTA National Conference, St. Louis, MO.

Gane, B. D., Zaidi, S. Z.. McElhaney, K., & Pellegrino, J. W. (2019, April). Design and validation of instructionally supportive assessment: Examining student performance on knowledge-in-use assessment tasks. In J. Koster van Groos (Chair), *Next Generation Science Standards Assessment Design Across Use Cases: From Formative Classroom Assessment to Large-Scale Accountability Assessment.* Symposium conducted at the American Educational Research Association annual meeting, Toronto, ON, CA.

Harris, C. J., Pellegrino, J. W., Krajcik, J. S., Damelin, D., Alozie, N., McElhaney, K., ..., & Severance, S. (2019, April). Designing and implementing instructionally supportive assessment tasks for promoting three-dimensional learning: Challenges faced and lessons learned. In A. Badrinarayan (Chair), *Overcoming Challenges in Developing and Implementing Next Generation Science Standards' Aligned Instructional Materials and Assessments.* Symposium conducted at the American Educational Research Association annual meeting, Toronto, ON, CA.

Zeller, L., Wink, D. J., & **Gane, B. D.** (2019, April). *Teacher exploratory and expository talk: Contrasting cases of unpacking the NGSS science and engineering practices.* Paper presented at the NARST Annual International Conference, Baltimore, MD.

Gane, B. D., Wink, D., Kemp, N., Levites, L., Sarna, J., & the ALPs Team (2018, October). *Assessment in the science classroom: A professional learning community centered around assessment practice.* Poster presented at the 2018 NCME Special Conference on Classroom Assessment, Lawrence, KS.

Templin, J., **Gane, B. D.**, Douglas, K., Zaidi, S., & Pellegrino, J. (2018, October). *Validating classroom assessments of multidimensional science and engineering competencies using Bayesian diagnostic models.* Poster presented at the 2018 NCME Special Conference on Classroom Assessment, Lawrence, KS.

Gane, B. D., McElhaney, K. W., Zaidi, S. Z., & Pellegrino, J. W. (2018, March). *Analysis of student and item performance on three-dimensional constructed response assessment tasks.* Paper presented at the 2018 NARST Annual International Conference, Atlanta, GA.

Harris, C. J., Krajcik, J. S., Pellegrino, J. W., McElhaney, K. M., Pennock, P., H., & **Gane, B. D.** (2018, March). *Designing classroom-based assessments for supporting three dimensional teaching and learning.* Paper presented at the 2018 NARST Annual International Conference, Atlanta, GA.

McElhaney, K. W., Zaidi, S., **Gane, B. D.**, Alozie, N., & Harris, C. J. (2018, March). *Designing NGSS-aligned assessment tasks and rubrics to support classroom-based formative assessment.* Paper presented at the 2018 NARST Annual International Conference, Atlanta, GA.

Zaidi, S. Z., Ko, M., **Gane, B. D.**, Madden, K., Gaur, D., & Pellegrino. J. W. (2018, March). *Portraits of teachers using three-dimensional assessment tasks to inform instruction.* Paper presented at the 2018 NARST Annual International Conference, Atlanta, GA.

Zaidi, S. Z. & **Gane, B. D.** (2017, November). *NGSS, 3D learning, and the design and use of classroom assessments.* Presentation at the 2017 National Science Teachers Association (NSTA) Regional Conference, Milwaukee, WI.

Pellegrino, J. W., **Gane, B. D.**, Zaidi, S. Z., Harris, C., McElhaney, K., Aloze, N. et al. (2017, September). *Designing and using instructionally supportive, NGSS-aligned science assessments with diverse learner.* Symposium at the 2017 NCME Special Conference on Classroom Assessment and Large-Scale Psychometrics: The Twain Shall Meet, Lawrence, KS.

McElhaney, K. W., **Gane, B. D.**, DiBello, L. V., Fujii, R., Haugabook Pennock, P., Vaishampayan, G., & Pellegrino, J. W. (2017, April). *Designing scoring rubrics to support NGSS-aligned, classroom-based formative assessment.* Poster presented at the American Educational Research Association annual meeting, San Antonio, TX.

Gane, B. D., McElhaney, K. W., Pennock, P. H., & Krajcik, J. S. (2017, March). *Classroom-based assessment tasks and rubrics: Using student responses as evidence of three-dimensional learning.* Presentation at the National Science Teachers Association (NSTA) National Conference, Los Angeles, CA.

Pennock, P. H. & **Gane, B.** (2017, March). *Designing three-dimensional tasks for the Next Generation Science Standards.* Poster presentation at the NGSS@NSTA Forum at the National Science Teachers Association (NSTA) National Conference, Los Angeles, CA.

DiBello, L. V., & **Gane, B. D.** (2016, June). *Designing tasks for assessing three-dimensional learning.* Presentation at the 2016 National Conference on Student Assessment (NCSA), Philadelphia, PA.

McElhaney, K. W., **Gane, B. D.**, Harris, C. J., Pellegrino, J. W., DiBello, L. V., & Krajcik, J. S. (2016, April). *Using learning performances to design three-dimensional assessments of science proficiency.* Paper presented at the 2016 National Association for Research on Science Teaching (NARST) Annual International Conference, Baltimore, MD.

Gane, B. & Damery, K. (2016, April). *Three-dimensional assessments for classroom use.* Poster presentation at the NGSS@NSTA Forum at the National Science Teachers Association (NSTA) National Conference, Nashville, TN.

McElhaney, K., Harris, C. J., Peek-Brown, D., **Gane, B.**, & Damelin, D. (2016, April). *Strategies for using NGSS-focused physical science assessment tasks formatively in classrooms.* Presentation at the National Science Teachers Association (NSTA) National Conference, Nashville, TN.

Gane, B. D., Okoroh, C., DiBello, L. V., & Minstrell, J. (2015, April). *Making sense of big data from classroom assessments: Teacher case studies and facets-based physics assessments.* Paper presented at the American Educational Research Association annual meeting, Chicago, IL.

Denick, D., **Gane, B. D.**, Jorion, N., Miller, R. L., Streveler, R. A., DiBello, L., & Pellegrino, J. W. (2015, April). *Continuing refinement of a concept inventory: Developing and selecting items for an expanded domain model.* Poster presented at the American Educational Research Association annual meeting, Chicago, IL.

Dorsey, C., **Gane, B. D.**, Harris, C., & Krajcik, J. (2015, March). *Creating assessments for physical science that integrate the three dimensions of the NGSS.* Presentation at the National Science Teachers Association (NSTA) National Conference, Chicago, IL.

Ryan, M., Usselman, M., Grossman, S., Gale, J. D., Kostka, B. A., Newsome, N. A., **Gane, B. D.**, Koval, J., & Rosen, J. H. (2014, June). *Science Learning with Design, Engineering and Robotics (Curriculum Exchange).* Roundtable presentation at the 2014 American Society for Engineering Education Annual Conference and Exposition.

Jorion, N., **Gane, B. D.**, James, K., Schroeder, L., Pellegrino, J., & DiBello L. (2014, April). Conceptual and analytical frameworks for examining validity and utility of concept inventories. In J. W. Pellegrino (Chair), *Evaluating and Improving Concept Inventories as Assessment Resources in STEM Teaching and Learning.* Symposium conducted at the American Educational Research Association annual meeting, Philadelphia, PA.

Denick, D., Miller, R., Streveler, R., Pellegrino, J., DiBello, L. Schroeder, L. **Gane, B. D.**, James, K. & Jorion, N. (2014, April). The use of evidence centered design to reverse engineer an existing CI and develop new questions for diagnostic reporting. In J. W. Pellegrino (Chair), *Evaluating and Improving Concept Inventories as Assessment Resources in STEM Teaching and Learning.* Symposium conducted at the American Educational Research Association annual meeting, Philadelphia, PA.

Jorion, N., **Gane, B. D.**, James, K., Schroeder, L., Pellegrino, J., & DiBello L. (2014, April). Quantitative analyses of student performance on concept inventories. In J. W. Pellegrino (Chair), *Evaluating and Improving Concept Inventories as Assessment Resources in STEM Teaching and Learning.* Symposium conducted at the American Educational Research Association annual meeting, Philadelphia, PA.

Grossman, S., Ryan, M., **Gane, B.**, & Usselman, M. (2013, April). *Supporting teachers adopting an engineering-based, PBL middle school science curriculum.* Paper presented at the 86$^{\text{th}}$ National Association for Research on Science Teaching (NARST) annual international conference, Rio Grande, Puerto Rico.

Usselman, M., Ryan, M., **Gane, B.**, & Grossman, S. (2013, April). *Innovating science curricula with engineering: A balancing act.* Paper presented at the 86th National Association for Research on Science Teaching (NARST) annual international conference, Rio Grande, Puerto Rico.

Gane, B. D., & Hendricks, C. (2012, April). *Implementing a problem-based learning curriculum in a university-school collaborative project for improving middle school science education: Lessons from year one on fidelity of implementation.* Paper presented at the American Educational Research Association annual meeting, Vancouver, British Columbia, Canada.

Gane, B. D., & Catrambone, R. (2010, November). *Using rate of performance improvement to quantify and compare amount of practice within and across experiments.* Poster presented at the 51st annual meeting of the Psychonomic Society, St. Louis, MO.

Gane, B. D., & Catrambone, R. (2009, April). *Practice schedules in cognitive skill acquisition: Effects of example order on categorization and problem solving.* Paper presented at the American Educational Research Association annual meeting, San Diego, CA.

Gane, B. D., Turaga, R. M. R., Bostrom, A., Catrambone, R., Riggieri, A., & Wood, S. K. (2007, November). *Manipulating maps to affect risk perception: The effects of landmarks and dimensionality.* Poster presented at the 28th Annual Meeting of the Society of Judgment and Decision Making, Long Beach, CA.

Gane, B. D., & Catrambone, R. (2006, November). *Can mental workload during training explain test performance after training?* Poster presented at the 47th Annual Meeting of the Psychonomic Society, Houston, TX.

Gane, B. D., & Catrambone, R. (2006, April). *Can modular examples and contextual interference improve transfer?* Paper presented at the American Educational Research Association annual meeting, San Francisco, CA.

Gane, B. D., Embretson, S. E., & Catrambone, R. (2006, February). *Using IRT to model performance differences from learning materials.* Poster presented at the New Directions in Psychological Measurement With Model-Based Approaches Conference, Atlanta, GA.

Invited Presentations

Bates, M., **Gane, B.**, Lehman, L., Madden, K., & Zaidi, S. (2019, January). *Assessing the NGSS in the classroom.* Presentation given at the Peggy Notebaert Nature Museum Partner Teacher Conference, Chicago, IL.

Bates, M., **Gane, B.**, & Lehman, L. (2018, October). *Improving multi-dimensional assessment and instruction: Building and sustaining elementary science teachers' capacity through learning communities.* Presentation given at the Science For the Next Generation: A Vision for Elementary Science in Chicago Public Schools meeting, Chicago, IL.

Gane, B. D. (2017, October) *Developing assessments for the Next Generation Science Standards: The role of design process and measurement modeling in validation.* Presentation given at the Purdue University weekly engineering education symposium.

Gane, B. D. (2017, June). *A design framework for developing science assessment tasks for formative use.* Presentation given at the 2017 RiSE Conference at the University of Maine. Orono, ME.

Gane, B. D.[3] (2016, November) *Assessments for three-dimensional learning: Developing assessments that conform to the NGSS.* Presentation given at the third annual Northern Illinois Science Educators (NISE) Conference, Naperville, IL.

Pellegrino, J. W., & **Gane, B. D.** (2016, May) *NGSS and the design of 3-D classroom assessments.* Presentation given at the District Science Collaborative quarterly meeting, West Dundee, IL.

Gane, B. D. (2013, April). *What to teach and how to test? Designing curriculum and assessment when adding engineering into a physical science class.* Presentation given at the weekly journal club seminar at the Learning Sciences Research Institute, the University of Illinois at Chicago.

Local Presentations

Gane, B. D., Arnold, S., & Strickland, C. (2022, November) *Using rubrics and multidimensional assessment to promote students' science learning.* Presentation given at the 2022 Northern Illinois Science Educators (NISE) Conference, Naperville, IL.

Lehman, L., Bates, M., **Gane, B.**, & Gaur, D. (2019, November). *Assessing the NGSS in the Classroom.* Presentation given at the Northwestern University's 10^{th} Annual STEM Summit, Prairie State College, Chicago Heights, IL.

Gane, B. D. (2017, November). *Developing assessments for the Next Generation Science Standards: The role of design process and measurement modeling in validation.* Presentation given at the UIC Learning Sciences Researcher Institute seminar series at the University of Illinois at Chicago.

Gane, B. D. (2016, April). *Big data from the classroom: Analyzing and validating diagnostic physics assessments.* Presentation given at the UIC Learning Sciences Research Institute seminar series at the University of Illinois at Chicago.

Gane, B. D. (2015, October). *Conceptual Knowledge in Physics: Making Meaning from Classroom Assessments.* Presentation given at the weekly cognitive brown bag at the Department of Psychology, the University of Illinois at Chicago.

Gane, B. D. (2014, November). *Practice schedule effects in motor skill learning: Testing the experience-dependent hypothesis.* Presentation given at the weekly cognitive brown bag at the Department of Psychology, the University of Illinois at Chicago.

Pellegrino, J., DiBello, L., Jorion, N., James, K., Schroeder, L., & **Gane, B. D.** (2013, December). *Integrating cognition and measurement with conceptual knowledge: Establishing the validity and diagnostic capacity of concept inventories.* Presentation given at the biweekly LSRI Brown Bag Series at the University of Illinois at Chicago.

Usselman, M., Ryan, M., **Gane, B. D.**, & Grossman, S. (2013, January). *Science Learning Integrating Design, Engineering and Robotics (SLIDER): Balancing inquiry, design, standards and classroom realities.* Poster presented at the 2013 Georgia Tech STEM Education Research Expo at the Georgia Institute of Technology.

Gane, B. D. (2012, November). *Assessing knowledge in education (Pt. 1).* Presentation given at the CEISMC research brown bag at the Georgia Institute of Technology.

Gane, B. D. (2011, April). *Manipulating skill acquisition via practice schedules and amount of practice.* Presentation given at the weekly cognitive seminar at the Georgia Institute of Technology.

Ryan, M., Rosen, J., & **Gane, B. D.** (2010, March). *SLIDER: Science Learning Integrating Design, Engineering, & Robotics.* Poster presented at the 2010 Celebrating Teaching Day at the Georgia Institute of Technology.

[3] Featured speaker

Gane, B. D. & Catrambone, R. (2010, March). *Skill acquisition under varied practice schedules.* Presentation given at the monthly engineering psychology colloquium at the Georgia Institute of Technology.

Gane, B. D., & Catrambone, R. (2010, February). *Improving teaching effectiveness through instructional design: How example order can affect accuracy of categorizing word problems.* Poster presented at the 2010 Georgia Tech Research and Innovation Conference, Atlanta, GA.

Gane, B. D. (2009, September). *Dr. Thurstone or: How I learned to stop guessing and calculate the curve.* Presentation given at the monthly engineering psychology colloquium at the Georgia Institute of Technology.

Gane, B. D. (2009, February). *The effects of example order on categorization and problem solving.* Presentation given at the monthly engineering psychology colloquium at the Georgia Institute of Technology.

Gane, B. D. (2007, November). *Spacing and interleaving learning episodes.* Presentation given at the weekly cognitive seminar at the Georgia Institute of Technology.

Gane, B. D. (2007, March). *Order effects in learning: How can evidence from "simple" skill learning inform research on "complex" cognitive skill learning?* Presentation given at the weekly cognitive seminar at the Georgia Institute of Technology.

Gane, B. D. (2006, October). *Pickin' Singin' & Attendin' (Weisberg, Hass, & Buonanno).* Presentation given at the weekly cognitive seminar at the Georgia Institute of Technology.

Gane, B. D. (2005, November). *Can modular examples and contextual interference improve transfer? Problem solving, working memory, and mental workload findings.* Presentation given at the weekly cognitive seminar the Georgia Institute of Technology.

Gane, B. D. (2004, December). *Does language enable numerical cognition?* Presentation given at the weekly cognitive seminar at the Georgia Institute of Technology.

Gane, B. D. (2004, May). *Facilitating active learning via algorithm animations.* Presentation given at the weekly cognitive seminar at the Georgia Institute of Technology.

Workshops

Di Domenico, J., **Gane, B. D.**, Strickland, C. (2023, March). *NGSS-aligned formative elementary assessments.* Workshop conducted at the 2023 NSTA National Conference, Atlanta, Georgia.

Gane, B. D., Lehman, E. M., & Zaidi, S. Z.(2022, July). *NGSS-Aligned assessments for formative use in the elementary classroom.* Workshop conducted at the 2022 NSTA National Conference, Chicago, Illinois.

Wink, D., **Gane, B.**, Pellegrino, J., Goldman, S., George M., Zeller, L., & Ko, M-L. (2019, April). *Developing three-dimensional instruction and assessment practices using scaffolds for text and task analysis.* Workshop conducted at the 2019 NSTA National Conference, St. Louis, MO.

Harris, C. J., Krajcik J. S., Severance, S., Pellegrino, J. W., Zaidi, S. Z., & **Gane, B. D.** (2018, June). *Designing knowledge-in-use assessment tasks and rubrics to assess and promote deep learning in science classrooms.* Full day workshop conducted for the 13th International Conference of the Learning Sciences (ICLS) 2018. London, UK.

Gane, B. D. (2017, June). *Using three-dimensional learning performances to structure instruction and assessment.* Workshop conducted for the 2017 RiSE Conference at the University of Maine. Orono, Maine.

Pellegrino, J., & **Gane, B. D.** (2017, January) *NGSA project: Classroom use of three-dimensional assessment.* Full day workshop conducted for the Rhode Island Department of Elementary and Secondary Education. Barrington, Rhode Island.

Pellegrino, J. & **Gane, B. D.** (2016, October) *NGSS assessment workshop.* Full day workshop conducted for Oklahoma science educator leaders. Oklahoma City, Oklahoma.

Pellegrino, J., **Gane, B. D.**, & Zaidi, S. (2016, November) *NGSS, 3-D learning, and the design and use of classroom assessments.* Full day workshop conducted for DuPage Regional Office of Education. Lombard, Illinois.

Pellegrino, J. & **Gane, B. D.** (2016, May) {Untitled} Full day workshop conducted for the Kentucky Department of Education. Louisville, Kentucky.

Professional Development: Design & Facilitation

Assessment and Instruction in Elementary Science Teaching	2018–present
Assessment Literacy Project (ALP)	2017–2019
Illinois Science, Technology, Engineering and Mathematic (I-STEM) Network	2015–2017
Next Generation Science Assessment (NGSA)	2015–2017
Science Learning Integrating Design, Engineering, & Robotics (SLIDER)	2011–2013

Teaching

Instructor

Research Methods in the Learning Sciences (graduate level)	Fall 2017
Introduction to the Learning Sciences (graduate level)	Fall 2014
Developmental Psychology	Summer 2009 (2 sections)
General Psychology	Summer 2006; Fall 2006; Fall 2009

Lab Instructor

Cognitive Psychology	Fall 2004; Fall 2005; Fall 2008

Teaching Assistant

Applied Experimental Psychology	Spring 2005; Spring 2009
Cognitive Psychology	Fall 2003; Spring 2007
Engineering Psychology	Summer 2004
General Psychology	Fall 2003; Spring 2006
Personality Psychology	Spring 2004

Committee Membership

Feiya Luo

- Dissertation committee: *Studying Students' Computational Thinking Leveraging Affordances of Learning Trajectories*; College of Education, University of Florida, 2020.

Laura Zeller

- Portfolio committee: *A Portfolio of Becoming a Learning Scientist*; Learning Sciences Research Institute, University of Illinois at Chicago, 2019.

Nathan Hicks

- Dissertation committee: *Variability Analysis of Grading Open-Ended Tasks with Rubrics across Many Graders*; School of Engineering Education, Purdue University, 2020.

Undergraduate Research Mentorship*

Gregory C. Hughes

- Senior thesis: *Applying optimal augmentation training for visual categorization of football formations*; Georgia Tech, 2013.
- Hughes, G. C, Catrambone, R., & Gane, B. D. (April, 2013). *Augmented reality learning: Applying optimal augmentation training for visual categorization of football formations.* Poster presented at Georgia Tech's 8th Annual Undergraduate Research Symposium, Atlanta, Georgia.

Roudabeh Kishi

- Senior thesis: *Environmental effects on variable practice of example formats*; Georgia Tech, 2008.
- Kishi, R., Gane, B. D., & Catrambone, R. (2008, April). *Can practice schedule affect learning and retention?* Poster presented at the 3rd Annual Undergraduate Research Spring Symposium (Georgia Institute of Technology), Atlanta, GA.

* In conjunction with Richard Catrambone, School of Psychology (Georgia Tech)

Service

Referee Service (Journals)

Cognitive Science; International Journal of Artificial Intelligence in Education; Journal of Engineering Education; Journal of Experimental Psychology: Applied; Journal of Experimental Psychology: Learning, Memory & Cognition; Journal of Science Education & Technology; Journal for STEM Education Research

Referee Service (Conferences & Awards)

American Educational Research Association Annual Meeting (2013–2018; 2020–2021); Annual Conference of the Cognitive Science Society (2009; 2010); Annual Meeting of the Human Factors and Ergonomics Society (2011; 2013); International Conference of the Learning Sciences (2010; 2014; 2016); National Council on Measurement in Education Annual Meeting (2024); President's Undergraduate Research Award (Georgia Tech) (2010; 2012); Undergraduate Research Symposium (Georgia Tech) (2008; 2011; 2012)

College of Liberal Arts & Sciences (UIC)

- First-at-LAS Faculty Mentor — 2021

Learning Sciences Research Institute (UIC)

- LSRI Advisory Committee — 2020-2021

Conference Student Volunteer

- Annual Conference of the Cognitive Science Society — 2010
- Annual Meeting of the Human Factors and Ergonomics Society — 2007

Human Factors and Ergonomics Society, Georgia Tech Student Chapter

- Vice-president / Secretary — 2007–2008

Problem Solving and Educational Technology Lab (Georgia Tech)

- Undergraduate research assistant manager — 2008–2011
- Lab manager — 2004–2008
- Webmaster — 2004–2006; 2007–2008

School of Psychology (Georgia Tech)

- Recruitment Weekend committee member — 2005; 2006
- Engineering Psychology student representative — 2005

Latin American Association Youth Leadership Conference

- Georgia Tech team leader — 2008
- Georgia Tech volunteer — 2009

Awards

Georgia Institute of Technology

- School of Psychology Graduate Research Award, 2011
- Goizueta Foundation Fellowship, 2008–2010
- President's Fellowship, 2003–2008
- OMED Tower Award, 2006; 2011
- School of Psychology Graduate Student Development Award, 2004; 2005

Carnegie Melon University

- 36^{th} Carnegie Symposium on Cognition Travel Fellowship, 2009

The University of Texas at Austin

- Special Honors in Psychology, 2001

Professional Affiliations

American Educational Research Association (AERA)
National Council on Measurement in Education (NCME)

Professional Development

- *QSR International: NVivo two-day workshop*, Atlanta, GA. March 20–21, 2013.
- AAAS Project 2061 workshop: *Developing and using assessments aligned to science learning goals*, Washington, DC. October 17–19, 2012.
- *3^{rd} annual national meeting on STEM concept inventories*, Alexandria, VA. August 8–9, 2012.
- *4^{th} Annual Summer School on "Building Intelligent Tutoring Systems"*, Carnegie Mellon University, Pittsburgh, PA. June 28–July 2, 2004.

Software Skills

Statistics Applications:

- R, SPSS

Productivity Applications:

- Emacs, LaTeX, MAXQDA, Adobe Illustrator, Adobe InDesign

Computing Languages:

- Python, Java, Visual Basic, HTML