

Curriculum Vitae

(last updated: December, 2021)

Steven Jones

Associate Professor, Mathematics Education
Brigham Young University
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EDUCATION

PhD in Mathematics Education, University of Maryland, 2010

- Dissertation topic: Students' understanding of the definite integral

MS in Mathematics, Brigham Young University, 2005

- Masters project topic: Ordinary differential equations
- Minor in mathematics education

BS in Mathematics, Brigham Young University, 2003

- Minor in music

ACADEMIC POSITIONS

Associate Professor of Mathematics Education

Brigham Young University. August 2013—current (promoted to Associate in 2019).

- Research Foci: Calculus learning/instruction; Bridging the gap mathematics and science/engineering; Connection of quantities to mathematical understanding/thinking
- Courses Taught: Calculus I, II, & III, The Teaching and Learning of Calculus, The History and Philosophy of Mathematics, Teaching Statistics and Probability, Critical Review of School Mathematics

Professor of Mathematics

Sierra Community College. August 2009—August 2013

- Courses Taught: Calculus I & II, Statistics, Trigonometry, Intermediate and Elementary Algebra, Mathematics for Elementary Education

Adjunct Mathematics Instructor Positions

- Johns Hopkins University, CTY, July 2007—August 2007. (Mathematical Logic)
- LDS Business College, June 2005—August 2005. (College Algebra)
- Brigham Young University, August 2003—April 2005. (Calculus I, Trigonometry, Quantitative Reasoning)

High School Mathematics Department Assistant

Provo High School. November 2001—January 2004

- ASSIST program coordinator
- Substitute teaching and tutoring

RESEARCH

Peer-reviewed journal papers and contributed book chapters

Jones, S.R. (forthcoming). Introducing definite integrals quantitatively through adding up pieces. In D.L. Corey & S.R. Jones (Eds.), *Building a knowledge base for teaching undergraduate mathematics: Lesson analysis*. Washington, DC: Mathematical Association of America.

Jones, S.R., & Kuster, G.E. (2021). Examining students' variational reasoning in differential equations. *The Journal of Mathematical Behavior*, 64, #100899.

Williams, K.R., Wasson, S.R., Barrett, A., Greenhall, R.F., Jones, S.R., & Bailey, E.G. (2021). Teaching Hardy-Weinberg equilibrium using population-level Punnett Squares: Facilitating calculation for students with math anxiety. *CBE – Life Sciences Education*, 20(2), 1–16.

Jones, S.R. (2020). Scalar and vector line integrals: A conceptual analysis and an initial investigation of student understanding. *The Journal of Mathematical Behavior*, 59, #100801.

Jones, S.R. (2019). What education research related to calculus derivatives and integrals implies for chemistry instruction and learning. In M. Towns, K. Bain, and J. Rodriguez (Eds.), *It's just math: Research on students' understanding of chemistry and mathematics* (pp. 187-212). Washington, DC: American Chemical Society.

Jones, S.R. (2019). Students' application of concavity and inflection points to real-world contexts. *International Journal of Science and Mathematics Education*, 17(3), 523-544.

Jones, S.R. (2018). Prototype images in mathematics education: The case of the graphical representation of the definite integral. *Educational Studies in Mathematics*, 97(3), 215-234.

Jones, S.R. & Watson, K. (2018). Recommendations for a “target understanding” of the derivative concept for first-semester calculus teaching and learning. *International Journal of Research in Undergraduate Mathematics Education*, 4(2), 199-227.

Jones, S.R. (2017). An exploratory study on student understandings of derivatives in real-world, non-kinematics contexts. *The Journal of Mathematical Behavior*, 45, 95-110.

Jones, S.R., Lim, Y., & Chandler, K.R. (2017). Teaching integration: How certain instructional moves may undermine the potential conceptual value of the Riemann sum and the Riemann integral. *International Journal of Science and Mathematics Education*, 15(6), 1075-1095.

Jones, S.R. & Dorko, A. (2015). Students' understandings of multivariate integrals and how they may be generalized from single integral conceptions. *The Journal of Mathematical Behavior*, 40(B), 154-170.

Jones, S.R. (2015). The prevalence of area-under-a-curve and anti-derivative conceptions over Riemann sum-based conceptions in students' explanations of definite integrals. *International Journal of Mathematics Education in Science and Technology*, 46(5), 721-736.

Jones, S.R. (2015). Areas, anti-derivatives, and adding up pieces: Integrals in pure mathematics and applied contexts. *The Journal of Mathematical Behavior*, 38, 9-28.

Jones, S.R. (2015). Calculus limits involving infinity: The role of students' informal dynamic reasoning. *International Journal of Mathematics Education in Science and Technology*, 46(1), 105-126.

Jones, S.R. (2013). Adding it all up: Reconceiving the introduction of the integral. *Mathematics Teacher*, 107(5), 372-377.

Jones, S.R. (2013). Understanding the integral: Students' symbolic forms. *The Journal of Mathematical Behavior*, 32(2), 122-141.

Edited books

Corey, D.L., & Jones, S.R. (Eds.) (forthcoming). Building a knowledge base for teaching undergraduate mathematics: Lesson analysis. Washington, DC: Mathematical Association of America.

Participants of the Conference on Building a Knowledge Base for Teaching College Mathematics. (forthcoming). How to write a lesson analysis manuscript. In D.L. Corey & S.R. Jones (Eds.), *Building a knowledge base for teaching undergraduate mathematics: Lesson analysis*. Washington, DC: Mathematical Association of America.

Peer-reviewed conference proceedings

Jones, S.R. & Ely, R. (accepted). Meanings, Reasoning, and Modeling with Definite Integrals: Comparing Adding Up Pieces and Accumulation from Rate. In *Proceedings of the 24th annual conference on Research in Undergraduate Mathematics Education* (forthcoming). Boston, MA.

Jones, S.R. & Stevens, B.N. (accepted). Combining Sealey, Von Korff & Rebello, Jones, and Swidan & Yerushalmy into a Comprehensive Decomposition of the "Integral with Bounds" Concept. In *Proceedings of the 24th annual conference on Research in Undergraduate Mathematics Education* (forthcoming). Boston, MA.

Weinberg, A. & Jones, S.R. (accepted). A Framework for Designing Intellectual Need-Provoking Tasks. In *Proceedings of the 24th annual conference on Research in Undergraduate Mathematics Education* (forthcoming). Boston, MA.

Stevens, B.N. & Jones, S.R. (accepted). A Learning Trajectory Based on Adding Up Pieces for an Entire Unit on Integration. Poster presented at the 24th annual conference on Research in Undergraduate Mathematics Education (forthcoming). Boston, MA.

Jones, S.R., Corey, D.L., & Teuscher, D. (2021). Conventions and context: Graphing related objects onto the same set of axes. In D. Olanoff, K. Johnson, and S. Spitzer (Eds.), *Proceedings of the 43rd annual conference of the North American chapter of the International Group for the Psychology of Mathematics Education* (pp. 1381-1391). Philadelphia, PA.

Rodriguez, J.M. & Jones, S.R. (2021). Identifying graphical forms used by students in creating and interpreting graphs. In D. Olanoff, K. Johnson, and S. Spitzer (Eds.), *Proceedings of the 43rd annual conference of the North American chapter of the International Group for the Psychology of Mathematics Education* (pp. 1799-1808). Philadelphia, PA.

Jones, S.R., & Jeppsen, H.P. (2021). Students' reasoning about multivariational structures. In A.I. Sacristán, J.C. Cortés-Zavala, and P.M. Ruiz-Arias (Eds.), *Proceedings of the 42nd annual conference of the North American chapter of the International Group for the Psychology of Mathematics Education* (pp. 1139-1147). Mazatlan, Mexico.

Eliason, K.L., & Jones, S.R. (2021). Students' "multi-sample distribution" misconception about sampling distributions. *Proceedings of the 42nd annual conference of the North American chapter of the International Group for the Psychology of Mathematics Education* (pp. 1322-1330). Mazatlan, Mexico.

Weinberg, A., & Jones, S.R. (2020). A theorization of learning environments to support the design of intellectual need-provoking tasks in introductory calculus. In S. Karunakaran, Z. Reed, and A. Higgins (Eds.), *Proceedings of the 23rd annual conference on Research in Undergraduate Mathematics Education* (pp. 787-795). Boston, MA.

Stark, T., & Jones, S.R. (2020). Undergraduate students' perspectives on what makes problem contexts engaging. In S. Karunakaran, Z. Reed, and A. Higgins (Eds.), *Proceedings of the 23rd annual conference on Research in Undergraduate Mathematics Education* (pp. 1-9). Boston, MA.

Jeppson, H. & Jones, S.R. (2020). A comprehensive hypothetical learning trajectory for the chain rule, implicit differentiation, and related rates: Part I, the development of the HLT. In S. Karunakaran, Z. Reed, and A. Higgins (Eds.), *Proceedings of the 23rd annual conference on Research in Undergraduate Mathematics Education* (pp. 690-698). Boston, MA.

Jeppson, H. & Jones, S.R. (2020). A comprehensive hypothetical learning trajectory for the chain rule, implicit differentiation, and related rates: Part II, a small-scale teaching experiment. In S. Karunakaran, Z. Reed, and A. Higgins (Eds.), *Proceedings of the 23rd annual conference on Research in Undergraduate Mathematics Education* (pp. 285-293). Boston, MA.

- Jones, S.R., Jeppson, H., & Corey, D.L. (2019). Potential intellectual needs for Taylor and power series within textbooks, and ideas for improving them. In A. Weinberg, D. Moore-Russo, H. Soto, and M. Wawro (Eds.), *Proceedings of the 22nd annual conference on Research in Undergraduate Mathematics Education* (pp. 292-299). Oklahoma City, OK.
- Kuster, G. & Jones, S.R. (2019). Variational reasoning used by students while discussing differential equations. In A. Weinberg, D. Moore-Russo, H. Soto, and M. Wawro (Eds.), *Proceedings of the 22nd annual conference on Research in Undergraduate Mathematics Education* (pp. 348-356) Oklahoma City, OK.
- Leiva, B., Borrowman, N., Jones, S.R., & Teuscher, D. (2019). Influences from pathways college algebra on students' initial understanding and reasoning about calculus limits. In A. Weinberg, D. Moore-Russo, H. Soto, and M. Wawro (Eds.), *Proceedings of the 22nd annual conference on Research in Undergraduate Mathematics Education* (pp. 368-376). Oklahoma City, OK.
- Jones, S.R. (2018). Building on covariation: Making explicit four types of "multivariation." In A. Weinberg, C. Rasmussen, J. Rabin, M. Wawro, and S. Brown (Eds.), *Proceedings of the 21st annual Conference on Research in Undergraduate Mathematics Education* (pp. 1110-1118). San Diego, CA: SIGMAA on RUME.
- Theminkosi, M.P. & Jones, S.R. (2018). A study of calculus students' solution strategies when solving related rates of change problems. In A. Weinberg, C. Rasmussen, J. Rabin, M. Wawro, and S. Brown (Eds.), *Proceedings of the 21st annual Conference on Research in Undergraduate Mathematics Education* (pp. 408-415). San Diego, CA: SIGMAA on RUME.
- Jones, S.R. & Probst, J.M. (2018). Students' usage of visual imagery to reason about the divergence, integral, direct comparison, limit comparison, ratio, and root convergence tests. In A. Weinberg, C. Rasmussen, J. Rabin, M. Wawro, and S. Brown (Eds.), *Proceedings of the 21st annual Conference on Research in Undergraduate Mathematics Education* (pp. 400-407). San Diego, CA: SIGMAA on RUME.
- Naranjo, O. & Jones, S.R. (2018). Students' strategies for setting up differential equations in engineering contexts. In A. Weinberg, C. Rasmussen, J. Rabin, M. Wawro, and S. Brown (Eds.), *Proceedings of the 21st annual Conference on Research in Undergraduate Mathematics Education* (pp. 334-341). San Diego, CA: SIGMAA on RUME.
- Jones, S.R. & Naranjo, O. (2017). How students interpret line and vector integral expressions: Domains, integrands, differentials, and outputs. In A. Weinberg, C. Rasmussen, J. Rabin, M. Wawro, and S. Brown (Eds.), *Proceedings of the 20th annual Conference on Research in Undergraduate Mathematics Education* (pp. 673-681). San Diego, CA: SIGMAA on RUME.
- Jones, S.R. & Thompson, C. (2017). Definite integrals versus indefinite integrals: How do students see them as the same or as different? In A. Weinberg, C. Rasmussen, J. Rabin, M. Wawro, and S. Brown (Eds.), *Proceedings of the 20th annual Conference on Research in Undergraduate Mathematics Education* (pp. 682-689). San Diego, CA: SIGMAA on RUME.

- Jones, S.R. (2016). What does it mean to “understand” concavity and inflection points? In Wood, M.B., Turner, E.E., Civil, M., & Eli, J.A. (Eds.), *Proceedings of the 38th annual conference of the North American chapter of the International Group for the Psychology of Mathematics Education* (pp. 597-604). Tucson, AZ: PME-NA.
- Bernard, A.M. & Jones, S.R. (2016). Student problem solving in the context of volumes of revolution. In T. Fukawa-Connelly, N. Infante, M. Wawro & S. Brown (Eds.), *Proceedings of the 19th annual Conference on Research in Undergraduate Mathematics Education* (pp. 554-561). Pittsburg, PA: SIGMAA on RUME.
- Jones, S.R. (2016). Ways of understanding and ways of thinking in using the derivative concept in applied (non-kinematic) contexts. In T. Fukawa-Connelly, N. Infante, M. Wawro & S. Brown (Eds.), *Proceedings of the 19th annual Conference on Research in Undergraduate Mathematics Education* (pp. 917-924). Pittsburg, PA: SIGMAA on RUME.
- Jones, S.R. (2016). Prototype images of the definite integral. In T. Fukawa-Connelly, N. Infante, M. Wawro & S. Brown (Eds.), *Proceedings of the 19th annual Conference on Research in Undergraduate Mathematics Education* (pp. 909-916). Pittsburg, PA: SIGMAA on RUME.
- Gundlach, M., & Jones, S.R. (2015). Students’ understanding of concavity and inflection points in real-world contexts: Graphical, symbolic, verbal, and physical representations. In T. Fukawa-Connelly, N. Infante, K. Keene & M. Zandieh (Eds.), *Proceedings of the 18th annual Conference on Research in Undergraduate Mathematics Education* (pp. 568-573). Pittsburg, PA: SIGMAA on RUME.
- Jones, S.R. (2015). Promoting students’ construction and activation of the multiplicatively-based summation conception of the definite integral. In T. Fukawa-Connelly, N. Infante, K. Keene & M. Zandieh (Eds.), *Proceedings of the 18th annual Conference on Research in Undergraduate Mathematics Education* (pp. 632-638). Pittsburg, PA: SIGMAA on RUME.
- Jones, S.R., & Dorko, A.(2015). Students’ generalizations of single-variable conceptions of the definite integral to multivariate conceptions. In T. Fukawa-Connelly, N. Infante, K. Keene & M. Zandieh (Eds.), *Proceedings of the 18th annual Conference on Research in Undergraduate Mathematics Education* (pp. 639-645). Pittsburg, PA: SIGMAA on RUME.
- Watson, K.L., & Jones, S.R. (2015). Adding explanatory power to descriptive power: Combining Zandieh’s derivative framework with analogical reasoning. In T. Fukawa-Connelly, N. Infante, K. Keene & M. Zandieh (Eds.), *Proceedings of the 18th annual Conference on Research in Undergraduate Mathematics Education* (pp. 1041-1047). Pittsburg, PA: SIGMAA on RUME.
- Dorko, A., & Jones, S.R. (2015). Generalization in undergraduate mathematics education. In T. Fukawa-Connelly, N. Infante, K. Keene & M. Zandieh (Eds.), *Proceedings of the 18th annual Conference on Research in Undergraduate Mathematics Education* (pp. 461-465). Pittsburg, PA: SIGMAA on RUME.

Jones, S.R. (2014). The frequencies of various interpretations of the definite integral in a general student population. In S. Oesterle, P. Liljedahl, C. Nicol & D. Allan (Eds.), *Proceedings of the 38th annual meeting of the International Group for the Psychology of Mathematics Education* (Vol. 3, pp. 401-408). Vancouver, BC: PME.

Jones, S.R. (2014). Three conceptualizations of the definite integral in mathematics and physics contexts. In T. Fukawa-Connelly, G. Karakok, K. Keene & M. Zandieh (Eds.), *Proceedings of the 17th annual Conference on Research in Undergraduate Mathematics Education* (pp. 731-738). Denver, CO: SIGMAA on RUME.

Invited presentations

Jones, S.R. (2021). *Aligning the disconnect between mathematics in math classes versus science and engineering classes*. Invited keynote address at UMATYC, Weber State University, Ogden, UT

Long, N.E., & Jones, S.R. (2021). *Calculus in Virtual Reality: Studying VR Resources as Lessons and Manipulatives*. Invited colloquium at University of Oklahoma, Norman, OK.

Jones, S.R. (2019). *Many calculus concepts are grounded in meanings in math classes that do not align well with how those same concepts are used in science*. Invited presentation at the American Association of Physics Teachers' Physics Education Research Conference, Provo, UT.

Kuster, G. & Jones, S.R. (2019). *Variational reasoning used by students while discussing differential equations*. Invited presentation to represent the RUME community at the Joint Mathematical Meetings, Denver, CO.

Jones, S.R. (2019). *Helping students develop deep meanings for the derivative and integral concepts*. Invited professional development workshop for Alpine School District, Lehi, UT.

Jones, S. R. (2017). *Toward a comprehensive definite integral framework: Fits and starts, overreaches, collaborations, and adding the pieces together*, Invited colloquium at Oklahoma State University, Stillwater, OK.

Other presentations

Jones, S.R. (2019). *Education research at the interface of mathematics and science: Curricular alignment between the disciplines*. Workshop conducted at the Conference for Research in Undergraduate Mathematics Education. Oklahoma City, OK.

Jones, S. R. (2018). *Helping STEM students understand and use calculus*. Presentation at the BYU College Volunteer Leadership Council, Provo, UT.

Jones, S. R. & Bailey, L. (2017). *STEM connections: Examples of conceptual blending between biology and mathematics*. Poster presented at the Transformation Research in Undergraduate STEM Education conference. St. Paul, MN.

Williams, K., Baek, D., Nelson, N., Quirante, T., Rice, N., Rose, S., Jones, S., & Bailey, E. (2016). *Teaching Hardy-Weinberg equilibrium using population-level Punnett squares: Emphasizing biology while facilitating calculation*. Poster presented at the Society for the Advancement of Biology Education Research. Minneapolis, MN.

Dorko, A., Weber, E., & Jones, S.R. (2014). *Some ideas about how calculus students generalize from single to multivariate contexts*. Colloquium at University of Maine's Center for Research in STEM Education. Orono, ME.

Chandler, K.R; Lim, Y.; & Jones, S.R. (2014). *A new way to introduce the integral: Focusing on Riemann sums for better application in physics and engineering*. Mentored Research Conference. Brigham Young University. Provo, UT.

Jones, S.R. (2012). *Focusing on meaning in preparing elementary school teachers*. Sacramento Valley Community College Mathematics Conference. Sierra College, CA.

Fey, J.T. & Jones, S.R. (2007). *Activities that promote intuition and precision in geometric thinking*. National Council of Teacher of Mathematics Regional Conference. Richmond, VA.

Fukawa-Connelly, T. & Jones, S.R. (2006). *We know what they knew, but what do they know?* The 9th annual Conference on Research in Undergraduate Mathematics Education. Rutgers, NJ.

Invited book review

Leatham, K.R., Johnson, K.R. & Jones, S.R. (2015). An introduction to research in mathematics education [Review of the book *MasterClass in mathematics education: International perspectives on teaching and learning* by P. Andrews & T. Rowland (eds.)]. *Journal for Research in Mathematics Education*, 46(4), 497-504.

EXTERNAL GRANTS

Conference on Building a Knowledge Base for Teaching College Mathematics (Co-PI)
National Science Foundation Grant
Apr 2020—Mar 2021

Calculus in Virtual Reality (Senior Personnel)
National Science Foundation Grant
Dec 2018—Aug 2020

AWARDS

Outstanding Teaching Award
BYU, College of Physical and Mathematical Sciences
June 2021—May 2024

High Impact Teaching Support Award
BYU, College of Physical and Mathematical Sciences
Nov 2017—Oct 2018

Travel Support Awards for Mentored Undergraduate Students
BYU, College of Physical and Mathematical Sciences
Fall 2014, Fall 2016, Fall 2017, Fall 2019

PROFESSIONAL CITIZENSHIP

Mathematical Association of America: Special Interest Group on Research in Undergraduate Mathematics Education.

North American Chapter of the International Group for the Psychology of Mathematics Education.

Co-Guest Editor of Special Issue
International Journal for Research in Undergraduate Mathematics Education. July 2020—current

Conference Co-Organizer
NSF-funded Conference on Building a Shareable Knowledge Base for College Mathematics. Apr 2020—June 2020

Working Group Organizer
Education Research at the Interface of Mathematics and Science. Feb 2018—Feb 2019

Invited Representative for Mathematics Education
NSF-funded Transformational Research in Undergraduate STEM Education Conference. July 2018

Manuscript Reviewer
Multiple Journals, Aug 2013—current

Conference Proposal Reviewer
Multiple Conferences, Aug 2013—current

UNIVERSITY CITIZENSHIP

Graduate Committee
Brigham Young University, Aug 2013—current

Student Research Conference
Brigham Young University, Aug 2021—current

College MEG/ORCA Reviewer
Brigham Young University, Aug 2020—current

Calculus Committee, co-chair
Brigham Young University, Aug 2013—Aug 2021 (co-chair since Aug 2017)

Awards Committee
Brigham Young University, Aug 2019—Aug 2020

Department Writing Group, chair
Brigham Young University, Aug 2016—Aug 2019

Course Content Restructuring Committee
Brigham Young University, May 2017—Dec 2017

Statistics Course Development Committee
Brigham Young University, Jun 2014—Apr 2015

Math Tutoring Lab hiring process review
Brigham Young University, Jan 2014—Mar 2014

Curriculum Review for Statistics and Calculus Classes
Sierra College, Aug 2012—Aug 2013

College Senate Academic Task Force
Sierra College, Apr 2012—Aug 2013

Textbook Committee
Sierra College, Aug 2011—Mar 2012

MASTERS THESIS ADVISOR

Leilani Fonbuena: Quantitative development of u-substitution
Oct 2020—current

Brinley Stevens: Quantitative hypothetical learning trajectory for a unit on integrals
Sep 2019—Jun 2021

Nathan Smith: Teaching the derivative unit quantitatively
Sep 2018—Aug 2020

Tamara Stark: Student perspectives on engaging problem contexts
Sep 2017–Dec 2019

Haley Jeppson: Connected and conceptual approach to the chain rule, related rates, and implicit differentiation
Sep 2017–Aug 2019

Kia Eliason: Pre-service teachers' understanding and misconceptions of inferential statistics
Aug 2016–Jun 2018

Omar Naranjo: Students' modeling of complicated contexts with differential equations
Nov 2015–Aug 2017

Stephen Scott: Leverage mathematical modelling to teach specific concepts
Nov 2013–Dec 2017