CURRICULUM VITAE

University of Idaho

NAME: Robert Edward Ely

DATE: Dec 2021

RANK OR TITLE: Professor

DEPARTMENT: Mathematics

OFFICE LOCATION AND CAMPUS ZIP:
875 Perimeter Drive MS 1103
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Moscow, ID 83844-1103

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DATE OF FIRST EMPLOYMENT AT UI: August 2007

DATE OF TENURE: 2013

DATE OF PRESENT RANK OR TITLE: August 2020

EDUCATION BEYOND HIGH SCHOOL:

Degrees:

Ph.D., University of Wisconsin, Madison, WI, 2007, Curriculum and Instruction

M.A., University of Wisconsin, Madison, WI, 2003, Mathematics

B.A., University of Northern Colorado, Greeley, CO, 2000, History and Mathematics

EXPERIENCE:

Teaching, Extension and Research Appointments:

Professor, Department of Mathematics and Statistical Science, University of Idaho (Aug 2020-present)

Associate Professor, Department of Mathematics, University of Idaho (August 2013 – present)

Assistant Professor, Department of Mathematics, University of Idaho (August 2007 – August 2013)

Project Assistant, Wisconsin Center for Education Research, University of Wisconsin (Sept. 2006 – July 2007) *Coordinating Social and Institutional Aspects of Generalizing Activity*

Project Assistant, Wisconsin Center for Education Research, University of Wisconsin (June 2006 – Oct. 2006) *System-Wide Change for All Learners and Educators*

Project Assistant, Wisconsin Center for Education Research, University of Wisconsin (Jan. 2004 – June 2006) *Improving Alignment Tools for Enhanced, More Accessible Assessment: Development of an Electronic, Automated Analysis System for States*

Consulting:

Teacher professional development:

Explicit Reasoning and the Five Practices—Two workshops for Highland Elementary School, Clarskton, WA: Nov, 2018 & Feb 2019.

Rich Tasks and Strings—Whole-district PD workshop for the Pullman School District in Pullman, WA: Oct 3, 2014.

Alignment Specialist:

Organizer, conductor, mathematics group leader, alignment reviewer, alignment analyst, for numerous studies of the alignment between academic content standards and assessments. Employed by the State Departments of Education in each of the following states: Alabama, Hawaii, Georgia, Wyoming, Michigan, Illinois, Pennsylvania, Texas, Mississippi, Wisconsin, North Dakota, and the nation of Qatar. (Jan. 2004 – June 2007)

TEACHING ACCOMPLISHMENTS:

Areas of Specialization: Mathematics Education, History of Mathematics

Courses Taught:

University of Idaho courses

Math 236—Mathematics for Elementary Teachers II (F 07, S 08, F 08, F 09, S 10, S 12, S 13, S14, F 21)
Math 170—Calculus and Analytic Geometry I (F 07, F 11, F 16, F 17, F 19, S 20, F 20)
Math 160—Survey of Calculus (Spr 2015)
Math 388—History of Mathematics (F 2008, F 2010, F 2012, F 2014, S 2017)
Math 388 EO—History of Mathematics (online) (Sp 13, Sum 13, Sp 14, Sum 14, F 14, Sp 15, Sp 18, F 18, S 19, F 19, S 21, F21)
Math 391—Modern Geometry (Spring 09, S 10, S 11, S 12, S 13, S 14, S 15, S 18, S 20, S 21)
Math 315—The Infinite and the Infinitesimal (Honors) (Fall 2013, Spring 2019)
MTHE 409—Algebraic and Functional Reasoning (Fall 2018, Fall 2020)
Math 504 (and EDCI 502 05)—Theories of Learning in Mathematics (Fall 2008, Spring 2015)
Math 504 (and EDCI 502 04)—Mathematics Curriculum & Teacher Training (S 2009, S 2015)
Math 504—Seminar in Mathematics Education (every term Fall 2009-present, except F 15 - S 16)
EDCI 502 03—Research Paradigms: Math Ed (Spr 2015)

University of Wisconsin courses

Math 131—Geometry for Elementary Teachers (Spring 2003)
Math 112—College Algebra (Fall 2001)
Math 221—Calculus and Analytic Geometry I (Fall 2000, Spring 2001)
Math 222—Calculus and Analytic Geometry II (Spring 2002, Fall 2002, Fall 2003)

Idaho teacher professional development courses

Idaho Math Initiative: Mathematics Thinking for Instruction—9-12 (Summer 2010, Sum. 2011)
Making Mathematical Reasoning Explicit: Proportional Reasoning (Summer 2012)
Making Mathematical Reasoning Explicit: Geometric Reasoning (Summer 2013)
Making Mathematical Reasoning Explicit: Algebraic Reasoning (Summer 2014)
Longitudinal Learning of Viable Argumentation in Mathematics among Adolescents Workshop (Summer 2017)
Longitudinal Learning of Viable Argumentation in Mathematics among Adolescents PD (Spring 2017, Fall 2017, Spring 2019)

Students Advised:

Graduate Students:

2 PhD students
6 MS in Math
On committee for 12 PhD students in Math and Education

44 Undergraduate Students

Materials and Courses Developed (non-scholarship activity):

Math 388—History of Mathematics

Math 504—Theory of Learning in Mathematics
Math 504—Mathematics Curriculum & Teacher Training
Math 504—Making Mathematical Reasoning Explicit: Proportional Reasoning
Math 504—Making Mathematical Reasoning Explicit: Geometric Reasoning
Math 315—The Infinite and the Infinitesimal (Honors)

Non-credit Classes, Workshops, Seminars, Invited Lectures, etc.:

Junior Engineering Mathematics Science camp for Teachers, University of Idaho School of Engineering (Summer 2008)

Professional Development Class for the PEOPLE Program—*Teaching Mathematics in an Urban Classroom,* University of Wisconsin, Madison (Summer 2005)

Honors and Awards:

University of Idaho Teaching Excellence Award, 2019.

Faculty Excellence Award, UI/WSU Naval Officer Training Program, 2010.

Departmental Excellence in Teaching Award, Mathematics, Univ. of Wisconsin-Madison, 2004.

SCHOLARSHIP ACCOMPLISHMENTS:

Publications, Exhibitions, Performances, Recitals:

Refereed/Adjudicated:

Journals:

Jones, S., & Ely, R. (in press). Approaches to integration based on quantitative reasoning: Adding up pieces and accumulation from rate. *International Journal of Research in Undergraduate Mathematics Education*.

Bair, J., Blaszczyk, P., Ely, R., Katz, M. & Kuhlemann, K. (2021) Procedures of Leibnizian infinitesimal calculus: An account in three modern frameworks. *British Journal for the History of Mathematics, 36*(3), 170-209.

Ely, R. (2021). Teaching calculus with infinitesimals and differentials. *ZDM, 53* (591-604).

Ellis, A. B., Ely, R., Singleton, B., & Tasova, H. I. (2020). Scaling-continuous variation: Supporting students' algebraic reasoning. *Educational Studies in Mathematics, 104*(1), 87-103.

Yopp, D., Ely, R., Adams, A., & Nielsen, A. (2020). Eliminating counterexamples: A case study intervention for improving adolescents' ability to critique direct arguments. *Journal of Mathematical Behavior, 57*(1). https://doi.org/10.1016/j.jmathb.2019.100751

Ely, R. (2019). The torpedo's shock. *For the Learning of Mathematics*, *39*(1), 30-32.

Bair, J., Blaszczyk, P., Ely, R., Heinig, P., & Katz, M. (2018). Leibniz's well-founded fictions and their interpetations. *Matematychni Studii, 49*(2), 186-224.

Ely, R. (2017). Reasoning with definite integrals using infinitesimals. *Journal of Mathematical Behavior, 48,* 158-167.

Bair, J., Blaszczyk, P., Ely, R., et al. (2017). Cauchy, infinitesimals, and ghosts of departed quantifiers. *Matematchni Studii, 47*(2), 115-144.

Bair, J., Błaszczyk, P., Ely, R., Henry, V., Kanovei, V., Katz, K., Katz, M., Kutateladze, S., McGaffey, T., Sherry, D., & Shnider, S. (online 2016, print 2017). Interpreting the infinitesimal mathematics of Leibniz and Euler. *Journal of General Philosophy of Science, 48*, 1-44.

Adams, A., Ely, R., & Yopp, D. (2016). Making arguments viable: Using generic examples. *Teaching Children Mathematics, 23*(5), 292-300.

Yopp, D., & Ely, R. (2016). When does an argument use a generic example? *Educational Studies in Mathematics*, *91*:37–53.

Yopp, D., & Ely, R. (2015). Generic example proving criteria for all. *For the Learning of Mathematics, 35*(3), 8-13.

Bialostocki, A., & Ely, R. (2015). Points on a line that maximize and minimize the ratio of the distances to two given lines. *Forum Geometricorum, 15*, 177-178.

Brendefur, J., Hughes, G., & Ely, R. (2015). A glimpse into secondary students' understanding of functions. *International Journal for Mathematics Teaching and Learning*. 1-22.

Bair, J., Błaszczyk, P., Ely, R., Henry, V., Kanovei, V., Katz, K., Katz, M., Kutateladze, S., McGaffey, T., Sherry, D., & Shnider, S. (2013). Is mathematical history written by the victors? *Notices of the AMS, 60*(7), 886-904.

Ely, R. (2012). Loss of dimension in the history of calculus and in student reasoning. *The Mathematics Enthusiast, 9*(3), 303-326.

Ely, R. & Adams, A. (2012). Unknown, placeholder, or variable: What is *x*? *Mathematics Education Research Journal*, *24*, 19–38.

Ely, R. (2011). Envisioning the infinite by projecting finite properties. *Journal of Mathematical Behavior, 30*(1): 1-18.

Ellis, A. & Ely, R. (2011). The Case of the Mystery Table. *Mathematics Teaching in the Middle School, 16*(8): 452-454.

Ely, R. (2010). Nonstandard student conceptions about infinitesimal and infinite numbers. *Journal for Research in Mathematics Education*. *41*(2): 117–146.

Ely, R. & Cohen, J. S. (2010). Using student work: The double-spin game. *Mathematics Teaching in the Middle School, 16*(4), 208-215.

Abstracts and Proceedings (Refereed/Adjudicated)**:**

Ellis, A.B., Horne, D., Bloodworth, A., Nielsen, A., & Ely, R. (In press). Playful math: Modeling students' engagement in play-based algebra activities. To appear in the *Proceedings of the Forty-Fourth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*.

Ely, R. & Ellis, A.B. (in press). Research colloquia: Playful mathematics and learning. To appear in the *Proceedings of the 44th Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (PME-NA 44).

Parr, E. D., Sencindiver, B., & Ely, R. (2022). Four ways students interpret and reason with points and portions of graphs of functions: An intersection of two theoretical frameworks. *Proceedings of the 24th Annual Conference on Research in Undergraduate Mathematics Education, Boston, MA,* 214-21.

Simmons, C., Reed, Z., Samuels, J., & Ely, R. (2022). A reemergence of a non-quantitative interpretation of the differential for definite integrals. *Proceedings of the 24th Annual Conference on Research in Undergraduate Mathematics Education, Boston, MA*, 589-96.

Jones, S. R., & Ely, R. (2022). Meanings, reasoning, and modeling with definite integrals: Comparing adding up pieces and accumulation from rate. *Proceedings of the 24th Annual Conference on Research in Undergraduate Mathematics Education, Boston, MA*, 789-98.

Parr, E., Sencindiver, B., & Ely, R. (2021). Points and positions: An intersection of two frameworks for reasoning with graphs of functions. In Olanoff, D., Johnson, K., & Spitzer, S.M. *Proceedings of the forty-third annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Philadelphia, PA,* 1884-88.

Ely, R., Yopp, D., & Adams, A. (2021). Domain appropriateness and skepticism in viable argumentation. *Proceedings of the 42nd annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education,* 1031-32.

Parr, E., Ely, R., & Piez, C. (2021). Conceptualizing and representing distance on graphs in Calculus: The Case of Todd. *Proceedings of the Twenty-Fourth Annual Conference on Research in Undergraduate Mathematics Education,* 214-222.

Ely, R. (2019). *Teaching calculus with (informal) infinitesimals*. In J. Monaghan, E. Nardi and T. Dreyfus (Eds.), *Calculus in upper secondary and beginning university mathematics – Conference proceedings*. Kristiansand, Norway: MatRIC, 91-95. Retrieved on 12-21-2019 from https://matric-calculus.sciencesconf.org/

Ely, R., & Samuels, J. (2019). "Zoom in infinitely": Scaling-continuous covariational reasoning by calculus students. *Proceedings of the Twenty-Second Annual Conference on Research in Undergraduate Mathematics Education*.

Ely, R., & Ellis, A. B. (2018). Scaling-continuous variation: A productive foundation for calculus. *Proceedings of the Twenty-First Annual Conference on Research in Undergraduate Mathematics Education*, San Diego, CA.

Ellis, A. B., Ely, R., Singleton, B., & Tasova, H. I. (2018). Scaling-continuous covariation: Supporting middle school students' algebraic reasoning. In Hodges, T.E., Roy, G. J., & Tyminski, A. M. (Eds.), *Proceedings of the 40th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. Greenville, SC: University of South Carolina & Clemson University, 147-154.

Ely, R. (2017). Infinitesimals-based registers for reasoning with definite integrals. *Online proceedings for the 21st SIGMAA on Research in Undergraduate Mathematics Education Conference*. San Diego, CA: San Diego State University, CA: pp. 579-587.

Adams, A., Karunakaran, M., Klosterman, P., Knott, L., & Ely, R. (2016). Using precise mathematics language to engage students in mathematics practices. *Proceedings of the Annual Conference on Psychology of Mathematics & Education of North America*, Nov 3, 2016: 1158-1165.

Karunakaran, M., Wnek, B., Knott, L., Adams, A., & Ely, R. (2016). Creating opportunities for justifying: An examination of one teacher's evolving questioning strategies. *Proceedings of the Annual Conference on Psychology of Mathematics Education of North America*, Nov 3, 2016: 427.

Knott, L., Olson, J., Adams, A., & Ely, R. (2014). Task design: Supporting teachers to independently create rich tasks. In P. Sullivan & Y. Yang (Eds.), *Proceedings of the 22nd Annual Conference of the International Commission on Mathematical Instruction, 4*, 1-8.

Knott, L., Olson, J., Rapone, B., Adams, A., & Ely, R. (2014). A model for systemic change in rural schools.

Proceedings of the 38th Annual Conference of the International Group for the Psychology of Mathematics Education, v4, 1-8.

Ely, R., Adams, A. E., Yopp, D., Blackham, V., Druffel, C., Knott, L., & Clay Olson, J. (2014). Shortcutting abduction to enable justification. In P. Sullivan & Y. Yang (Eds.), *Proceedings of the 22nd Annual Conference of the International Commission on Mathematical Instruction*, *vol 6*, 62.

Ely, R., Olson, J. C., Adams, A., Knott, L., & Weaver, D. (2012). A classroom observation rubric for mathematical justification. In L. R. Van Zoest, J.-J. Lo, & J. L. Kratky (Eds.), *Proceedings of the 34th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. Kalamazoo, MI: Western Michigan University, 1196.

Ely, R. & Radu, I. (2012). Promoting students' object-based reasoning with infinite sets. *Online proceedings for the 15th SIGMAA on Research in Undergraduate Mathematics Education Conference*. Portland, OR: Portland State University, OR.

Ely, R. & Boester, T. (2010). Point/Counterpoint: Should we teach calculus using infinitesimals? *Online Proceedings for the 13th SIGMAA on Research in Undergraduate Mathematics Education Conference*. Raleigh, NC: North Carolina State University.

Ely, R. (2007). Nonstandard models of arithmetic found in student conceptions of infinite processes. In Lamberg, T., & Weist, L. R. (Eds.) *Proceedings of the 29th Annual Conference of the North American Chapter of the International Group for the Psychology of Mathematics Education*. Stateline (Lake Tahoe), NV: University of Nevada, Reno, 116-119.

Other:

Yopp, D. Ely, R., Adams, A.E., Nielsen, A. (2022). Proof in the middle grades: Can we label middle grades arguments as proof with a capital P? In Kristen N. Bieda, AnnaMarie Conner, & M. Staples (Eds), *Conceptions and Consequences of Mathematical Argumentation, Justification, and Proof (Research in Mathematics Education)*, (pp. 109-127), Springer.

Ely, R. (2016). Infinitesimals in student reasoning. In E. Silver, & P. Kenney, (Eds.), *More Lessons Learned from Research: Volume 2*. Reston, VA: National Council of Teachers of Mathematics. pp. 151-158.

Knott, L. Olson, J., Adams, A., & Ely, R. (2015). *Task Design in Mathematics Education: Proceedings of ICMI Study 22*. Anne Watson & Minoru Ohtani. Springer. Dordrecht, NL.

Ely, R. (2010). Book review: Theories of mathematics education: Seeking new frontiers. *Educational Studies in Mathematics*, 75: 235-240.

Webb, N. L., Alt, M., Ely, R., Cormier, M., & Vesperman, B. (2006). The Web Alignment Tool: Development, Refinement, and Dissemination. In *Aligning Assessment to Guide the Learning of All Students: Six Reports on the Development, Refinement, and Dissemination of the Web Alignment Tool*, Council of Chief State School Officers, Washington, D.C.

Refereed/Adjudicated (currently scheduled or submitted):

Ely, R., Yopp, D., Adams, A., (in review). Domain appropriateness and empirical argumentation.

Ely, R., & Lewis, C. (in review). Effects of a large-scale intervention on Grade 8 viable argumentation in mathematics.

Professional Meeting Papers, Workshops, Showings, Recitals (refereed/adjudicated):

**All proceedings articles from the Abstracts and Proceedings (refereed/adjudicated) section above were accompanied by a presentation given at the corresponding conference. Those above are not listed here also. This section includes only refereed presentation papers that did not end up in published proceedings.*

Adams, A., Yopp, D., & Ely, R. (2016). *Reasoning paths from exploration to argument*. NCTM Research Conference, San Francisco, CA.

Karunakaran, M. S., Adams, A. E., Wnek, B., Blackham, V., Klosterman, P., Knott, L., Ely, R. (2016). Making mathematical reasoning explicit: Responsive PD. *Proceedings of the 13th International Congress on Mathematical Education,* Hamburg, July.

Ely, R., Adams, A. E., Blackham, V., & Druffel, C. (2014). Ways to Elicit Reasoning: Hunt-then-Fish vs. Anticipatory Tasks. Presented at the National Council of Teachers of Mathematics Research Conference, in New Orleans, LA, April 7-9.

Ely, R. & Frost, J. (2010). *Experiencing and resolving cognitive conflict induced by the infinite*. Paper presented at the Annual Meeting of the American Education Research Association, Denver, CO. May 2.

Ely, R. (2007). *Student Obstacles and Historical Obstacles to Foundational Concepts of Calculus*. New research paper presentation at the American Education Research Association Annual Meetings, Chicago, IL, April 13.

Professional Meeting Papers, Workshops, Showings, Recitals (other):

Ely, R. (2021). Ingenious slicings. WSU AMS Mathematics Colloquium, December 2.

Ely, R. (2020). Reasoning with infinite paradoxes. WSU AMS Mathematics Colloquium, February 20.

Parr, E., & Ely, R. (2020). A hypothetical learning trajectory for conceptualizing distances on Calculus graphs. Presented at the Fall Central Sectional Meeting of the American Mathematical Society, September 13.

Ely, R. (2018). *Zooming in on scaling-continuous covariational reasoning*. University of Idaho Mathematics Department Colloquium, Sept. 20.

Ely, R., & Smith, R. (2017). *Playing with fire: Handling double-binds*. University of Idaho Renfrew Interdisciplinary Colloquium, Oct 10.

Ely, R. (2017). *Reasoning with infinite paradoxes*. Cal Poly San Luis Obispo Mathematics Colloquium, June 2.

Ely, R. (2017). *Anatomy of a variable* (James Gerhart Lecture). Pacific Northwest Association of College Physics, April 7.

Ely, R. (2016). *Registers for reasoning with definite integrals*. University of Idaho Mathematics Departmental Colloquium. Sept 1.

Ely, R. (2013). *Analysis, Abduction, and Axiomatics*. University of Idaho Mathematics Departmental Colloquium. Dec. 12.

Ely, R. & Hesford, W. (2013). *Useful Fictions: Mathematics, Literature, and Pedagogy*. UI Renfrew Interdisciplinary Colloquium, April 9.

Chair of the Working Group on Limits and Infinity in Undergraduate Student Learning. 15th Annual Research in Undergraduate Mathematics Education Conference, Portland, OR, Feb 22-23, 2012.

Ely, R. (2011). *Loss of Dimension in the History of Calculus and in Student Reasoning*. Paper presented at the History and Pedagogy of Mathematics Conference, West Coast Section, Oct 1.

Ely, R. (2011). *Conceptions of dimension loss and the Fundamental Theorem of Calculus*. Department of

Mathematics Colloquium, Washington State University, March 31.

Chair of the Working Group on Limits and Infinity in Undergraduate Student Learning. 14th Annual Research in Undergraduate Mathematics Education Conference, Portland, OR, Feb 24, 2011.

Ely, R. (2010). *"What is x?"* University of Idaho Mathematics Departmental Colloquium. Oct. 21.

Ely, R. (2010). *Infinite Paradoxes Through the Ages*. 49th Northwest Math Conference, Spokane, WA, Oct 8.

Ely, R. (2010). *Infinite paradoxes and the cognitive construction of infinite objects*. Wright State University Department of Mathematics and Statistics Colloquium, June 4.

Chair of the Working Group on Limits and Infinity in Undergraduate Student Learning. 13th Annual Research in Undergraduate Mathematics Education Conference, Raleigh, NC, Feb 25, 2010.

Ely, R. (2009). *The Age of (Notational) Exploration: Meanderings in Italian 16th Century Mathematics*. Presented at the University of Idaho History Department Colloquium, Moscow, ID, Oct. 22.

Ely, R. (2009). *Hold Infinity in the Palm of Your Hand and Eternity in an Hour*. Presented at the University of Idaho Interdisciplinary Colloquium, Moscow, ID, Sept. 22.

Ely, R. & Vincent, K. (2009). *Context "vs." Notation: Lessons Learned From History and the Classroom*. Presented at MathFest, Portland, OR, Aug. 7.

Ely, R. (2009). *Productive Discourse From Rich Tasks: The Example of the Double Spin Game*. Presented at MathFest, Portland, OR, Aug. 7.

Ely, R. (2009). *Infinite Processes and Sets in the Learner's Mind*. Presented at MathFest, Portland, OR, Aug. 8.

Content Leader, Grades K-8 Mathematics Standards-Setting Committee and Working Group, Idaho State Department of Education. (May 6-8, 2009) (invited working group for the development of Idaho K-8 Mathematics Standards)

Content Leader, Grades K-8 Mathematics Standards-Setting Committee and Working Group, Idaho State Department of Education. (June 8-10, 2009) (invited working group for the development of Idaho K-8 Mathematics Standards)

Ely, R. (2009). *Depth-of-Knowledge for Mathematics Standards*. Presented at the Idaho Department of Education K-8 Mathematics Standards-Setting Meeting, Boise, ID, May 6.

Ely, R. (2009). *Toward a Middle Grades Mathematics Endorsement*. Presented at the Idaho Science, Mathematics, and Technology Coalition Meeting, Boise, ID, May 11.

Ely, R. (2007). *Horror Infiniti: A History of Indivisibles*, Department of Mathematics Colloquium, University of Idaho, Dec 6.

Ely, R. (2007). *The Development of Mathematics in Societies and in Individuals*. University of Idaho Technology, Engineering, Education, Mathematics, & Science Colloquium, Moscow, ID, Oct. 24.

Ely, R. (2007). *Solving a Pedagogical Puzzle: Making Sense of Three Different Students' Approaches to Quadratic Patterns*. Presented at the annual meeting of the Idaho Council of Teachers of Mathematics, Nampa, ID, Oct 4-5.

Ely, R. (2007). *Student Conceptions of Infinity*, Department of Mathematics, Beloit College, April 14.

Ely, R. (2007). *Conceptions of Infinitesimals in Undergraduate Calculus Students and in History*. New research paper presentation at the Joint Meetings of the American Mathematics Society and the Mathematics Association

of America, New Orleans, LA. Sunday, Jan. 7.

Ely, R. (2006). *A Student Model of Infinitesimals*. New research paper presentation at the annual conference for Research in Undergraduate Mathematics Education, Piscataway, NJ, Feb. 23-26.

Ely, R. (2005). *Interpretation of Web Alignment Data*. Presented at the Web Alignment Tool Dissemination Conferences, Phoenix AZ & Boston, MA.

Grants and Contracts:

PI: *Characterizing and Fostering Playful Mathematics in Grades 9-16*. National Science Foundation, EHR-Core Program. Aug. 2023 – July 2027.
Status: In review, submitted Oct. 2022.
Amount: $1,498,760

PI: *Longitudinal Learning of Viable Argument in Mathematics for Adolescents (LLAMA)*. National Science Foundation, DRK12. Aug. 2016 – July 2022.
Status: Awarded
Amount: $2,999,639.53

PI: *Playful Math*.
UI College of Science Pilot Grant. Aug. 2021 – July 2022.
Status: Awarded
Amount: $30,000

Co-PI: *Making Mathematical Reasoning Explicit*. National Science Foundation, Math-Science Partnership Program Institute Grant. Aug. 2011 – July 2016.
PI: Libby Knott, Washington State University
Status: Awarded
Amount Awarded: $4,996,102

PI: *Idaho Math Endorsement Program Course Development*. Idaho Department of Education Contract. Jan. 2011-June 2011.
Status: Awarded
Amount Awarded: $19,940

PI: *ISDE Mathematical Thinking for Instruction*. Idaho State Department of Education Contract.
Jan. 2010 – May 2010.
Status: Awarded
Amount Awarded: $14,049.

PI: *Student Conceptions of Infinite Processes*. University of Idaho Research Office Seed Grant. Aug. 2008 – Aug. 2009.
Proposal Submitted: Feb. 2008.
Status: Awarded
Amount of Award: $10,000.

Co-PI: *Collaborative Research: Project DIRACC: Developing and Investigating a Rigorous Approach to Conceptual Calculus*. National Science Foundation, Improving Undergraduate STEM Education (IUSE) Development and Implementation. Aug. 2016 – July 2019.
PI: Patrick Thompson (Arizona State University)
Status: Not Funded.
Amount: $1,984,536

Co-PI: *Developing Secondary STEM Teachers for Rural Idaho*. National Science Foundation, Robert Noyce Scholarship Program.
Proposal Submitted: April. 2012

Status: Not Awarded
Amount Requested: $1,422,143

PI: *Collaborative Research: Contextual Research-Empirical Research: Transitioning to Proof*. National Science Foundation, Research and Evaluation on Education in Science and Engineering (REESE) Program. Aug. 2010 – Aug. 2013.
Proposal Submitted: Nov. 2009.
Status: Not Awarded.
Amount Requested: $394,098.

Co-PI: *Washington Idaho Mathematics Leadership Institute*. National Science Foundation, Math-Science Partnership (MSP) Teacher Institutes Program.
Proposal Submitted: Feb. 2009.
Status: Not Awarded.
Amount Requested: $4,996,698.

PI: *Math in the Middle: Developing an Idaho Endorsement for Teaching Mathematics in the Middle Grades*. National Science Foundation, Discovery Research K-12 Program.
Pre-Proposal Submitted: Oct. 2009.
Status: Not Awarded.
Amount Requested: $2,047,609.

Senior Personnel: *Junior Engineering Science & Mathematics (JEMS) for Teachers: An Introduction to Engineering for High School Teachers*. National Science Foundation, Innovative Technology Experiences for Students and Teachers (ITEST) Program.
Proposal Submitted: Apr. 2008.
Status: Not Awarded.
Amount Requested: $440,470.

Co-PI: *Environmental Change in a Changing Climate: Integrating Ecological Research into Undergraduate Science Education*. Howard Hughes Medical Institute Research Grant Program.
Proposal Submitted: Oct. 2009.
Status: Not Awarded
Amount Requested: $2,199,189.

Co-PI: *STEM Integration: A Synthesis of Research*. National Science Foundation, Research and Evaluation on Education in Science and Engineering (REESE) Program.
Proposal Submitted: Jan. 2008.
Status: Not Awarded.
Amount Requested: $249,890.

Other Scholarly Activity:

Scholarship of Application and Integration:

Development of standards and coursework for the Idaho Math Endorsement Program, including two courses that are hybrid: *Algebraic & Functional Reasoning* and *Data Analysis & Probability*. This includes several conferences each year and meetings since 2008 with mathematics educators and leaders in the State Department of Education.

Developing and delivering research-based coursework for in-service mathematics teachers of grades 9-12, based on the MTI model, in 2010 and 2011 contracted by the Idaho Department of Education.

Developing and delivering research-based coursework for in-service mathematics teachers of grades 4-12 for the MMRE grant: Proportional Reasoning, Summer 2012

Leading and coordinating ongoing professional development workshops for in-service teacher leaders for the

MMRE grant and for the LLAMA grant.

Coauthoring a book about Calculus as part of the *Routledge* series *Interweaving Mathematics Pedagogy and Content for Teaching (IMPACT)*.

SERVICE:

Major Committee Assignments:

University:

- University Advising Committee (UI, 2020-present)
- Math Endorsement Planning Committee (Departments of Math and Curriculum & Instruction, 2016-present)
- General Education Task Force (University of Idaho, 2016)
- Teacher Education Curriculum Committee (University of Idaho, 2007-present)
- Search Committee, Mathematics Education Position (Department of Mathematics, Fall 2007-Spring 2008)
- Search Committee, Mathematics Education Position (Department of Curriculum and Instruction, Fall 2007-Spring 2008)
- Search Committee, Mathematics Education Position (Department of Curriculum and Instruction and Mathematics, Spring and Fall 2011, Spring 2012)
- Micron STEM Grant Advisory and Planning Committee (University of Idaho, 2011-2016)

Departmental:

- Education Course Supervisory Committee (Department of Mathematics, 2007-present)
- Calculus Course Supervisory Committee (Department of Mathematics, 2007, 2016-present)
- Math Club Committee Chair (Department of Mathematics, 2007-present)—This committee has involved planning and running events such as the Pi Day contests, scavenger hunts, games nights, Math Jeopardy, scary math paradoxes, movie nights, and the visit to the Barker Trading Lab.
- Master's of Teaching in Mathematics Committee (Department of Mathematics, 2007-present)
- Preliminary Exam Committee, Jodi Frost (Department of Mathematics, Spring 2009)
- Middle-School Mathematics Teacher Education Course Committee (University Level, University of Wisconsin-Madison, Fall 2006)
- Calculus II Satellite Sections Committee (Department of Mathematics, University of Wisconsin-Madison, Spring 2002)

Professional and Scholarly Organizations

Review Activities:

- Guest Editor, *International Journal for Research in Undergraduate Mathematics Education*, 2021.
    - Includes designing focus issue on Teaching and Learning of Definite Integrals, including inviting manuscripts, making acceptance/rejection decisions and writing editorial letters for 7 manuscripts.

- Editorial Board Member, *Mathematics Teaching in the Middle School* Journal, 2011-2014
    - Includes making acceptance/rejection decisions and writing letters for 45 manuscripts, and reviewing and managing the monthly Palette of Problems Department

- Reviewing journal manuscripts
    - *Journal for Research in Mathematics Education*
    - *Research in Collegiate Mathematics Education*
    - *Canadian Journal of Science, Mathematics, and Technology Education*
    - *Mathematics Teaching in the Middle School*
    - *Foundations of Science*

- *Journal of Mathematical Behavior*

- Reviewing conference proposals
  - *Research in Undergraduate Mathematics Education Conference, 2012*
  - *American Educational Research Association Conference, 2011*
  - *Psychology of Mathematics Education Conference—North American Chapter, 2007*

- Reviewing grant proposals
  - *Israeli Science Foundation*

Outreach Service:

Explicit Reasoning and the Five Practices—Two workshops for Highland Elementary School, Clarskton, WA: Nov, 2018 & Feb 2019.

Rich Tasks and Strings—Whole-district PD workshop for the Pullman School District in Pullman, WA: Oct 3, 2014.

Platonic and Semi-Regular Solids Activities, Middle School Science Bowl, UI College of Science. (2009, 2010, 2011, 2017, 2018)—Presentation and interactive activities with middle-school students and parents.

Math Day, invited leader of mathematics and math education activities organized by the Math Club at Cal Poly San Luis Obispo on June 2, 2017.

GearUp summer camp at Eureka Palouse, July 2017: Planning and running math activities.

Heavenly Geometry. Palouse Science Discovery Center, (Nov. 7, 2009)—Presentation and interactive mathematics activities for K-6 students and parents.

Math Day, Lena Whitmore Elementary School, Moscow, ID. (Nov. 9, 2009)—Working with pre-service teachers and in-service teachers to prepare and implement innovative mathematics activities with K-6 students.

Math Day, Lena Whitmore Elementary School, Moscow, ID. (Oct. 31, 2007)—Coordinating pre-service teachers' collection of data about K-6 students' reasoning with self-guided mathematics tasks.

MathBuilders grant through the Palouse Science Discovery Center, Project Consulting and Evaluation. Designing, piloting, and refining the MathBuilders activities, a set of rich self-guided tasks for Grades 2-6 students. In addition, the project brought pre-service elementary teachers to observe and collect data about the mathematical strategies and realizations students make when solving the activities, which provides valuable information for the formative assessment and project evaluation of the MathBuilders project. (2008 – 2010)