

Robert S. Keller

Division of Mathematics, Engineering, and Computer Science
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Education

- Ph.D., Mathematics** University of North Carolina, Chapel Hill (UNC-CH), 1999
▶ Dissertation research in Singularity Theory under the direction of J. Damon.
B.A., Mathematics, *magna cum laude.* St Olaf College, Northfield, MN, 1993

Scholarly Interests

K-12 Mathematics Education
STEM Professional Development of teachers
Quantitative Literacy and its assessment
Scholarship of Teaching and Learning, including course, curriculum, and program development

Professional Teaching and Administrative Experience

**Associate Professor of Mathematics and Chair,
Division of Mathematics, Engineering, and Computer Science**

- ▶ Loras College, Dubuque, IA 2011-present

Associate Professor of Mathematics and Director of Mathematics Programs

- ▶ Loras College, Dubuque, IA 2005-2011

Assistant Professor of Mathematics

- ▶ Loras College, Dubuque, IA 1999-2005

Courses taught at Loras College (* indicates course revised,** indicates course created):

Mathematics Courses taught:

<i>Intermediate Algebra</i>	<i>Survey of Mathematics</i> *
<i>Math for Survival</i> **	<i>College Algebra</i> *
<i>Statistics</i>	<i>PreCalculus</i>
<i>Math for Elementary Teachers I</i> **	<i>Math for Elementary Teachers II</i> **
<i>Intuitive Calculus</i>	<i>Calculus I</i> *
<i>Calculus II</i>	<i>Calculus III</i>
<i>Accelerated Calculus</i> *	<i>Intro to Probability & Statistics</i> **
<i>Discrete Mathematics</i>	<i>Linear Algebra</i>
<i>Real Analysis</i>	<i>Modern Geometry</i> *
<i>Mathematics Seminar</i> **	<i>Senior Capstone</i> *

Interdisciplinary General Education Courses taught:

<i>Rap'n Violence</i> **	<i>Materialism in America</i> **
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Education Courses taught:

Secondary Mathematics Methods *

Talented & Gifted Mathematics Teacher

- ▶ Dubuque Community Schools 2000-2004
Grades 5-6: Audubon, Irving, and Marshall Elementary Schools; 3 contact hours weekly.

Professional Activities

STEM Professional Development of Teachers

- ▶ Project Co-Director and presenter, Communities of Exemplary Practice: A Math-Science Professional Development Framework for Middle School Teachers.
See grants section for funding details.
 - Life Science & Mathematics. *Charles City IA, May 22 2014*
 - Life Science & Mathematics. *Loras College, January 25 2014*
 - STEaM: Making STEM connections to English & Language Arts. *Charles City IA, November 15-16 2013*
 - Life Science & Mathematics. *Loras College, July 23-26 and 29-31 2013*
 - Physical Science & Mathematics. *Charles City IA, June 4-5 2013*
 - Physical Science & Mathematics. *Loras College, January 26 2013*
 - Physical Science & Mathematics. *Loras College, June 28, 29, July 9-13 2012*
- ▶ Supervisor, Educational Technology Purchases, Verizon STEM grant. *2012-2013*
 - Led efforts to purchase 55 Apple iPads and AppleTV technology for use by area teachers and Loras faculty, students.
 - Coordinated professional development for area teachers on math, science, and productivity apps.
- ▶ Workshop organizer and presenter, 2012-13 Dubuque Community School District Professional Development for middle school math and science teachers.
 - Integrated Math/Science: A sample Lesson. *February 18 2013*
 - Strategies for Implementing Integrated Math/Science Lessons. *Oct 12 2012*
 - Strategies for Planning Integrated Math/Science Lessons. *September 21 2012*
 - Promoting Integration of Science and Math in Middle School using Lesson Study. *August 16 2012*

Mathematics Professional Development of Teachers

- ▶ Organizer and Instructor, Elementary Mathematics Course for Practicing and Future Teachers, St. Columbkille Elementary School. A unique course delivering elementary mathematics content simultaneously to future and practicing teachers following a professional development school model. *January 6-24 2014*
- ▶ Workshop organizer and presenter, Dubuque Holy Family School District Professional Development.
 - Investigations of Number & Operations: Fractions, K-5 teachers. *Feb 17 2014*
 - Investigations of Number & Operations in Base 10, K-5 teachers. *Oct 11 2013*
 - Teaching Mathematics for Understanding, K-8 teachers. *September 13 2013*
- ▶ Outside Evaluator, Iowa Teacher Intern License Pathway. *Fall 2011-Spring 2012*
- ▶ Workshop organizer and presenter, Loras College Teachers Circle.
 - Zometool Explorations. *March 23 2011*
 - Blaise Pascal Tosses Marshmallows. *November 10 2010*
 - Magic Squares, Patterning, and informal Visual Proofs. *August 2-6 2010*
- ▶ Workshop organizer and presenter, Loras College Lesson Study Project: One of four principal workshop presenters and a member of the planning team. Presented to practicing K-8 teachers from a number of districts throughout Eastern Iowa.
 - Middle School: Connected Mathematics Project and the Iowa Core. *Two-day workshop, summer 2011*

- Grades 5-6: Fractions and Decimals. *Two 3-day workshops, summer 2010*
- Middle School: Marshmallows, Probability and Pascal’s Triangle. *3-hour workshop, April 13 2010*
- Middle School: Patterns and Functions. *Two 3-day workshops, summer 2009*
- Middle School: Proportional Reasoning. *Two 3-day workshops, summer 2008*
- K-6: Patterns, Functions, Algebra. *Two one-week workshops, summer 2007*
- K-6: Geometry and Measurement. *Two one-week workshops, summer 2006*
- K-6: Numbers and Operations. *Two one-week workshops, summer 2005*
- Dubuque Holy Family Lesson Project Supervisor and Consultant *2005-07*
- ▶ Workshop presenter, Dubuque Community School District: transition to Algebra I standards-based curriculum. *Three full-day workshops and bi-monthly meetings, 2002-2003*

Consulting, Review, and Similar Work

- ▶ Member, Editorial Review Panel, Iowa Council of Teachers of Mathematics Journal *2013-14*
- ▶ Mathematics Review Panelist, Iowa Testing Programs. *January 11 2014*
- ▶ Testing Consultant, Mississippi Bend Area Education Agency. Coordinated with AEA staff to organize and administer assessment instruments for practicing K-5 teachers using instruments in the Learning Mathematics for Teaching project. *Summer 2013-Spring 2014*
- ▶ Faculty Consultant, Educational Testing Service
AP Calculus, Colorado State University. *June 2001, June 2003*
AP Calculus, Online Scoring Network. *July and August 2002*

State Content Requirements Action Group

One of three members of a team responsible for organizing statewide discussions to update the content requirements for licensure in secondary mathematics education in Iowa. The team dialogued with stakeholders across Iowa, making presentations at various conference meetings. Grants from the Regents’ Academy for Mathematics & Science and the University of Northern Iowa supported this work. *2002-04*

Professional Presentations at Regional, National or International Venues

Note: These do not include references to workshop presentations. See Professional Activities section above.

- “Reading, Writing, ’Rithmetic: Encouraging Reflection by Future Teachers.” 46th Annual Conference of the Wisconsin Mathematics Council. *Green Lake WI, May 2 2014*
- “Fusion STEM: Blending Science, Technology, Engineering, and Mathematics for Improved Digestion and Better Flavor.” Loras Legacy Symposium. *Dubuque IA, April 30 2014*
- “STEM Stew: Mixing it up for Improved Digestion and Better Taste.” Iowa Council of Teachers of Mathematics and Iowa Academy of Science Joint Conference. *Ames IA, October 23 2013*
- “Math and Science: Better Together.” Iowa Council of Teachers of Mathematics Conference. *West Des Moines IA, February 15 2013*
- “Reading, Writing, and ’Rithmetic: Professional Literature and Reflective Practices in a Pre-service Math Content Course” Iowa Council of Teachers of Mathematics Conference. *West Des Moines IA, February 15 2013*

Invited presentation on the use of the project *Figurate Numbers and sums of numerical powers: Fermat, Pascal, Bernoulli*. Workshop on Authorship of Student Projects Based on Primary Historical Sources for Courses in Mathematics or Computer Science. *New Mexico State University, April 16-17 2012*

“Reading, Writing, and Arithmetic: Use of Professional Literature and Reflective Practices Improve Performance by Future Teachers in Math Content Courses.” Iowa Science and Math Teacher Educators Summit. *Ankeny, August 12 2011*

“Discrete Observations or Continuous Ramblings: Some Thoughts on Historical Projects in Discrete Mathematics.” Iowa MAA Conference. *Cedar Rapids IA, October 23 2010*

“Practical Mathematics: A Mathematics Practicum.” SENCER Conference. *St. Paul MN, November 7 2009*

“Exemplary Programs for Elementary and Middle School Teachers.” Midwest Symposium on Excellence in Teaching Mathematics and Science: Research and Practice. *Chicago, October 13 2007*

“Developing and Assessing a Two-course Sequence in K-6 Mathematics: Tales from the Trenches.” PMET Conference. *Boone NC, July 27 2006*

“Getting Students to Speak Mathematics: One Model that Works.” Special Session on Mathematics and Education Reform, Joint Meetings. *San Antonio, January 13 2006*

“Recent Curricular Changes: The Loras College Mathematics Program.” Excellence in Undergraduate Mathematics: Mobilizing for the Future, American Mathematical Society & Mathematicians and Education Reform. *Tempe AZ, December 2 2005*

“New Directions: How One Small School Increased its Involvement in Mathematics Education.” Breakout session, Excellence in Undergraduate Mathematics: Mathematics for Teaching and Mathematics for Teachers, American Mathematical Society & Mathematicians and Education Reform. *Ithaca NY, March 14 2003*

“Incorporating Diversity into a First-Year Seminar: Modes of Inquiry.” Panel Discussion, Prizing Diversity, The Collaboration for the Advancement of College Teaching & Learning. *Minneapolis, November 15 2002*

“Characterizing Shape Change for Image Analysis.” Invited Talk, International Conference on the Applications of Singularity Theory to Geometry. *Liverpool, December 19 2000*

“Transitions of Ridges in Parametrized Families of Functions.” Contributed Talk, National Joint Mathematics Meetings. *Washington D.C., January 19 2000*

Scholarly Writing and Grants

Grant Work

Co-Principal Investigator (with R. Monhardt, Loras College): *Communities of Exemplary Practice: A Math/Science Professional Development Framework for Middle School Teachers*. Federal Title IIA (Improving Teacher Quality) funding awarded through the Board of Regents, State of Iowa. (ref. CFDA 84.367B)

- ▶ \$14,996 June 2014-September 2015
- ▶ \$136,111 June 2014-June 2015
- ▶ \$134,791 June 2013-June 2014
- ▶ \$29,906 April 2013 -September 2013
- ▶ \$134,543 April 2012-June 2013

Principal Investigator: *Meeting Best Practice STEM Education Needs*. Motorola Solutions Foundation, 2014. Funding pending.

- Co-Principal Investigator: *STEM Education*. Dubuque Racing Association, 2014. Not funded.
- Co-Principal Investigator: *Title Here*. Verizon Foundation, 2013. Not funded.
- Co-Principal Investigator: *Preparing STEM Educators for the 21st Century*. Verizon Foundation, 2013. \$77,000.
- Principal Investigator: Loras College’s application to serve as a *Regional STEM Hub*, Spring 2012. State of Iowa. Not funded.
- Co-Principal Investigator (with C. Nugent, Dubuque Community Schools): *Teaching and Learning Mathematics: A Problem-Solving Approach*, Proposal to the State of Iowa for Title II funding, 2011. Not funded.
- Co-Principal Investigator (with B. Stevens, University of Northern Iowa): *Integrating Reflective Practices in Mathematics for Elementary Teachers Content Courses*, Inter-Institutional Research Grant, UNI. 2009-2011. \$2500.
- Principal Investigator: Preparing Mathematicians to Educate Teachers Grant, 2004-2006. This grant supported the development of a two-course sequence in mathematics for K-8 teachers at Loras College. \$4000.

Publications

- R. Keller, “Math and Science: Stronger Together.” *Iowa Council of Teachers of Mathematics Journal*. Volume 40 (Winter 2013-14): pp 37-38, 2014
- R. Keller, *Essential Statistics: Exploring the World through Data*. 1st edition. *Student Solutions Manual*. Pearson Higher Education. 2014
- R. Keller, *Introductory Statistics: Exploring the World through Data*. 1st edition. *Instructor Solutions Manual*. Pearson Higher Education. 2013
- R. Keller, *Introductory Statistics: Exploring the World through Data*. 1st edition. *Student Solutions Manual*. Pearson Higher Education. 2013
- R. Keller (contributing author) et al., *Insider’s Guide to Teaching with A Problem Solving Approach to Mathematics for Elementary School Teachers*. Pearson. 2013
- R. Keller. *Generic Transitions of Relative Critical Sets in Parametrized Families with Applications to Image Analysis* Ph.D. Diss. UNC-CH, 1999
- T. Concannon and R. Keller. “Teaching Problem Solving.” *For Your Consideration*, #20. Center for Teaching and Learning, UNC-CH, June 1998
- J. Furst, R. Keller, J. Miller, and S. Pizer. “Image Loci are Ridges in Geometric Spaces.” *Lecture Notes in Computer Science*, Springer-Verlag, 1252: pp 176-187, 1997

Other Scholarly Writing

- Author, one of five chapters for the *Loras College Self Study*, for re-accreditation from the Higher Learning Commission, 2007-2009.
- Primary author and editor, *Mathematics Program Self-Study*, 2008.
- Invited professional textbook reviews:
- ▶ Calculus, Hawkes Learning Systems *Spring 2012*
 - ▶ Mathematics: A Discrete Introduction, 3rd ed., Scheinerman. Cengage *Summer 2010*
 - ▶ Introductory Statistics, Ryan and Gould. Pearson *Fall 2009*
 - ▶ Calculus, Blank and Krantz. Key College *Fall 2009*

- ▶ College Algebra, Becerra. Cengage Learning *Spring 2009*
- ▶ Calculus, Briggs and Cochran. Pearson *Fall 2008*
- ▶ Calculus: One and Several Variables, 9th ed., Salas, Hille, Etgen. Wiley *Spring 2006*
- ▶ Calculus, text proposal, Rogawski. W.H. Freeman *Summer 2005*
- ▶ Brief Calculus, 8th ed., Sullivan. Wiley *Fall 2004*
- ▶ Calculus, text proposal, Cohen and Henle. Key College *Fall 2002*
- ▶ Beginning and Intermediate Algebra, 1st ed., Hall & Mercer. McGraw-Hill *Fall 2002*
- ▶ Calculus, 2nd ed., Smith and Minton. McGraw-Hill *Fall 2001*
- ▶ Calculus Now, text proposal, Key College *Fall 2000*

Mentoring Undergraduate Research Projects

Peer-reviewed presentations as noted.

Nicole Jess, *Patterns in the Fibonacci sequence*, 2011-12

- Pi Mu Epsilon Conference, Du Pere WI, Fall 2011

Monica Welter, *Factors impacting Persistence in Mathematics*, 2009-10

- Midwest Undergraduate Mathematics Symposium, Indianola IA, Spring 2010
- Pi Mu Epsilon Conference, Du Pere WI, Fall 2009

Amanda Steffen, *Areas of Polygons in Spherical Geometry*, 2009

Jennifer Parker, *Modeling Chemical Oscillations*, 2008-09

- Midwest Undergraduate Mathematics Symposium, Indianola IA, Spring 2008

Tom Drosopoulos, *Isometries in Hyperbolic Geometry*, 2007-2008

Curriculum Development and Scholarship of Teaching and Learning

Master of Arts in Integrated STEM Education 2013-present

Co-developer and co-director of a master's program in curriculum and instruction for integrated STEM education to be launched in summer 2014.

Master of Business Administration in Business Analytics and Undergraduate Major in Business Analytics 2013-present

Assisted in developing these two programs at Loras College.

Mathematics for Future Teachers and its Assessment 2004 - present

Principal Investigator on a *Preparing Mathematicians to Educate Teachers* grant (NSF DUE-0230847) to support the development of a two-course sequence of mathematics courses for pre-service K-8 teachers. Ongoing assessment of these courses is done via the instruments developed by the Learning Mathematics for Teaching project at the University of Michigan. Certified to administer the LMT instruments through formal training at the the University of Michigan, Ann Arbor, November 2005. Courses continue to evolve based on findings from assessment.

Quantitative Literacy and its Assessment 2000-present

Key player in establishing definitive expectations on quantitative reasoning for Loras College, first as a member of the group charged with creating a general education mathematics curriculum. Subsequently, led efforts to assess quantitative reasoning skills of students, both in creating evaluation instruments and performing statistical analysis of data.

Historical Projects in Mathematics Fall 2009 - present

Piloting and class testing projects that utilize primary historical sources in mathematics courses. This required ongoing collaboration with faculty members at New Mexico State University. *April 15-17 2012 and April 7-10 2010, Las Cruces, NM*

Mathematics Major and Minor Programs 2000-2004

Responsible for substantial overhaul to the mathematics major and minor, including the development of two new courses: Introduction to Probability and Statistics and Mathematics Seminar. Also led recruiting efforts to increase the number of majors and minors. Since 2005, oversaw continued recruiting and further revisions to the program as Director of Mathematics Programs.

Professional Development: Conferences, Workshops, and Meetings Attended

Note: References to meetings at which presentation(s) were given are not duplicated below.

National Science Teachers Association STEM Forum. *New Orleans, May 14-17 2014*

Iowa Statewide STEM Conference. *Des Moines IA, March 28 2014*

Business Analytics Symposium. *Dubuque IA, March 27 2014*

Midwest Mathematics Meeting of the Minds (M4) Conference. *La Vista NE, March 7 2014*

First Lego League Competition. *Dubuque IA, December 7 2013*

STEM Teacher Educators' Conference. *Des Moines IA, September 20 2013*

Opportunities in Data Sciences. *Worcester MA, May 28-29 2013*

iExploreSTEM NE Iowa Family STEM Festival. *Dubuque IA, April 20 2013*

Iowa Association of Mathematics Teacher Educators. *Des Moines, February 16 2013*

Sustainability, Quantitative Reasoning, and the Liberal Arts: Enhancing Student Success through Civic Engagement. SENCER Midwest Symposium. *Beloit WI, Nov 10 2012*

STEM Community Conversation. *Cedar Falls IA, September 11 2012*

Formative Assessment Conference. *Platteville WI, March 30 2012*

Joint Mathematics Meetings. *Boston, January 4-7 2012*

Iowa Association of Mathematics Teacher Educators. *Des Moines, February 20 2011*

Iowa Council of Teachers of Mathematics Conference. *West Des Moines, February 19 2011*

Iowa Mathematics and Science Teacher Educators' Summit. *Des Moines, August 14 2009*

Tradeline College & University Science Facilities. *San Diego, October 27-28 2008*

Higher Learning Commission Workday on Accreditation. *Chicago, September 10 2007*

Learning Mathematics for Teaching, assessment training. *Ann Arbor, November 10 2005*

Chicago Lesson Study Conference. *Chicago, May 19-21 2005*

Regent's Academy for Mathematics and Science. *Marshalltown IA, January 28 2005*

Elementary Mathematics Requirements Forum. *Ames IA, December 14 2004*

Technology-Enhanced Learning at Loras. *Loras College, January 25 2003, March 13 2004*

Excellence in Undergraduate Mathematics, American Mathematical Society & Mathematicians and Education Reform. *Louisiana State University, November 7-10 2002; Washington University, May 2-5 2002*

Mathematics Association of America, Iowa Section. *Drake University, April 6-7 2001*

Joint Mathematics Meetings (and Project NExT workshops). *Washington D.C., January 2000; San Antonio, January 1999; Baltimore, January 1998*

MathFest, Mathematics Association of America (and Project NExT workshops). *Los Angeles, August 2000; Providence, August 1999*

Honors and Awards

- Nominated and selected as Keystone Area Education Agency Representative to the Iowa Council of Teachers of Mathematics. *October 2012*
- Fr. Naumann Award, Loras College, for exemplary service to students and institution. *2012*
- Who's Who of Emerging Leaders. *inducted Fall 2006*
- Who's Who in America's Teachers. *inducted Fall 2003*
- Who's Who in America. *inducted Fall 2003*
- Nominated for Vice President for Post-Secondary Education, Iowa Council of Teachers of Mathematics. *Fall 2003*
- Delta Epsilon Sigma. *inducted Fall 2002*
- Nominee for Loras College Professor of the Year. *2001, 2002*
- Project NExT Fellow, national professional development program for mathematics faculty. *inducted 1999*
- Tanner Award for Excellence in Teaching (nominee), UNC-CH. *1998*
- J. Burton Linker Award for Distinguished Teaching (nominee). Mathematics Department, UNC-CH. *1998-99, 1996-97 academic years*
- Visiting Mathematician. *The Fields Institute. Toronto, Canada. 1997*
- Phi Beta Kappa. *inducted Spring 1993*

Media Events

- Interview for the launch of the Master's program in Integrated STEM education at Loras College, Telegraph Herald newspaper. *Dec 17 2013*
- Interview for Loras College's capital campaign launch, Loras College video recordings. *Oct 18 2013*
- Mediacom Newsleaders Program interview regarding Loras College's capital campaign, Mediacom Communications public access channel. *October 16 2013*
- Faculty speaker, Public Press Conference for Loras College's capital campaign launch. *Oct 10 2013*
- Faculty speaker, Private Press Conference for Loras College's capital campaign launch. *Oct 10 2013*
- Interview regarding STEM education and professional development, Telegraph Herald newspaper. *July 29 2013*

Leadership and Service

For the Profession

- Member, Textbook and Curriculum Planning Committee, Holy Family School District. *Spring 2014*
- Member, planning committee for the iExploreSTEM Festival for April 2014.
- Regional Director for Keystone Area Education Agency and member of the Executive Board, Iowa Council of Teachers of Mathematics. *2013-15*
- Executive Board Meeting. *Cedar Falls, February 8 2014*
 - Executive Board Meeting. *West Des Moines, June 6-7 2013*

Member, Iowa Statewide Scale-Up Review Panel. Appointed by Dr. J. Weld, Executive Director of the Governor's STEM Council. *June 2012*

Mathematics Association of America Liaison. *1999-2012*

Member, Elementary Mathematics Committee, Dubuque Community Schools. *2003-04*

For Loras College

Chair, Division of Mathematics, Engineering, and Computer Science. *2011-14*

First-year registration counselor. *Summers 2007-2009, 2011-present*

Supervisor, Mathematics placement for incoming students. *Summer 2005-present*

Member, Literacy Specialist (Education) Search Committee. *Winter 2013-14*

Member, General Education Mathematics (Quantitative Reasoning) Assessment Team. *Spring 2005-present*

Member, Business Analytics Search Committee. *Spring 2013*

Member, College Statistics Software Adoption Committee (ad hoc). *Fall 2011-2013*

Director, Mathematics Programs. *Fall 2005-11*

Chair, College Re-accreditation Task Force. *Fall 2007-10*

Member, New STEM Facility Advisory Committee. *Spring 2007-2009*

Member, Degrees Committee. *2001-07*

Mentor, New Faculty Program. *Fall 2006*

Facilitator, Launch into Loras program. *Fall 2006*

Member, Joint Education-Mathematics Task Force. *2005-2006*

Division III Representative, Summer Session Committee. *2001-03*

Member, Modeling with Mathematics Action Group. *2000-03*

Member, Faculty Student Services Liaison Committee. *1999-2002*

Secretary, General Education Committee. *2000-01*

For the Mathematics, Engineering, and Computer Science Division

Chair, Mathematics Faculty Search Committee. *2005-06 AY, 2011-12 AY*

Member, Mathematics Faculty Search Committee. *2010-11 AY*

Chair(*) or Member, Faculty Peer Review Committees *2004**, *2007-2008**, *2009*, *2013*

Chair, Mathematics Major Committee. *2000-2005*

Member, Excellence in Undergraduate Mathematics: AMS-MER Workshop Planning team. *2003-04*

Department Webmaster. Overhauled and enlarged department website in 2001. *2001-04*

For Students

Academic advisor for up to 12 students annually. *2001-present*

Faculty supervisor, Loras College Mathematics Club. *2000-2009*

General education advisor for up to 35 students annually. *2001-2007*

For the Community

Treasurer, Shagbark Utility Corporation. *2002-present*

Treasurer, Cub Scouts Pack 19, Dubuque Iowa. *2009-2011*

Professional Memberships and Journal Subscriptions

Iowa Council of Teachers of Mathematics

Phi Beta Kappa

Delta Epsilon Sigma