

Lauren Keough
Department of Mathematics
Grand Valley State University
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Education

PhD Mathematics, May 2015

University of Nebraska - Lincoln

Dissertation Advisor: Jamie Radcliffe

Dissertation: *Extremal Results for the Number of Matchings and Independent Sets*

MS Mathematics, May 2011

University of Nebraska - Lincoln

BA Mathematics Education, May 2009

Hofstra University

Employment

Grand Valley State University, Assistant Professor, 2016- present

Davidson College, Visiting Assistant Professor, 2015-2016

University of Nebraska - Lincoln, Graduate Teaching Assistant, 2009-2015

Research

Research Interests

Combinatorics and graph theory, with special emphasis on extremal problems.

Publications

The Avalanche Polynomial of a Graph, D. Austin, M. Chambers, R. Funke, L.D. García Puente, L. Keough, submitted to Australasian Journal of Combinatorics, 2016, <https://arxiv.org/abs/1605.02713>

Graphs with the Fewest Matchings, L. Keough and A.J. Radcliffe, *Combinatorica*, 2015, 10.1007/s00493-014-3188-y

Research Mentor

Grand Valley State University, Fall 2016.

Co-advised 4 undergraduate students on a project motivated by Maurer's paper, *The King Chicken Theorem*.

Davidson College, 2015-2016.

Co-advised an undergraduate Honors Thesis *Matchings in Lex and Colex Graphs*.

Pacific Undergraduate Research Experience in Mathematics (PURE Math), Summer 2014.

Graduate research mentor for the residents program, an 8 week research program in which 12 advanced undergraduate mathematics majors (typically rising seniors) worked on 4 different projects related to the Abelian Sandpile Model.

Research Workshops and Summer Schools

Park City Math Institute - Undergraduate Faculty Program, July 2017.

A 3-week long workshop on special functions.

Mathematics Research Community, June 2017.

A week long workshop on crossing numbers of graphs.

Banff International Research Station in Mexico, November 2015.

A week long workshop on Sandpile Groups

Rocky Mountain Great Plains Graduate Research Workshop in Combinatorics, June 2015.

A two week summer research workshop fostering research collaborations among graduate students.

Rocky Mountain Mathematics Consortium Summer School: Algebraic Graph Theory, June 2013.

A two week summer workshop dedicated to exposing researchers to topics in algebraic graph theory.

Sage-Combinat Days 40, Summer 2012.

A week long workshop for Sage development with a focus on algebraic combinatorics.

Nebraska IMMERSE, Summer 2009.

Intensive Mathematics: a Mentoring, Education and Research Summer Experience. A six week long summer school in algebra and analysis for entering graduate students.

Presentations

Scholarship Presentations

AMS Spring Central Sectional Meeting, Special Session on Topics in Extremal, Probabilistic and Structural Graph Theory, *An Extremal Question for the Lights Out Game*, April 2017.

Joint Mathematics Meetings, MAA Session on Intertwining Mathematics with Social Justice in the Classroom, 1, *Raising Awareness of Social Justice Issues in Calculus 1: How to Get Started*, January 2017.

AMS Spring Central Sectional Meeting, Special Session on Probabilistic and Extremal Combinatorics, *The Combinatorics of RNA*, North Dakota State University, April 2016.

MAA Spring Southeastern Sectional Meeting, *Extremal Graph Theory for Graph Substructures*, University of Alabama at Birmingham, March 2016.

University of South Carolina: Discrete Mathematics Seminar, *Independent Sets in Hypergraphs*, March 2016.

AMS Fall Central Sectional Meeting, Special Session on Topics in Graph Theory, Hypergraphs, and Set Systems, *Maximizing 2-independent sets in 3-uniform hypergraphs*, Loyola University, October 2015.

Clemson University: Algebra, Discrete Mathematics and Number Theory Seminar, *Extremal hypergraphs for independent sets*, Clemson University, October 2015.

The Infinite Possibilities Conference, *Maximizing 2-independent sets in 3-uniform hypergraphs*, Oregon State University, March 2015.

Joint Mathematics Meetings - AWM Poster Session, *Extremal Questions for Matchings*, San Antonio, TX, January 2015.

CombinaTexas, *Extremal Questions for Matchings*, Texas A&M University, April 2014.

AMS Spring Western Sectional Meeting, Special Session on Extremal Graph Theory, *Minimizing Matchings in Graphs*, , University of Colorado Boulder, April 2013.

Graduate Students Combinatorics Conference 2013, *Minimizing Matchings in Graphs*, , University of Minnesota, April 2013.

Graduate Students Combinatorics Conference 2012 *Maximizing Matchings in Threshold Graphs*, University of Illinois Urbana - Champaign, April 2012.

Discrete Mathematics Seminar at UNL:

The Abelian Sandpile Model: Projects from PURE Math, Fall 2014.

Research Adventures in Discrete Math, Spring 2014.

The Abelian Sandpile Model, Spring 2014.

Minimizing Matchings, Spring 2013.

Maximizing Matchings in Threshold Graphs, Spring 2013.

Outreach Presentations

Teaching and Assessing Proof Writing, August 2016.

Co-organized a panel for MathFest 2016 as part of the Project NExT program.

Julia Robinson Day, March 2016.

Organized and ran a platonic solids activity for middle school girls at Julia Robinson Day at UNC-Charlotte.

All Girls/All Math Summer Camp, July 2015.

All Girls/All Math is a summer mathematics camp for high school girls. Co-taught a 4 hour mini-course on the game SET and its connection to Tic-Tac-Toe and some topics in topology.

Infinite Possibilities Conference, March 2015.

Invited panelist for “Summer REUs and Internships”.

Nebraska Association of Teachers Annual Meeting, September 2014.

A presentation called “Trains and Integer Partitions” for in-service 7-12 teachers.

Nebraska Wesleyan University, October 2013.

An introduction to Hall’s Marriage Theorem and extremal graph theory in a presentation to a Calculus 1 class.

National Security Education Consortium Workshop, August 2013.

A presentation about past and present methods of cryptanalysis for undergraduates from across the country interested in working in the intelligence community. Worked with one other graduate student to give a presentation and to implement a code breaking activity.

All Girls/All Math Summer Camp, July 2013.

All Girls/All Math is a summer mathematics camp for high school girls. I gave a 4 hour introduction

to graph theory for 20 students, leading them through activities about Eulerian graphs, planarity, and platonic solids.

Joint Math Meetings, MAA Session on Mathematics Experiences in Business, Industry and Government, January 2012.

Presentation about projects from Math in the City and information about how the course was run.

Graduate Student Seminar Talks at UNL

Mathematical Puzzles, Spring 2013

Crinkly Curves, Fall 2013

The ABC Conjecture, Fall 2012

Filling a Penny Album, Spring 2012

Other Research Conferences Attended

Extremal Combinatorics at Illinois, Chicago, Illinois, Summer 2016.

Triangle Lectures, Greensboro, NC, Spring 2016.

AMS Sectional Meeting, Eau Claire, WI, Fall 2014.

Erdős Lectures, Memphis, TN, Spring 2014.

MAA Sectional Meeting, Lincoln, NE, Spring 2014.

AMS Sectional Meeting, Louisville, KY, Fall 2013.

Combinatorics in Cambridge, Summer 2013.

Joint Math Meetings, San Diego, CA, Spring 2013.

Third Abel Conference, Minneapolis, MN, Fall 2012.

Midwestern Graph Theory (MIGHTY), Ames, IA, Fall 2012.

Other Teaching Conferences and Workshops Attended

Academy for Inquiry Based Learning, DePaul University, Chicago Illinois, Summer 2017.

Associated Colleges of the South Math for Social Justice Workshop, Rollins College, FL, Summer 2016.

A workshop targeted at developing materials that incorporate issues of social justice into mathematics courses. I worked in the Calculus group and developed materials for a Calculus 1 course.

Enacting Standards for Mathematical Practices Conference, Lincoln, NE, Fall 2011.

A conference discussing how to implement the processes and proficiencies embedded in mathematical practice standards from the Common Core in classrooms in meaningful, high-quality ways.

Teaching Experience

Grand Valley State University

Modern Algebra, (Math 350), Fall 2016 and Winter 2017 (2 sections).

Calculus 1, (Math 301), Fall 2016 and Winter 2017 (3 sections).

Davidson College

Number Theory, (Math 255), Spring 2016.

Linear Algebra, (Math 150), Spring 2016. (2 sections)

Calculus 2 (Math 112), Fall 2015.

Introduction to Sets and Proofs (Math 230), Fall 2015.

University of Nebraska - Lincoln

Associate Convener

College Algebra (Math 101), Fall 2012.

In the Fall 2012 Semester, UNL began a redesign of their college algebra program with a goal of making a more learner-centered classroom and improving success rates. As associate convener I was responsible for designing lesson plans, leading weekly meeting discussions about teaching, assessment, managing group work, and promoting conceptual understanding for 14 other instructors, writing exams, choosing online homework, and reporting to departmental administration on progress.

Instructor of Record

Math Matters (Math 300), Fall 2011 and Spring 2014.

A content course for pre-service K-3 school teachers. The course focused on number and operation as taught in elementary school. A co-instructor from the education department and I emphasized the importance of deep understanding and developing the habits of mind of a mathematical thinker.

Calculus 1 (Math 106), Fall 2013.

Had full responsibility for a large lecture section (108 students). Responsibilities included supervising four TA's that ran recitation sections.

College Algebra (Math 101), Fall 2010, Fall 2012.

Three total sections of College Algebra of about 30 students each over 2 semesters. The course covers linear, quadratic, exponential, and logarithmic functions.

Contemporary Math (Math 203), Spring 2011.

A survey course for non-math majors. Course content included graph theory, probability and statistics, voting methods, and finance.

Mentor

Master of Arts in Teaching, Summer 2015.

Advised 2 groups (7 students total) on expository research papers required for the completion of their Master of Arts in Teaching (M.A.T.) degree. The two projects were titled *Binary Paper Folding* and *Congruent Sums of Powers*.

Active Learning Mathematics Project, Fall 2014.

As a graduate assistant working for this grant, I mentored 3 first time graduate student instructors of College Algebra. In addition to serving as a resource for these instructors, I observed their classes and met to discuss. I am also collecting data about the effectiveness of the redesign of UNL's pre-calculus courses.

Math in the City (Math 435), Fall 2011.

An interdisciplinary course in which students engaged in a hands-on learning experience using real data. Students collaborated with Lincoln's budget analyst and treasurer on a semester long project. As TA for this course, I offered guidance, created and graded assignments, and helped students prepare for their final presentations.

Nebraska IMMERSE, Summer 2010.

After participating in Summer 2009, I was a teaching assistant for the analysis course, I helped with homework, grading and mentoring pre-graduate students reading their first research paper.

Other Teaching Experience**NebraskaMATH**, *Lead Instructor*, Summer 2016 and *Co-Instructor*, Summer 2015.

A capstone course for K-12 teachers in a masters program. Material included trigonometry and linear algebra.

Discrete Qualifying Exam Workshop, *Leader*, Summer 2012.

Organized and ran a two week workshop for graduate students preparing for a PhD qualifying exam in discrete mathematics.

NebraskaMATH, *Teaching Assistant*, Summer 2010, Summer 2012, Summer 2015.

TA'd for a content course for in-service elementary school teachers twice and a content course for high school teachers once. Responsibilities included leading discussions, helping teachers during group activities, and grading homework.

Grader**Discrete Mathematics I** (Math 850), Fall 2014.**Mathematical Analysis II** (Math 826), Spring 2012.**Grants, Awards, and Fellowships****Robert C. Whitton Mentoring Fund, 2015.**

An internal grant at Davidson College that supports events or projects that promise cooperation and collaboration between students and faculty and emphasize the mentoring at which Dr. Whitton excelled. Awarded \$500 to attend the Nebraska Conference for Undergraduate Women in Mathematics with 3 Davidson students.

Don Miller Outstanding GTA Award, 2014.

An award given annually by the Department of Mathematics to an outstanding Graduate Teaching Assistant.

Steve Haataja Award for Outstanding Exposition by a Graduate Student, 2014.

An award given annually by the Department of Mathematics to the graduate student who has given outstanding talks in the Graduate Student Seminar.

Graduate Assistantship in Areas of National Need Fellowship, 2013.

Provided funding for the spring semester and summer.

Lloyd Jackson Award Emeritus Faculty Fellowship, 2012.

An award given annually by the UNL Department of Mathematics in honor of emeritus faculty.

Mentoring Through Critical Transition Points Traineeship, 2009-2010.

A department fellowship for students in their first year of graduate school. Provided funding for one year.

Professional Development

First Year Faculty Mentoring Group (GVSU), Fall 2016-Winter 2017.

A group that meets for an hour and a half once every two weeks. We discuss readings from *The Skillful Teacher* as well as other sources.

Project NExT Fellow, Red '15.

Project NExT (New Experiences in Teaching) is a professional development program for recent Ph.D.s in the mathematical sciences. Selected as one of 80 fellows in the Red '15 Cohort.

Preparing Future Faculty Fellow, Summer 2013.

Selected as a graduate student to participate in summer course to learn about faculty roles and responsibilities at different types of institutions. Also participated in a mentoring experience with Professor Kristie Pfabe at Nebraska Wesleyan University throughout the fall semester.

Professional Development Seminar (weekly), UNL Math Department, Spring 2013, Spring 2014.

Teaching Seminar (weekly), UNL Math Department, Fall 2011.

Service

Service to the Discipline

- Fall in Love with STEM, February 2017.
- Association for Women in Science, Mentoring Task Force, 2017-.
- MAA Student Presentation Judge, MathFest 2016.
- Organizer for Teaching and Assessing Proof Writing, Project NExT, MathFest 2016.
- Julia Robinson Day (UNC-Charlotte, 2016)
- Treasure Hunt Planner (MAA Southeast Sectional Meeting, 2016)
- Breakout session leader (NCUWM, 2016)
- Poster Judge for the MAA Undergraduate Student Poster Session (JMM 2016).
- Referee for Journal of Integer Sequences (2015).

Department and College or University Service

- Math 210 Task Force (GVSU), (2016-2017).
- Awards of Distinction Scholarship Competition Interviewer (GVSU), (2016-2017).
- Association for Women in Science West Michigan Mentoring Task Force (2016-).
- AWM Student Chapter at Davidson College, *Advisor* (2015-2016).

- Academic Program Review, *Graduate Student Representative* (Fall 2014)
- Discrete Mathematics Seminar, *Organizer* (AY 2014-2015)
- Math Department Graduate Student Advisory Board (GSAB) (2012-2014)

The GSAB serves as a liaison between graduate students and the department and works to encourage a positive environment by organizing department activities. I was elected by fellow graduate students to serve a 2 year term.

- Math Day, *Volunteer* (2009-2014)
- Putnam Seminar, *Session Organizer* (Fall 2013, Fall 2014)
- Campuswide TA Workshop, *Math Breakout Session Leader* (Fall 2013)
- McNair Scholars Colloquium, *Judge* (Summer 2013)
- Graduate Student Seminar, *Organizer* (AY 2011-2012)

Memberships in Professional Societies: American Mathematical Society (AMS), Association for Women in Mathematics (AWM), Mathematical Association of America (MAA), National Center for Faculty Development & Diversity