

Kate Fractal

781-248-7400

(formerly Kate Farb-Johnson)

k8fractal@gmail.com

KateFractal.com

Professional Profile

Created innovative curriculum that connected computer science to diverse fields including psychology, creative writing, and history. Skilled at helping people make sense of abstraction and use these concepts to understand and influence their world. Began career in engineering and software development, giving industry experience that informs curriculum design. Key skills:

Curriculum Development

Deep Pedagogical Content Knowledge
Strong Written Communication
Attentive to Multiple Stakeholders

Teacher Support and Collaboration

Problem Solving Orientation
Mentoring and Coaching
Delivering Professional Development

Classroom Teaching

Student Centered Teaching
Project-Based Learning
Standards-Based Assessment

Curriculum Development and Teaching Experience

Curriculum Consultant, *London Maths Academy*

London, England

2018

- Sought out to advise on math curriculum, based on experience in adapting advanced concepts for young students
- Developed lesson plan and teacher notes for pilot program

Math+C Teacher Advisory Group Member, *Educational Development Center (EDC)*

Waltham, MA

2018

- Identified connection points between 2nd grade math curriculum standards and computer science, supporting development of programming activities for new math curriculum

Math and Computer Science Teacher, *Acera School*

Winchester, MA

2011 – 2017

- Grew computer science program from parent volunteer run to competitive advantage of school
 - Developed, taught and supported fellow teachers in implementing universal computer science education in K-5
 - Created and taught multiple computer science electives in which students created complex projects
 - Student achievements included use of programming outside of class, transfer of programming skills between languages, teams working with professional tools, long-term project development, fluent use of variables
 - Provided project management and debugging skills to students in wide array of programming languages
- Collaborated with teachers to create engaging interdisciplinary programs
 - Co-developed 2nd grade curriculum integrating Social-Emotional Learning, Psychology, and Computer Science, providing conceptual foundation for variables to happy students
 - Enabled students studying local history to program interactive fiction games about life in Colonial Mass.
- Taught math to gifted and twice-exceptional students in grades 3-8
 - Developed students' deep conceptual understanding and mathematical habits of mind
 - Translated college level material to elementary and middle school classrooms

Volunteer METCO Tutor, *Diamond Middle School*

Lexington, MA

2011 – 2012

Student Teacher, Mathematics, *Diamond Middle School*

Lexington, MA

2011

Tutor, *Education Perspective*

MA

2007 – 2010

Peer Learning Assistant, *Worcester Polytechnic Institute*

Worcester, MA

2001

Volunteer Tutor, *Bowman School*

Lexington, MA

1997 – 1998

Engineering and Computer Science Experience

Game Developer, *Geeoffco*

Somerville, MA

2009

President and Lead Developer, *Neocyclic Games, Inc*

Waltham, MA

2008 – 2009

Electrical Engineer, *Innov-X Systems*

Woburn, MA

2006

Hardware Engineer, *Top Layer Networks*

Westborough, MA

2005 – 2006

Software Engineer, *Digital Voice Systems, Inc*

Westford, MA

2005

Licensure

Massachusetts Initial License, #453842, Technology/Engineering 5-12, Mathematics 5-8 and 8-12, General Science 5-8

Education

Master of Arts in Teaching in Secondary Mathematics, *Boston University*

Boston, MA

May 2011

GPA: 3.9/4.0

Bachelor of Science *with High Distinction*, *Worcester Polytechnic Institute (WPI)*

Worcester, MA

May 2004

Major: *Electrical Engineering*, Minor: *Mathematics*

GPA: 4.0/4.0

Curriculum development

Computer Science

Understanding Computers, Understanding Ourselves (*with Katie Semine*) 2nd grade

- Integrates social-emotional learning, psychology, and neuroscience
- Comparing and contrasting humans and computers
- Focused on communication and information processing

Programming Challenges in Scratch 2nd – 5th grade

- Lessons ranging from resetting to state machines that developed skills for students with wide range of experience

Design Studio: Programming 3rd – 5th grade

- Projects focused on engineering design process and teamwork

Interactive Fiction and Data Structures with Twine 4th – 6th grade

- Introduces text-based programming
- Integrates creative writing, social studies and grammar
- Teaches decision trees, variables, conditional statements and web design

Stories of Computing and Culture, (*with Stefanie Friedhoff*) 6th – 8th grade

- Project-based history of computing
- Integrated with journalism

Collaborative Programming experienced 6th – 8th grade

- Based on college-level software engineering class
- Teaches source control (git), code readability, and modular design through small group projects

Video Game Programming, experienced 6th – 8th grade

- Teaches design patterns such as: timers, randomized locations, collectible objects and basic collision detection
- Introduces object-orientation in Processing with Java

Programming for Good, experienced 6th – 8th grade

- A service learning, project-based class, focused on the engineering design process

Mathematics (highlights)

What If? Absurd Mathematical Modeling elective 6th – 8th grade

- Based on essays by Randall Munroe
- Focused on mathematical modelling process and writing about math

Linear Algebra (unit)

- Structured problem sets enable students to make sense of matrix multiplication
- Integrates functions, geometric transformations, programming, and computer graphics

Logic Puzzles Without Words

- Focused on mathematical communication, persistent problem solving, and building toward proof

Conference Presentations and Publications

Integrating Programming into Curricula through Interactive Fiction with Twine

Computer Science Teacher Association (CSTA) 2017

Understanding Computers and Ourselves: A CS Theory Class for Elementary School (*with Katie Semine*) CSTA 2017

Games, Role-Playing, and Consent

in *Ask: Building Consent Culture*, published 2017

Including Invisible Identities: Welcoming Those Already in Our Classrooms

True Colors 2018

Gender Inclusion Without Gender Essentialism in a K12 Computer Science Classrooms (*with Sarah Judd*) CSTA 2018

International Society for Technology in Education (ISTE) 2018, CSTA New England 2018

Preparing Young Student for Data Structures

CSTA New England 2018

Programming Languages

Taught: Scratch, Twine, Processing, Javascript, Java, OpenScad, BlocksCAD, Scheme, Python, Alice

Developed in: Javascript, Blockly, Java, Google Apps Script, Twine, Processing, Scratch, C++, C, Assembly

Familiar with: Snap!, Greenfoot, GP, Pencil Code, Tynker, TouchDevelop