A Decade of Open Teaching

MAA MathFest 2025, Sacramento CA

Special Session: 10 Golden Years: Stories of Struggle and Success from the Gold'14 Project NExT Cohort

Mike Janssen, August 2025

Openness
Two senses, three threads

- Two senses

    - Receptivity to new ideas

    - Open pedagogy and open educational resources

- Three threads

    - Alternative grading

    - Inquiry-based learning

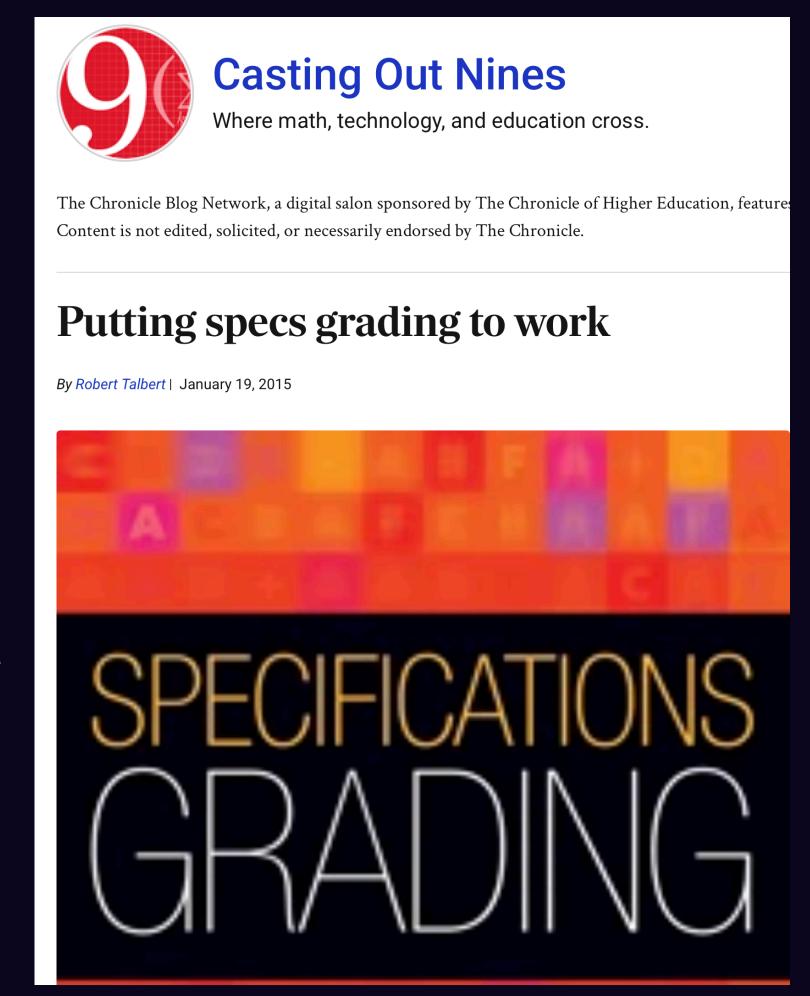   - Open educational resources

Alternative grading

- Introduced to the idea of "mastery-based testing" by Austin Mohr

- Incorporated into a calculus course my second semester at Dordt

- Read Robert Talbert's blog about *Specifications Grading* in spring 2015

Putting specs grading to work

By *Robert Talbert* | January 19, 2015

SPECIFICATIONS GRADING

Inquiry-based learning

- Some exposure in graduate school

- Formal introduction via Project NExT workshops

- IBL PRODUCT workshop, June 2017

IBL and Open Pedagogy

- **Open Pedagogy** "is the practice of engaging with students as creators of information rather than simply consumers of it. It's a form of experiential learning in which students demonstrate understanding through the act of creation."

- Structure of proof-oriented courses

- Collaboration on course material—building shared understanding together

ABSTRACT ALGEBRA SCRIBED NOTES

ABSTRACT ALGEBRA STUDENTS

1. THE STRUCTURE OF RINGS AND FIELDS

1.1. Fields.

Investigation 1.1.5. *Which of* $+, -, \cdot, \div$ *are binary operations:*

    (1) on $\mathbb{R}$?
    (2) on $\mathbb{Q}$?
    (3) on $\mathbb{Z}$?
    (4) on $\mathbb{N}$?
    (5) on $\mathbb{C}$?

Solution. $\mathbb{R}: +, -, \cdot$
$\mathbb{Q}: +, -, \cdot$
$\mathbb{Z}: +, -, \cdot$
$\mathbb{N}: +, \cdot$
$\mathbb{C}: +, -, \cdot$

BEHOLD

Activity 1.1.6. *Choose your favorite nonempty set* X *and describe a binary operation different than those in Investigation 1.1.5.*

Open Educational Resources

What is an OER?

Creative Commons: Open Educational Resources (OER) are teaching, learning, and research materials that are either (a) in the public domain or (b) licensed in a manner that provides everyone with free and perpetual permission to engage in the **5R activities**:

- Retain

- Reuse

- Revise

- Remix

- Redistribute

Active Calculus: Dipping my toe in the OER waters

- Calculus OER written by Matt Boelkins, David Austin, and Steven Schlicker

- Started using *AC* activities in Calculus II by 2016

- Officially adopted for Calculus I and II in 2018

PreTeXt

- XML-based authoring system/ publishing language created by Rob Beezer

- Math syntax similar to LaTeX

- Write once, output to PDF, HTML

Theorem 1.2.8. The Division Algorithm for $\mathbb{N}$.

Let $a, b \in \mathbb{N}$. Then there exist unique integers q, r such that $a = bq + r$, where $0 \leqslant r < b$.

▸ Hint 1.

▸ Hint 2.

Unsurprisingly, the Division Algorithm also holds in $\mathbb{Z}$, though the existence of negative integers requires a careful restatement.

Corollary 1.2.9. The Division Algorithm for $\mathbb{Z}$.

Let $a, b \in \mathbb{Z}$ with $b \neq 0$. Then there exist unique integers q, r such that $a = bq + r$, where $0 \leqslant r < |b|$.

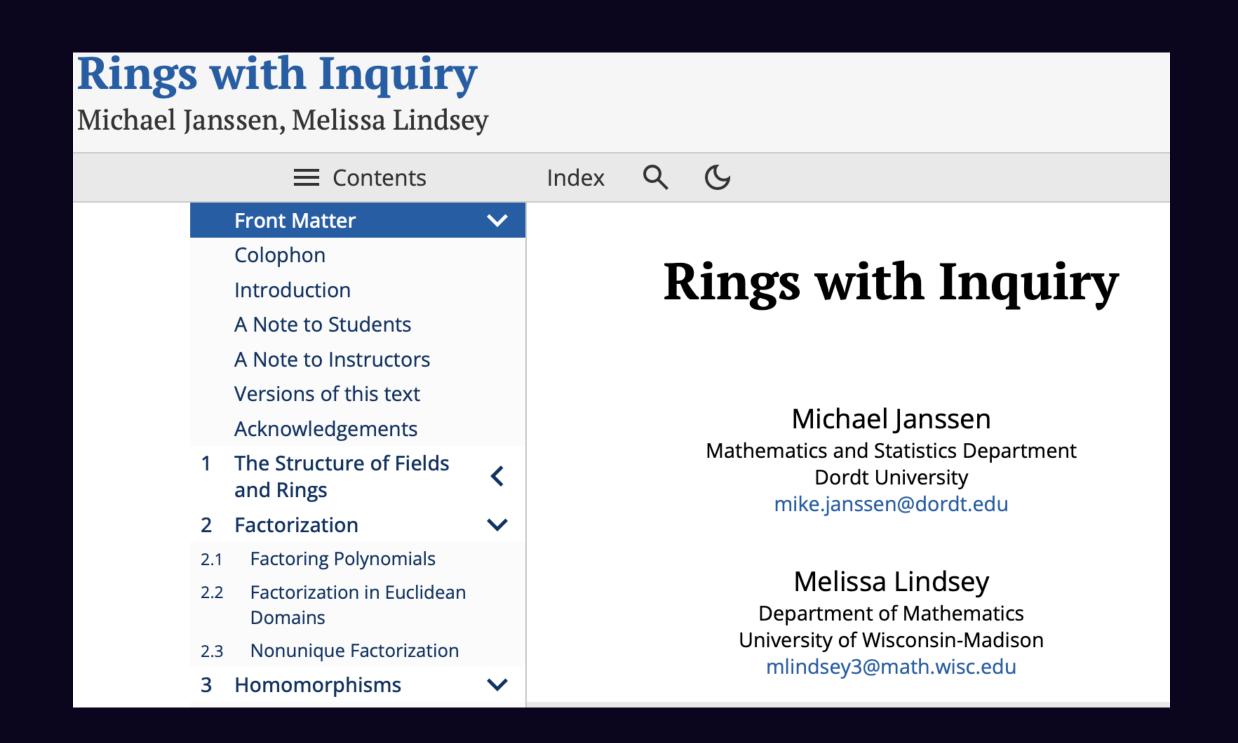▸ Hint.

1.2.2 Greatest Common Divisors

```
<theorem xml:id="thm_divalg">
  <title>The Division Algorithm for <m>\N</m>
  </title>
  <idx>Division Algorithm (<m>\N</m>)</idx>
  <statement>
    <p>
      Let <m>a,b\in \N</m>.
      Then there exist unique integers <m>q,r</m>
      such that <m>a = bq + r</m>,
      where <m>0 \le r \lt b</m>.
    </p>
  </statement>
  <hint>
    <p>
      There are two parts to this theorem. First,
      you must establish that <m>q</m> and
      <m>r</m> exist. This is best done via <xref
      ref="axiom_wellordering" />. If you're
      stuck on that, check the second hint.
```

Rings with Inquiry

ringswithinquiry.org/eq

- Rings-first, inquiry-oriented OER

- Written in LaTeX in 2018, converted to PreTeXt with the help of David Farmer at the American Institute of Mathematics

- Iterated (bi)annually

Rings with Inquiry
Michael Janssen, Melissa Lindsey

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Rings with Inquiry

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Explorations in Modern Math

emmath.org

- Liberal arts math OER

- First iteration as course notes in 2020

- Expanded via a grant from IPAL in 2021

- Work continues!

Exploration in Modern Mathematics

Mike Janssen

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8 Fractals and Dynamics ‹

Exploration in Modern Mathematics

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May 28, 2025

olophon

ntroduction

Iowa OER COP

- Summer 2024: campus librarian approached me about facilitating a Community of Practice for the Iowa OER group

- She and I co-led a group of ~10 faculty from across the state, representing various types of institutions and levels of engagement with OER

12 JUN 2025 /

Reflecting on the 2024/2025 Communities of Practice

During the 2024/2025 academic year, the Iowa Open Education Action Team ran our third Communities of Practice program, bringing together instructors across the state to share their interest in open education.

This year, we coordinated three cohorts for instructors in the disciplines of Business, Mathematics, and Nursing. 19 faculty and staff from 8 institutions participated in the program, including representatives from Des Moines Area Community College, Dordt University, Kirkwood Community College, Iowa State University, Mount Mercy University, Southeastern Community College, University of Iowa, and University of Northern Iowa.

The participants in this year's OER Communities of Practice program shared positive notes about their experience engaging with their peers and facilitators. As one participant noted at the end of the program,

> "The facilitators of the CoP for Math & Stats that I participated in were excellent. They fostered a welcoming environment, communicated the program schedule clearly and efficiently, and encouraged meaningful, engaging discussions."

Thank you!

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