Encouraging and Supporting the Adoption of Alternative Grading Methods in Higher Education

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Outline

- My Alternative Grading Journey
- Example: Intro to Proofs
- Benefits to Students and Faculty
- Equitable Grading
- Building a Community of Adopters

My Alternative Grading Journey

The Early Years

- Traditional assignments
  - Quizzes
  - Problem sets
  - Exams
- Points-based grading systems with partial credit
- Lecture-based classes with some group work

Cognitive Dissonance

- Involved in Allegheny College "Year of..."
  - Civil Rights
  - Voting Rights and Democratic Participation
- Facilitated group study courses around college-wide events
- Started reading books like *The New Jim Crow* and *Whistling Vivaldi*

Exploration

- Read Robert Talbert blog posts on flipped courses
- Decided to flip my "Intro to Proofs" course using his methods
  - Also used a variation of his grading system
- Moved Calculus I differentiation and integration skills from exams to assessments

Diving In

Focused sabbatical on rethinking how I structured my Precalculus and Calculus I courses

- Based on literature/evidence-based techniques
- Attended inquiry-based learning workshop
- Fully integrated alternative grading into these two courses
  - See my article in PRIMUS for details

Full Adoption

- Precalculus and Calculus I
- Calculus I with Precalculus, Parts I and II
- Differential Equations
- Intro to Proofs
- Linear Algebra
- Real Analysis
- First year communication seminar
- Sophomore communication seminar

Spreading the Word!

- Math syllabi collection
- PRIMUS article
- Workshops, Presentations, etc
  - AAC&U, AskPsychSessions podcast, Lilly, MathFest, Project NExT, Section NExT
- Grading Consultant
  - TPSE project on fostering broader change
  - NSF project with Spelman College

Overall Grading Approach

Provide students with multiple opportunities to meet objectives or satisfy specifications, with no penalty for unsuccessful attempts

Example:
Foundations of Mathematics

Click here to see the Fall 2023 syllabus

Method 1:
Mastery-Based Testing

Typical Implementation

- A list of **objectives** is created and shared
- Students have the opportunity to demonstrate their learning via **assessments**
  - Each assessment contains one question for each objective covered in the course up to that point
  - Students select which problems they want to attempt

Typical Implementation, cont.

- Solutions are marked as Pass/ Not Yet Passed
  - No partial credit
- A student's grade depends on the number of objectives passed by the end of the course, regardless of the number of attempts required.

Assessment Objective Categories

- Mathematical Language (10)
- Proof Techniques (6)
- Proofs in Context (8)

The numbers in parentheses indicate how many objectives are in each category

Mathematical Language Objectives (10)

Examples

- ML.1 I can state the converse and contrapositive of a conditional statement.
- ML.2 I can convert a statement written using symbolic logic into plain English and vice versa.
- ML.3 I can negate statements involving conjunctions, disjunctions, implications, or quantifiers.

Proof Technique Objectives (6)

- PT.1 I can construct a correct direct proof of a conditional statement.
- PT.2 I can construct a correct proof by contraposition.
- PT.3 I can construct a correct proof by contradiction.
- PT.4 I can construct a correct direct proof of a universal statement.

Sample Assessment Problem - ML.2

ML.2 I can convert a statement written using symbolic logic into plain English and vice versa.

(a) Restate the following proposition in plain English:

$$(\forall \epsilon > 0)(\exists N \in \mathbb{N})(n > N \Rightarrow |x_n - a| < \epsilon).$$

(b) Restate the following proposition using symbolic logic:

There exists an integer n such that for all integers m, if $m + n$ is odd and mn is odd, then m is less than 0.

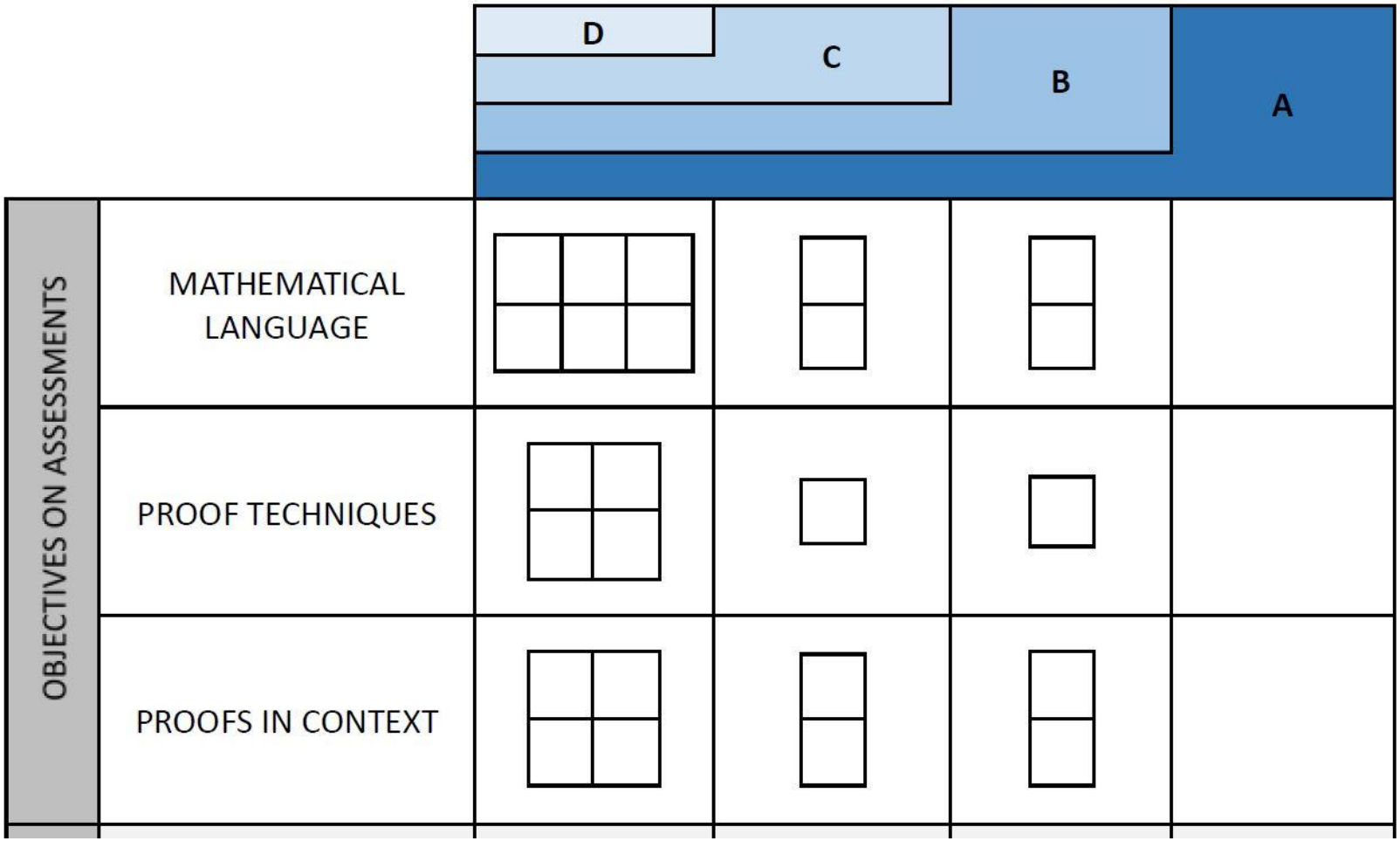
Sample Assessment Problem - PT.1

PT.1 I can construct a correct direct proof of a conditional statement.

Use a direct proof to prove the following statement:

Let $n, m \in \mathbb{Z}$. If n is even and m is odd, then $n + m$ is odd.

Integrating Objectives into Grading System



Method 2:
Specifications Grading

Typical Implementation

- For each assignment, the instructor provides **specifications** describing what a successful submission would look like
- An assignment is successfully completed when a submission meets all of the specifications
- Students have (or may earn) **multiple opportunities to revise assignments** in order to meet the specifications.

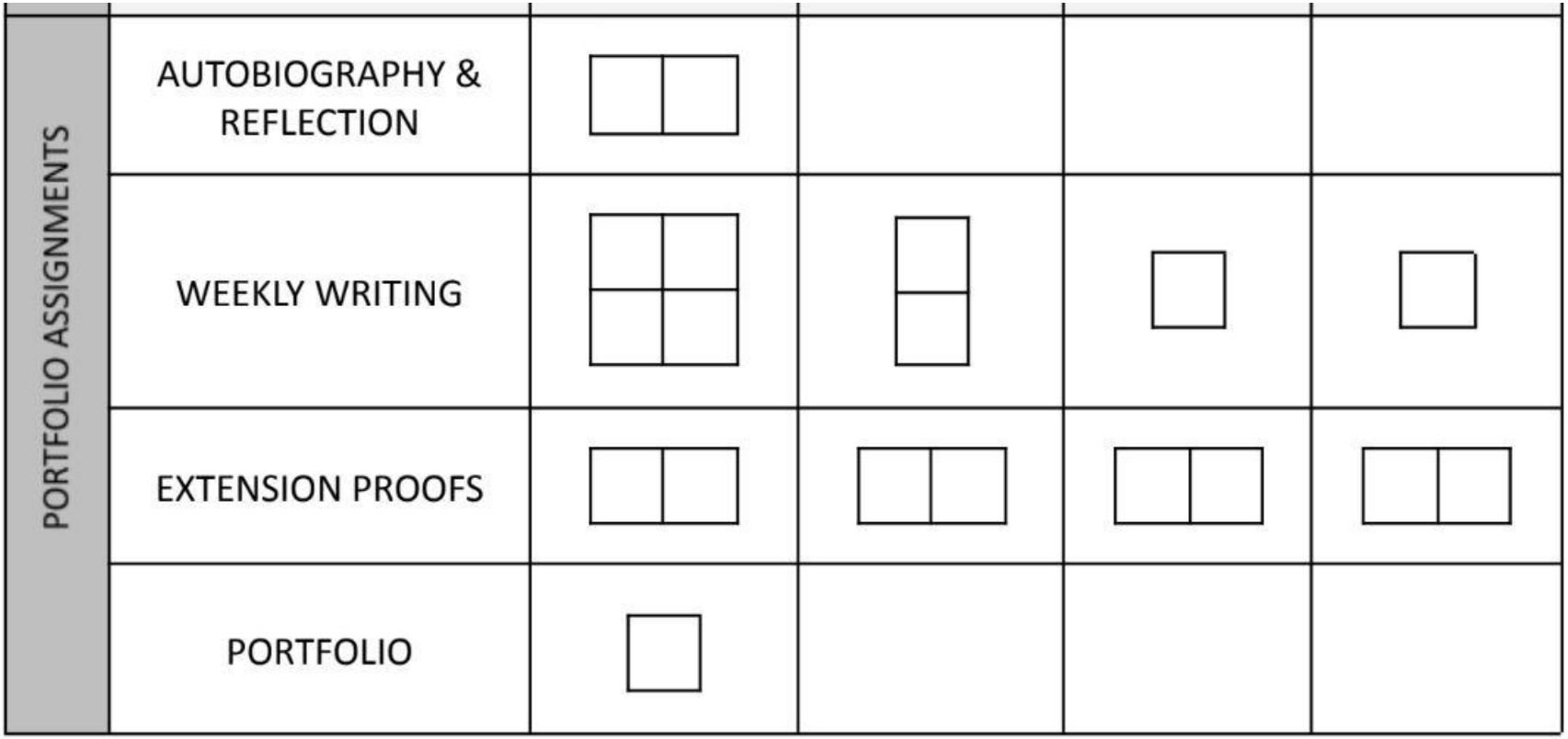
Extension Proofs

- Students independently develop correct proofs of results that extend the foundational material
- They can revise and resubmit each Extension Proof, up until the final deadline for that assignment
- Once a week, I look at any submitted work, provide feedback, and mark each submission as either Complete or Not Yet Complete
- A submission is marked as Complete if it satisfies all of the specifications.

Sample Specifications

- The proof is typeset using LaTeX.
- All mathematical expressions are part of complete sentences.
- The proof is correct.
- The writing is almost free, if not entirely free, of spelling errors.
- Mathematical notation and terminology are used correctly.

Integrating Extension Problems into Grading System



Benefits of Alternative Grading

Benefits for Students

- **Recognizes and supports the learning process**
  - Students are graded on what they eventually know
- **Promotes a growth mindset**
  - Students get to learn from mistakes and build upon failures
- **Progress towards course goals is clearly communicated**
  - They can see what they do and don't understand so far

Benefits for Faculty

- **Grading is more efficient**
  - No need to think about partial credit
  - Expectations are clear, so no second guessing
- **Grading is more enjoyable!**
  - Focused on feedback that helps students grow, rather than punishing them for mistakes
- **Student work is at a high standard**
  - Clear specifications
  - Submission-feedback-revision-resubmission cycle encourages improvement and growth

Benefits for Faculty, cont.

- **Interactions with students are more effective**
  - Focused office hour questions
  - Clear paths to success
  - Common understanding of course goals
  - Current information about student progress
- **Deeper understanding of course structure**
  - Course preparation is focused on learning, not course content
  - Decisions are made based on course objectives

Equitable Grading

In *Grading for Growth,* Clark and Talbert describe how alternative grading approaches align with Feldman's three pillars of Equitable Grading, namely,

1. Accuracy
2. Bias Resistance
3. Motivation.

1. Clark, D., & Talbert, R. (2023). *Grading for Growth: A Guide to Alternative Grading Practices that Promote Authentic Learning and Student Engagement in Higher Education*. Routledge.
2. Feldman, J. (2019). *Grading for Equity: What It Is, Why It Matters, and How It Can Transform Schools And Classrooms*. Corwin.

Accuracy

- Clear content standards (or objectives)
  $\Longrightarrow$ grades reflect learning, rather than the environment or behaviors
- Reassessment without penalty
  $\Longrightarrow$ grades reflect current level of understanding

1. Clark, D., & Talbert, R. (2023). *Grading for Growth: A Guide to Alternative Grading Practices that Promote Authentic Learning and Student Engagement in Higher Education*. Routledge.

Bias Resistance

- Base grades on learning, not other behaviors such as participation
- Reassessments, not extra credit
  ⟹ all students have equal access
- Focus on eventual learning
  ⟹ Doesn't penalize students who need more time and doesn't benefit students with prior access to topic

1. Clark, D., & Talbert, R. (2023). *Grading for Growth: A Guide to Alternative Grading Practices that Promote Authentic Learning and Student Engagement in Higher Education*. Routledge.

Motivation

- Helpful feedback
- Opportunities to use that feedback
- Grades and marks have clear meaning

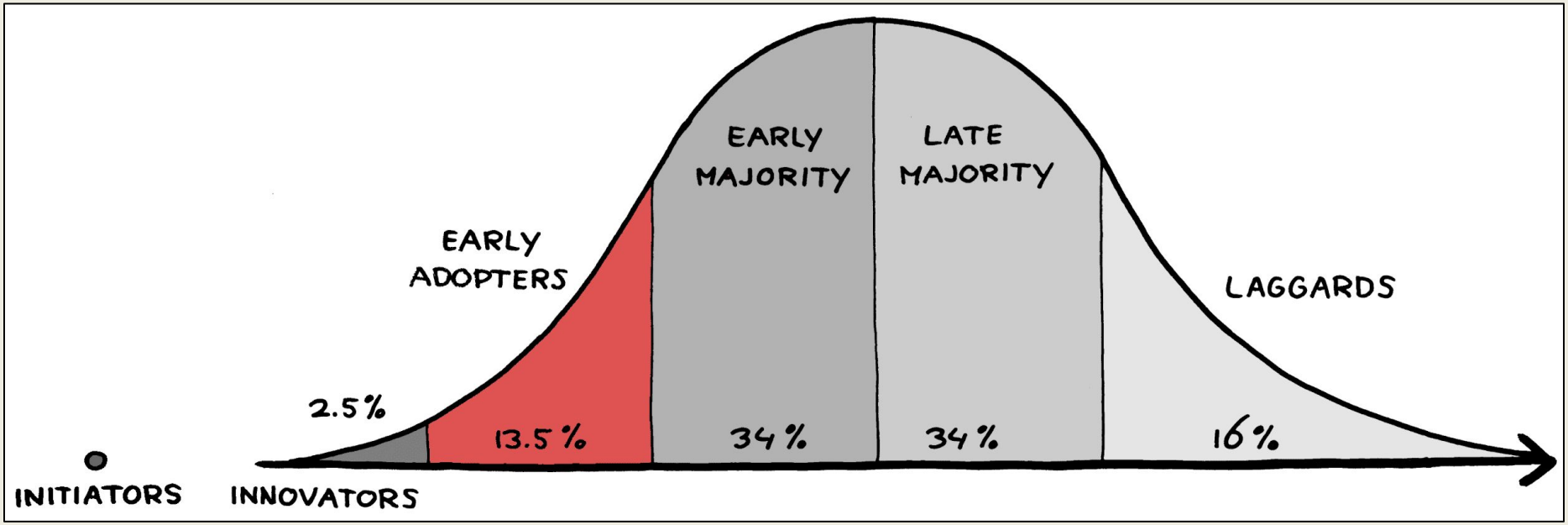
I would add

- Students have agency and choice

1. Clark, D., & Talbert, R. (2023). *Grading for Growth: A Guide to Alternative Grading Practices that Promote Authentic Learning and Student Engagement in Higher Education*. Routledge.

Crossing the Chasm

Technology Adoption Curve



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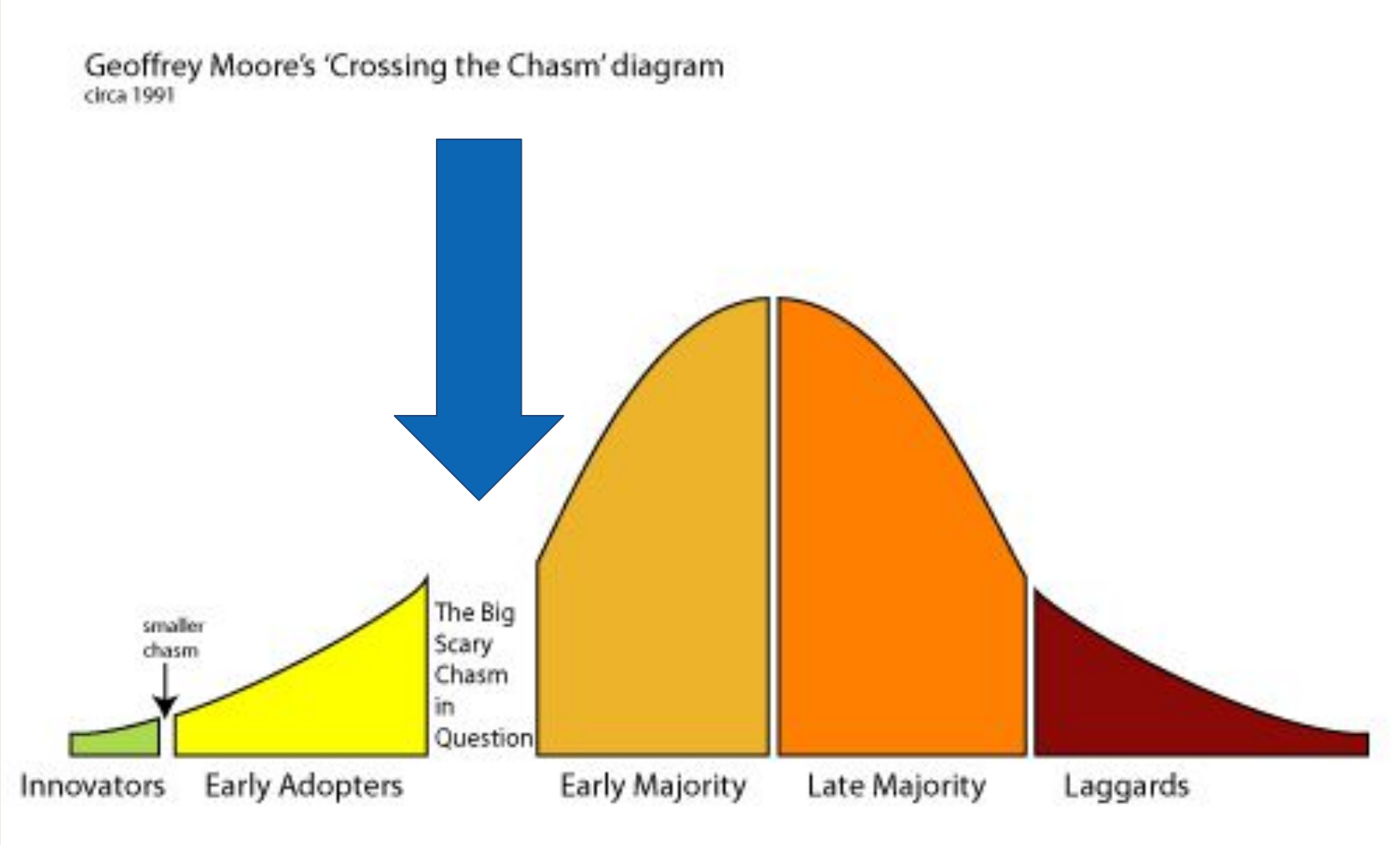
In his book *Crossing the Chasm*, Geoffrey Moore suggests that there is a "chasm" between early adopters and the early majority because their reasons for using a new product are so different.

1. Moore, G. A. (2014). *Crossing The Chasm: Marketing and Selling Disruptive Products To Mainstream Customers* (3rd ed.). HarperBusiness.

The Chasm



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Early Adopters

- Risk takers
- Expect to see major improvements
- Expect a "radical discontinuity" between old and new methods
- "Prepared to champion the cause against entrenched resistance"
- "Prepared to bear with the inevitable bugs and glitches"

Early Majority

- Want guaranteed improvements
- Want to "minimize the discontinuity" between new and old methods
- "Evolution, not revolution"
- "Enhance, not overthrow, the established ways"
- Don't want to deal with bugs and glitches.

Building a Community of Adopters

Highlight Observed Improvements

Multiple Entry Points

- Equity and inclusion
- Student retention and success
- Alignment with increased assessment demands
- Evidence-based teaching
- More efficient grading
- Understanding student thinking
- Building on pandemic adaptations

Highlight Observed Improvements

Evidence

- SoTL articles
- Grading scheme anatomy (Michael Palmer & Adriana Streifer, University of Virginia, Center for Teaching Excellence)
- Do we need a large scale research study, similar to the one on IBL by Sandra Laursen et al.?

Remove the Discontinuity
Small Adjustments

Talk about how to integrate these methods into traditional grading systems

- e.g. Two Ways to Get Started with Alternative Grading

(In my experience, once people try it, they want to do more!)

Remove the Discontinuity

Share Examples

- Grading with Growth blog and book
- PRIMUS Special Issue
- Ungrading book
- Podcasts

Remove the Discontinuity

Share Materials

Sample Syllabi and Materials

- Biology
- Chemistry
- Math
- Physics

Free sharing of materials and advice on Slack, etc

Evolution, Not Revolution
Build Community

- Alternative Grading Slack group
  - (click here for invitation to join group)
- The Grading Conference
- X (Twitter)
  - #altgrading, #ungrading, #SBG, #SpecsGrading, etc

Evolution, Not Revolution

Leverage Established Venues

- MAA OPEN Math workshops
- PRIMUS Special Issue: Implementing Mastery Grading in the Undergraduate Mathematics Classroom
- MathFest sessions and workshops
- Project NExT workshops

Evolution, Not Revolution

Permission from Department

- Have discussions about grading
- Share examples
  - Entire courses, sample assignments, etc
- Reassure tenure-track and non-tenure-track faculty
- Recognize and celebrate effective innovations

Evolution, Not Revolution

Permission from Institution

- Sponsor book groups and learning communities
- Re-examine tenure and promotion guidelines
- Re-examine student evaluation questions
- Build alternative grading into college-wide initiatives (advising courses, first year seminars, etc)
- Use it in graduate courses

Address Bugs and Glitches

Anticipate Issues

- Large classes or coordinated classes
  - Chapter 8 of *Grading for Growth*
  - Case studies e.g. Heubach and Krinsky article in PRIMUS special issue
- Student buy-in
  - Chapter 12 of *Grading for Growth*
- Integrating with LMS
  - Canvas example

Let's aim to make "alternative grading" just grading!

Thank you!

Questions?