MASTERY-BASED GRADING IN THE CALCULUS CLASSROOM

INCREASING RIGOR, IMPROVING TRANSPARENCY,
AND EMPOWERING STUDENT SUCCESS
TODAY’S ENVIRONMENT

• Students as “Customers”
• Lack of Preparation
• Ties between classes and the “real” world are lacking
• What does an “A” mean? “Passing” mean?
TRADITIONAL GRADING SYSTEMS

• Student learning outcomes at the course level
  • How to assess them?

• Partial Credit as a Game

• Who has the responsibility for a grade?

• How to master complex material?
  • The importance of time and repeated assessment
MASTERY-BASED GRADING/SPECIFICATIONS-BASED GRADING

• Specific standards developed that tie course content directly to student learning outcomes
• Frequent – low-stakes assessments (Quizzes, Uber Quizzes, Final Exam)
• Everything is rubric graded
  • Standards: Mastery, Proficiency, Developing, Beginning, Not Assessable
  • Problems: Completely correct, correct with minor errors, incorrect but on the right path, incorrect and not approached correctly, not assessable

• Why change?
EXAMPLE - QUIZ PROBLEM – ASSESSING CONTENT

• Describe the first four terms of the following sequence

\[ a_{n+1} = \begin{cases} 
2a_n - 1, & \text{if } a_n \text{ is even} \\
3a_n + 1, & \text{if } a_n \text{ is odd} 
\end{cases}, \quad a_1 = 6 \]

• Correct Work:

\[ a_1 = 6, a_2 = 2(6) - 1 = 11, a_3 = 3(11) + 1 = 34, a_4 = 2(34) - 1 = 67 \]

Typical Incorrect Work:

- \[ a_2 = 2(6) - 1 = 11 \]
- \[ a_3 = 3(11) - 1 = 33 \]
- \[ a_4 = 3(33) + 1 = 100 \]
REASSESSMENT TO ALLOW FOR DEMONSTRATION OF MASTERY

• Two assessment opportunity through in class quizzes and uber quizzes.
• Reassessment quizzes – upon request
• Other requirements: mandatory homework completion, mandatory participation in a group project
RESULTS

• Clarity of Assessment – clear distinction between Success and Failure
• Almost no “C” grades. Mostly A, B, and F.
• Increased focus on higher level thinking (analyze, model, create, critique)
• Student Empowerment
• Growth Mindset focused – opportunities to Fail Forward
IN SUMMARY: MASTERY-BASED GRADING

• Reduces scheming and grade grubbing
• Places the onus on students for their grades
• Assessments are kinder and track with studies in cognition
  • Interleaved Practice
  • Repetition
• Increase metacognition and self-awareness in students