Challenge Quizzes: The Impact of a Unique Assessment Tool on Student Performance

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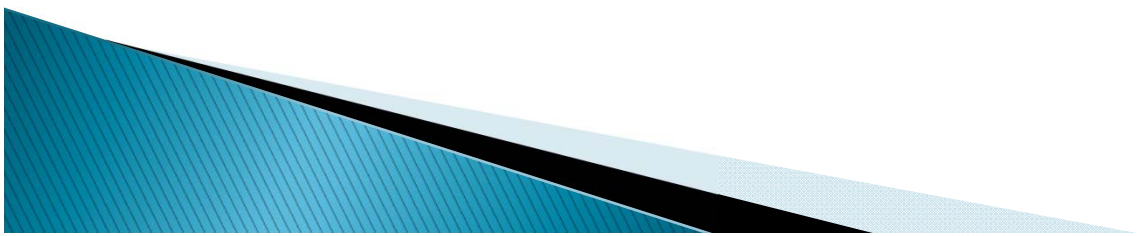
Overview

- Motivation for study
- Introduction to mastery-based learning and our adaptation
- Data, descriptive statistics, observations
- Hypotheses
- Empirical methodology and results
- Future directions



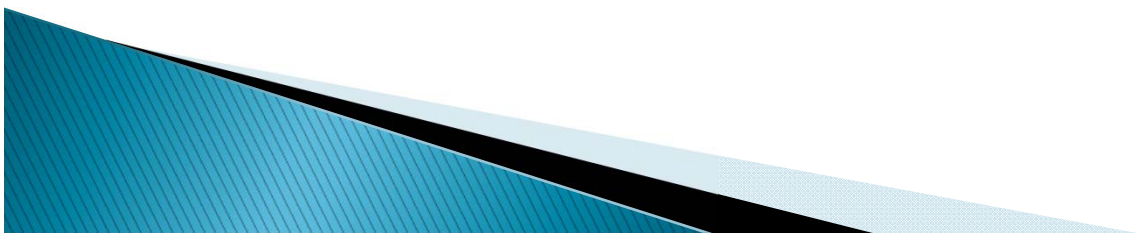
Motivation

- Lecture dominates pedagogic practice
- Lack of evidence that economic knowledge gains are substantial or sustained (Walstad & Allgood, 1999)
- Lack of evidence that innovation lead to substantial learning gains
- Becker (1982), Allgood (2001) argue that innovation lowers the price of knowledge and students consume less knowledge
- How do we overcome this knowledge acquisition conundrum?

Mastery-based learning

- Typical class structure- go over assessment and assume students learn from mistakes

- Mastery approach
  - Identification and communication of learning objectives
  - Period of instruction
  - Formative assessment
  - Additional instruction as needed
  - Formative/summative assessment



Does mastery learning work?

- Educational literature
- Kulik et al (1990)- meta analysis, 96 of 103 studies report improvement
- Covic and Jones (2008)- revise and resubmission of essays, improved performance
- Marshall (2009)- quizzes, most eventually score 100% but overall performance not different than when HWK used
- Armacost and Pet-Armacost (2003)- exams, improvements in grades with each exam taken

Mastery learning in economics?

- Self-paced instruction (SPI) in 1970s
- Mixed results
- Allison (1975, 1976)- 10-20% increase in scores, greater increases for lower ability and first year students, students liked course more. Very costly to implement
- Siegfried and Strand (1976)- no differences in learning, students liked course more, no more likely to persist in economics, greatest learning gains for student proctors

Assessment in economics

- Primarily summative in nature
- Schaur et al (2008)- most commonly MC questions, homework and problem sets

Description of innovation

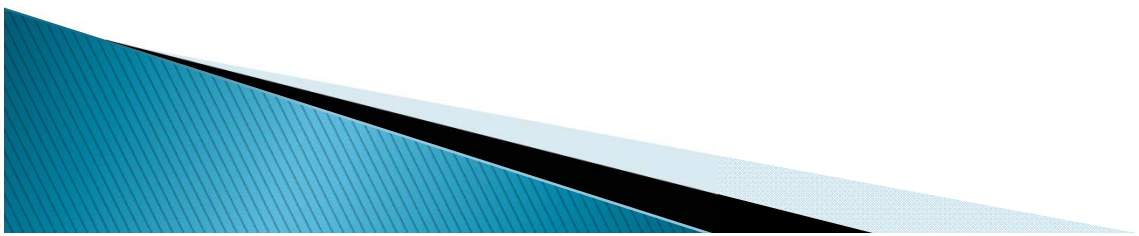
- Step in the direction of mastery learning while still minimizing the costs
- Challenge quizzes
  - Limited number (2 of 6 at UR, 1 of 3 at UNCW)
  - Must be taken prior to exam which covers material
  - Automatically replaces in class quiz grade
  - More difficult
  - Provides students with the opportunity to use their in-class quiz as a formative assessment of understanding and take part in another assessment prior to the much weightier exam
  - Brings student's objective of quality grade in line with instructor's objective of quality learning

Syllabus description UNCW

"CHALLENGE QUIZ": **One** of your quiz grades may be replaced during the semester by taking a "challenge quiz" prior to the next exam. This process entails submitting a formal written request (email is fine), and scheduling a time to take a **much more difficult** quiz on the same topics. **Do not sign up to take a challenge quiz unless you are prepared to explain all of the material in great detail in your own words.** By submitting the request and scheduling the challenge, you automatically forfeit the original quiz grade and accept the outcome of the challenge quiz. **Quizzes that were missed because of an unexcused absence cannot be challenged.**

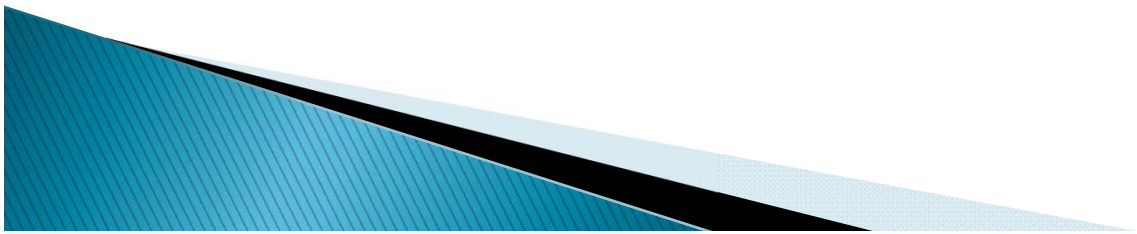
Syllabus description UR

- Challenge Quizzes: You are permitted to challenge 2 quizzes during the semester. A quiz may be challenged up until the date of the exam covering that material. Challenge quizzes are somewhat harder but are not time constrained. Taking a challenge quiz replaces your quiz grade- no exceptions. Challenge quizzes may not be taken for any quiz that you miss because of an unexcused absence.



Data

- Principles of Microeconomics course
  - 2 institutions (UR, UNCW)
- Survey administered at end of semester
  - What was preparation for quizzes
  - What was motivation for taking challenge quiz
  - What was preparation for challenge quiz
  - Did challenge quiz help prepare for exam
  - If did not take a challenge quiz, why not
- Spring 2010, Fall 2010, Spring 2011
- N= 459 (UR=151; UNCW= 308)

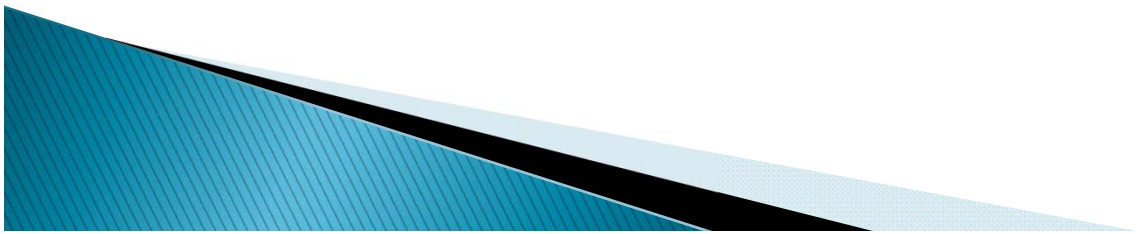


Who took a challenge quiz?

- 78% of UR and 8.5% of UNCW took challenge
- Those taking challenge quiz were more likely to engage in more study behaviors, visit professor, seek tutoring
- Those not taking, why not
  - 52% stated not worth the risk (59% UR; 51% UNCW)
  - 47% satisfied with in class quiz grade (31% UR;49% UNCW)
  - 20% saving (48% UR; 17% UNCW)

Challenge quiz outcomes

- 89% UR and 65% UNCW improved grade
- Average improvement: 17.73 UR; 9.04 UNCW
  - UR students engage in more study methods for in-class quiz and more likely to change methods over semester
  - UNCW students more likely to change study habits before taking challenge quiz

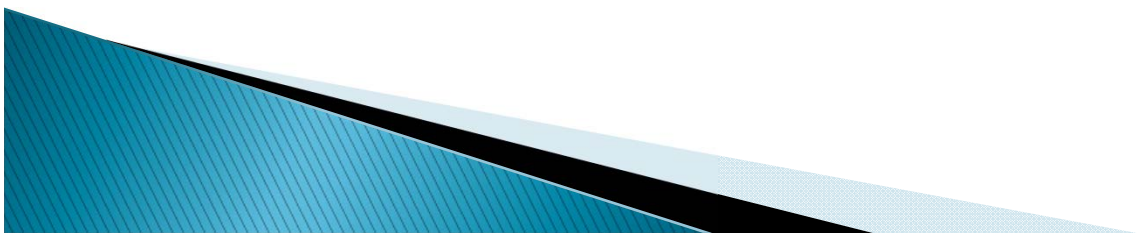


Explaining differences…

- in participation
  - Free pass theory for UR students
  - Difference in opportunity (2 UR; 1 UNCW)
  - Message sent by instructor
- in learning
  - Improvement in scores same for 1st and subsequent challenge quiz taken by UR students
  - UNCW students taking 3rd challenge (only 38% improved, negative average change of 7.4pts)… desperation without preparation

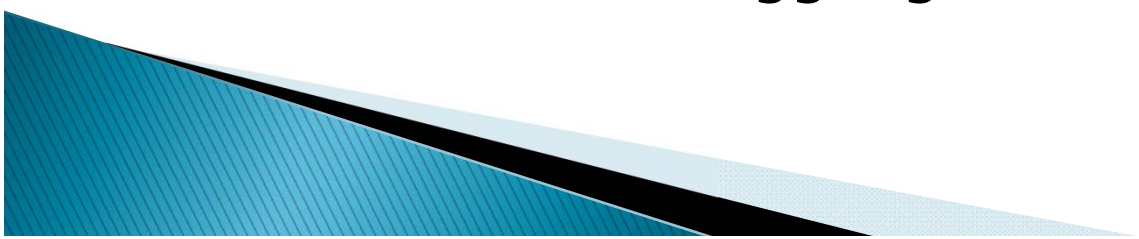
Hypotheses

- Decision to take challenge quiz (chi-square)
  - Opportunity and risk (institutional differences)
  - Gender differences
  - Ability
- Improvement (t-tests, regression)
  - GPA
  - Preparation
  - Change in study habits
  - Institution



Decision to take challenge quiz (Chi-Square)

- UR students significantly more likely to take
  - Signaling effect? Number of opportunities?
- UR students with high GPA more likely to take
  - Underestimate difficulty of quizzes, free pass?
- Students who rewrote notes, engage in peer studying, seek assistance from tutor and visit professor more likely to take.
  - More engaged in class? More likely to seek assistance if struggling?



Improvement (t-tests)

- Mean improvement= 16.38 points (out of 100)
- UR students (17.94 vs. 9.04)
- Studying by rewriting notes (18.95 vs. 14.30)
- Changes in study behavior (18.66 vs. 12.15)
- UR students using tutors (25.43 vs. 16.85)
- UNCW students engaging in peer studying (18.30 vs. 2.87)

Regression models

- Model 1: Improvement = f(UR, GPA, rewrote notes, Peer study, Tutoring, Changed study behavior)
- Model 2: Improvement = f(UR, GPA, rewrote notes, Peer study, Tutoring, Changed study behavior, last challenge quiz)
- Model 3: First quiz improvement = f(UR, GPA, rewrote notes, Peer study, Tutoring, Changed study behavior)

Regression results

	Model 1	Model 2	Model 3
Variable	Coefficient (standard dev)	Coefficient (standard dev)	Coefficient (standard dev)
Intercept	−15.57 (10.15)	−7.58 (10.90)	**−21.70* (11.24)**
UR	**15.00*** (5.50)**	9.39 (6.20)	**15.97*** (6.10)**
GPA	3.67 (2.57)	3.22 (2.55)	**5.56** (2.85)**
Rewrote notes	**6.73** (2.80)**	**6.16** (2.79)**	**5.48* (3.11)**
Peer study	0.32 (2.77)	−0.25 (2.76)	2.01 (3.06)
Tutoring	2.07 (4.02)	2.96 (4.01)	4.96 (4.46)
Changed study behavior	**5.98** (2.83)**	**6.46** (2.81)**	4.55 (3.14)
Late challenge quiz		**−8.68* (4.60)**	
R^2	0.1449	0.1697	0.1279

*** indicates significance at the 1% level
** indicates significance at the 5% level
* indicates significance at the 10% level.

Summary

- This paper focuses on the method, who took it, how much they improved and why they improved
  - UR students more likely to take and more likely to improve overall
  - improvement same on first challenge quiz across institutions
  - changing study habits are significant determinant of improvement as is studying by rewriting notes
  - GPA results mixed
- 99% students recommend keeping challenge quizzes

Future directions

- 71% who took reported it *definitely* helped them prepare for exams; 26% reported it helped *somewhat*
- Next… does the method improve student outcomes in the course?