

A close-up photograph of a hand holding a golden key. The hand is positioned on the left side of the frame, with the thumb and index finger gripping the key's head. The key is held horizontally, pointing towards the right. The background is a solid dark blue color.

# Does Practice Make Perfect?

Multiple Homework Attempts & Student Learning

Kathy K Archer, DBA

Assistant Professor of Economics

Grand Canyon University

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# What Are We Talking About?

- Web-based Homework Management Systems
  - Extended Practice. Immediate Student Feedback.
- Deliberate Practice (Ericsson, Krampe, & Teusch-Romer, 1993)
  - Attempt-feedback-reattempt
  - No feedback, limited improvement (Trowbridge & Carson, 1932)
  - Extends practice beyond the classroom (Butler & Zerr, 2005)



# What Do We Know So Far?

## Improved Exam Scores

- Accounting: Better homework = better exams. (Titard et al, 2014)
- Chemistry: More time on homework = better exams. (Bowman, Gulacar, & King, 2014)

## True Mastery

- Engineering: Better exams now and later. (Arora et al., 2013)

## Reduced Exam Scores

- Engineering: Better exams top student only. (Kontur, de la Harpe, & Terry, 2015)
- Chemistry: Multiple attempts = poor exams. (Bowman, Gulacar, & King, 2014)

## Superficial Learning

- Physics: Guessing males more than females. (Kortemeyer, 2009)
- Physics: Problem solving unproductive after first attempt. (Kortemeyer, 2015)



# What Is The Question?

- Is there a significant relationship between allowing multiple homework attempts and improved student learning as measured by exam scores for adult learners in a fully online environment?



# Who Did We Study?

## 2017 Online Adult Learners In Introductory Economics

Group	Attempts	Sample Size	Dates
A	Single Attempt	405	JAN 2015 – MAY 2015
B	Multiple Attempt	1611	JUN 2015 – DEC 2016



# What Did We Find Out?

Multiple attempts improve student learning

- Mean exam score up from 60% to 68%
- ANOVA  $F(1,2015) = 45.15, p < 0.001$

With multiple attempts, homework explains more of variance in exam scores than other options

- Homework explained 74% of variance in exam
- $\beta = .80, t(1609) = 68.60, p < .001$
- Compared to 62% for single attempts



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# Are These Results Valid?

## **Unequal Group Size: 405 vs 1611**

- Second Analysis Equal Groups: Jan – May 2015 vs 2016
- Mean Exam Score: 70.77% vs 60.34%

## **Exam Changes or Cheating**

- **Exam questions** changed to prevent cheating
- **Exam content** remained constant by Bloom's Taxonomy
- 25% Knowledge, 25% Comprehension, 50% application





# What About Grade Inflation?

## **Homework Scores Similar**

- Means scores increased from 77.97% to 78.92%
- Not statistically significant

## **Homework Explained More Exam Score Variance**

- 74.22% vs 63.24%

## **Homework Completion Rate Edged Up**

- 97.65% vs 96.31%
- Not statistically significant



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