An incentivized early remediation program in Calculus 1: To require office hours or not? And, on an unrelated note... A clicker demonstration

Lake Ritter* and Jennifer Vandenbussche

Kennesaw State University

March 16, 2017
Outline

1 The remediation program

2 Our study

3 A clicker demo
The remediation program

Our program is modeled after the Calculus 1 *Grade Recovery Program* at West Virginia U. (Hensel, Sigler, & Lowery), and the Physics for Engineers *Success Enhancement Program* at U. of Tennessee, Knoxville (Bennett & Schleter).

It consists of

- limited in class review of prereq concepts and access to targeted material,

- an early exam over precalculus concepts (week 2 of classes immediately following Drop/Add) worth 5.25 % of course grade,

- an optional remediation and exam retake opportunity.
Remediation

Eligibility for retaking the exam is based on completion of tasks.

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**Office Hours:** Originally, the program required students to attend 2 hours of review with the instructor during the 2–2.5 week period between the original testing and the opportunity to retake the test.
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Office Hours: This requirement may inhibit adoption. It is very time intensive for the instructor.

\[
40 + \text{ students} \times 2 \text{ hours} = \text{ 😞 Yikes!}
\]

Accurately tracking student attendance is challenging.
Remediation

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Office Hours: It’s not clear whether this is necessary. Do the students make good use of this, and is there appreciable benefit? (A smaller scale requirement at NCSU—15 minute advising meetings—was dropped due to lack of resources and effective use by students.)
Eligibility for retaking the exam is based on completion of tasks.

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**Office Hours**: On the plus side, it pushes students to get the help and to make contact with the instructor.
## Remediation

Eligibility for retaking the exam is based on completion of tasks.

**Remediation Requirements Based on Score**

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**Office Hours:** Jennifer has historically had high office hour use all semester which may be related.
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Office Hours: It gets students together in small groups outside of class that may foster the formation of enduring study groups.
With Me (this supersedes previously posted office hours):

- Monday, Jan. 23, 11am–noon
- Tuesday, Jan. 24, 1:30pm–3:00pm
- Wednesday, Jan. 25, 10:30am–11:30am, 12:30pm–1:30pm
- Thursday, Jan. 26, 7:20am–7:50am
- Friday, Jan. 27, 9:30am-11am, 3:00pm–4:00pm
- Saturday, Jan. 28, 11:00am–1:00pm **Note: Saturday!**
- Monday, Jan. 30, 11:00am–noon
- Tuesday, Jan. 31, 3:00pm–4:00pm
- Wednesday, Feb. 1, 10:00am–11:00am, 3:00pm–4:00pm

With Dr. Vandenbussche (her office is next door to mine):

- Monday, Jan. 23, 10:45am–1:45pm
- Tuesday, Jan. 24, 9:00am–noon
- Thursday, Jan. 26, 9:00am–11:00am
- Friday, Jan. 27, 12:30pm–1:30pm
- Monday, Jan. 30, 10:45am–2:45pm, 6:40pm-9:00pm **Note: Evening Hours!**
- Tuesday, Jan. 31, 9:00am-11:00am
- Wednesday, Feb. 1, noon-1:00pm
Our Main Questions

- Do required office hours impact students’ performance on the second attempt at the prereq test? In the Calculus 1 course?

- Do required office hours impact students’ use of and perception of instructor office hours?
Our Main Questions

- Do required office hours impact students’ performance on the second attempt at the prereq test? In the Calculus 1 course?

- Do required office hours impact students’ use of and perception of instructor office hours?
Study

- Two associate professors with experience teaching Calc 1 are running two sections per semester over the course of two semesters (fall ’16 and spring ’17).

- Each section (for each instructor) is identical except that the office hour requirement for retake is included for one section and not for the other.

- We are tracking performance on the prereq exams, embedded final exam questions, and overall course averages.

- Office hour use is being tracked all semester.

- Pre- and Post-surveys are implemented to assess student perceptions.
Some Preliminary Results (fall 2016)

Remediation: Performance & Participation

Does the requirement inhibit participation in remediation?

Participation among students scoring < 86% on their initial attempt

- Office hours required: 54.1%
- Office hours NOT required: 42.5%

Does the requirement affect performance on the retake exam?

Percentage of students eventually obtaining at least 70% in the prereq exam

- Office hours required: 34.7%
- Office hours NOT required: 26.5%
Some Preliminary Results (fall 2016)

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Some Preliminary Results (fall 2016)

Remediation: Performance & Participation

Does the requirement affect performance on the retake exam?

Average change in prereq assessment score amongst participating students:

Ritter
- Office hours required: 22 of 40 participated with an average change of +14.1%
- Office hours NOT required: 17 of 40 participated with an average change of +9.5%

Vandenbussche
- Office hours required: 21 of 38 participated with an average change of +16.0%
- Office hours NOT required: 15 of 37 participated with an average change of +15.1%
Some Preliminary Results (Spring 2017)

Remediation: Performance & Participation

Average change in prereq assessment score amongst participating students:

**Ritter**
- Office hours required: 13 of 34 participated with an average change of +13.7%
- Office hours NOT required: 21 of 39 participated with an average change of +11.1%

**Vandenbussche**
- Office hours required: 15 of 32 participated with an average change of +17.4%
- Office hours NOT required: 16 of 35 participated with an average change +14.2%
Some Preliminary Results

Remediation: Performance & Participation

Does the requirement increase student use of office hours?

We tracked student visits (for any reason) after the remediation program had ended.

- Office hours required: 171 visits
- Office hours NOT required: 110 visits
Some Preliminary Results

We used a series of Likert questions to assess attitudes and perceptions. Some findings include:
Some Preliminary Results

We used a series of Likert questions to assess attitudes and perceptions. Some findings include:

Students with the office hour requirement were more likely to agree with the statement

*I think that instructors want students to attend their office hours.*
Some Preliminary Results

We used a series of Likert questions to assess attitudes and perceptions. Some findings include:

Students with the office hour requirement were more likely to DISagree with the statement

*Students who pay attention in class shouldn’t need to attend office hours.*
And now for something completely different, ...
Let’s get started with Clickers

Throughout a typical class day, I will post questions for you to answer. Some will involve computation, others will be more conceptual.

The questions will appear in slides like this one, and will be either True/False or Multiple Choice.

You will be able to submit answers using our class set of Clickers.
Registering with Roll Call

An incentivized early remediation program in Calculus 1: To require office hours or not? And, on an unrelated note... A clicker demonstration
Help! I missed Roll Call Registration!

I got here late, **and I have a really good reason!**. Can I still participate in clicker polls?

- Grab a clicker, turn it on, and participate in remaining polls.
- Make note of the code on the back of the clicker you’re using (e.g. "3D8903B7")
- **See me after class with this code, and make sure I register it to you.**

I expect very few after class clicker registrations.

lritter@kennesaw.edu
Kennesaw State University

An incentivized early remediation program in Calculus 1: To require office hours or not? And, on an unrelated note... A clicker demonstration
Conceptual clicker polls can be T/F or MC

Sample T/F Question

**True or False:** \( \frac{\sin x}{x} = 1 \)

Sample MC Question

The limit \( \lim_{x \to 0} \frac{\sin(4x)}{x} = 4 \) because

(a) \( \frac{\sin(4x)}{x} = \frac{4\sin(x)}{x} \)

(b) \( \frac{\sin(4x)}{x} = \sin(4) = 4 \)

(c) \( \frac{\sin(4x)}{x} = \frac{4\sin(4x)}{4x} \)
The polls can be computational

Find $y'$ if $y = x (\ln x)^2$.

(a) $y' = \frac{2 \ln x}{x}$

(b) $y' = 2 \ln x + 2$

(c) $y' = (\ln x)^2 + 2 \ln x$

(d) $y' = \ln(x^2) + 2$
Example
Find all of the critical numbers of the function.

\[ F(x) = \frac{\ln x}{x} \]

Question
Find the derivative of \( f(x) = xe^x \).

(a) \( f'(x) = xe^x \)

(b) \( f'(x) = e^x \)

(c) \( f'(x) = (x + 1)e^x \)

(d) \( f'(x) = e^x + x^2 e^{x-1} \)

Question
Find all of the critical numbers of the function.

\[ f(x) = xe^x \]

(a) \(-1\) and 0

(b) \(-1\)

(c) \(-1\) and \(e\)

If the header is "Example," I demonstrate.

If the header is "Question," the students answer.
Session 1 - Question 4
Calc 1 Sp 17 sec 62
Generated: 02/21/2017 09:43:07
Multiple Choice

Correct Answer: B

<table>
<thead>
<tr>
<th>Possible Points</th>
<th>Average Points</th>
<th>Average %</th>
<th>Total Responses</th>
<th>Missing Responses</th>
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<tbody>
<tr>
<td>1.00</td>
<td>0.79</td>
<td>79%</td>
<td>24</td>
<td>0</td>
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Legend
(NR) = No response
Average % = Based only on students who responded to this question

Color coding applies if a correct answer is selected
**Bold Red** = incorrect
Black = correct

If \( G(\theta) = \cos \left( \frac{\pi \theta}{2} - \frac{\pi}{4} \right) = f(g(\theta)) \) where \( f(u) = \cos u \), and \( g(\theta) = \frac{\pi \theta}{2} - \frac{\pi}{4} \), then

(a) \( G'(\theta) = -\frac{\pi}{2} \sin \theta \)
(b) \( G'(\theta) = -\frac{\pi}{2} \sin \left( \frac{\pi \theta}{2} - \frac{\pi}{4} \right) \)
(c) \( G'(\theta) = -\sin \left( \frac{\pi \theta}{2} \right) + \sin \left( \frac{\pi}{4} \right) \)
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<tr>
<td>Christopher</td>
<td>C</td>
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<tr>
<td>Gene</td>
<td>C</td>
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<tr>
<td>Anna</td>
<td>B</td>
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<td>Dnee</td>
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<td>Dennis</td>
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<td>hansen</td>
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<td>娼</td>
<td>B</td>
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<td>C</td>
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<td>j.</td>
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<tr>
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Clicker Feedback

- Students get a chance to try their hand using the new concept, and I get some immediate feedback.

- I can save the class record/responses in various formats.

- It offers a means of awarding some participation grade.

- Student feedback has been mostly positive.
Clicker Options

Free device (phone/tablet) based options:

- Poll Everywhere (Free up to 25)
- WebClicker.org

For price device based option:

- iClicker Reef Polling

Pearson’s New Option:

- Learning Catalytics