

# **The Electronic Seminar on Mathematics Education: Creating an online community of educators**

**Haynes Miller, MIT**

**Canadian Math Society Annual Meeting  
Toronto, December 7, 2019**

## The problem:

Thoughts from spring 2017 (with Grace Lyo, Stanford):

There is a lot of ferment in mathematics education at the university level, but very few venues for letting the world know.

Many math departments have a number of regular disciplinary seminars, with invited speakers. We're used to talking about what we've done in research. We belong to research communities.

Why not in education? The interest group is (presently!) too scattered.

## The solution:

Create an online seminar, following the example of Dan Isaksen's Electronic Computational Homotopy Theory Seminar.

### eCHT

The electronic Computational Homotopy Theory Seminar is an international research seminar on the topic of computational homotopy theory. Topics include any part of homotopy theory that has a computational flavor, including but not limited to stable homotopy theory, unstable homotopy theory, chromatic homotopy theory, equivariant homotopy theory, motivic homotopy theory, and K-theory.

The seminar meets on Thursdays at 11:30am in Detroit (Eastern Time). In the 2019-2020 academic year, the meeting link is [zoom.us/j/612660457](https://zoom.us/j/612660457).

In the 2019-2020 academic year, the organizers are Dan Isaksen (Wayne State University), J.D. Quigley (Cornell University), and Hana Kong (University of Chicago). Contact any of us for more information, or to be added to the seminar mailing list. Guchuan Li (Northwestern University) was an organizer in 2018-2019.

The [eCHT calendar](#) lists all scheduled talks. Some of the previous talks are available on the [eCHT Youtube channel](#).

The result: <http://math.mit.edu/seminars/esme>


## Electronic Seminar on Mathematics Education

This is an online seminar centered on mathematics education at the university level. Talks will cover curriculum, pedagogy, inclusiveness, professional development, blended and flipped classrooms, and other topics of interest.

Upcoming Talks

Past Talks

### Past Talks

Click on the title of a talk to show the abstract and references (you should see a  next to the title if the talk has a folder).

FALL 2019 —

Nov 19  
2019

Incorporating Service-Learning into Math Courses



**Sara Billey**, University of Washington

Nov 05  
2019

Integrating Sustainability into the Mathematics Curriculum



**Bree Ettinger**, Emory University

## The story so far

- Noon Eastern Time, every other Tuesday.
- Started September, 2017.
- 35 presentations so far, featuring 45 speakers from 36 institutions.
- Typical session might be moderated from England, with participants from California, Canada, and Lebanon or Netherlands. Between 15 and 40 logins.
- Often groups gather locally and participate together.
- Joined this fall by Tara Holm (Cornell), supported by TPSE Math.

# A lasting resource: Here's a typical page

Oct 08  
2019

## Student-Centered Assessment of Mathematical Proficiency



Benjamin Braun, Univ of Kentucky

### Presentation:

- [Video](#)
- [Slides](#)

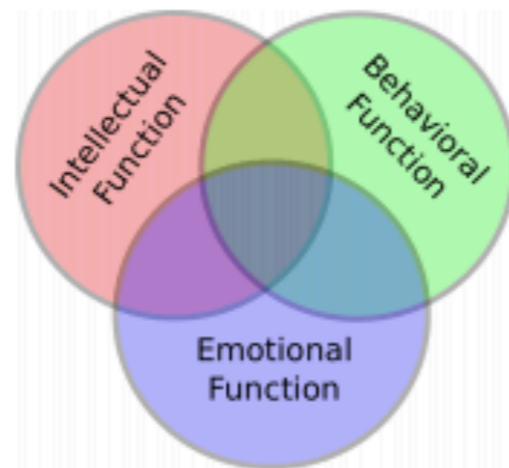
### Other Resources:

- [MAA Assessment practices in undergraduate mathematics \(1999\)](#)
- [MAA Supporting assessment in undergraduate mathematics \(2006\)](#)
- [ASA Guidelines for assessment and instruction in statistics \(2016\)](#)
- [SIAM Guidelines for assessment and instruction in mathematical modeling \(2016\)](#)
- [MAA CUPM curriculum guide to majors in the mathematical sciences \(2015\)](#)
- [CBMS Mathematical education of teachers II \(2012\)](#)
- [NCTM Principles to actions \(2014\)](#)

Substantial changes have occurred over the past decade in undergraduate mathematics education, with particular emphasis on the classroom practices used by instructors and faculty. These student-centered pedagogies should be complemented by the implementation of student-centered assessment practices. We will describe the characteristics of "student-centered assessment practices," and share basic frameworks and methods to guide faculty and instructors seeking to implement these.

# Electronic Seminar on Mathematics Education

## Student-Centered Assessment of Mathematical Proficiency



**Benjamin Braun**  
**Univ of Kentucky**

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**Noon ET, October 8, 2019**

To join the seminar, go to <https://cornell.zoom.us/j/169462410>

For more information on ESME: <http://math.mit.edu/seminars/esme/>

# The Topics: By subject

## Calculus

David Bressoud, “A radical approach to calculus”

Angie Hodge, “Inquiry-based learning calculus”

Matt Boelkins, “Active Calculus”

Steve Bennoun and Tara Holm, “Active learning in calculus at Cornell”

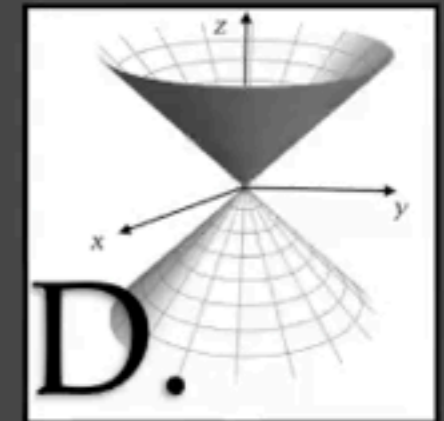
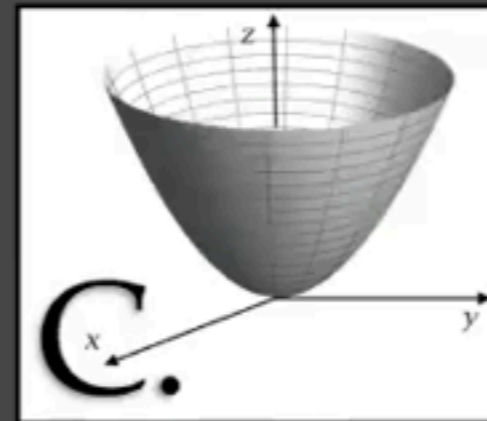
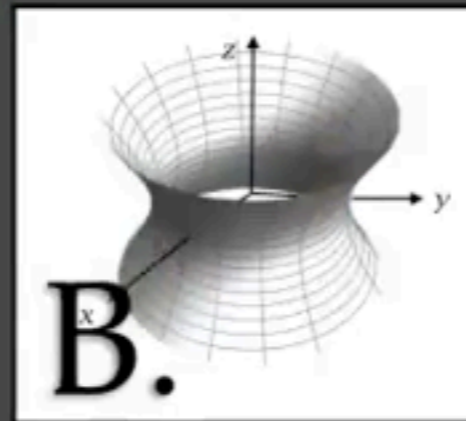
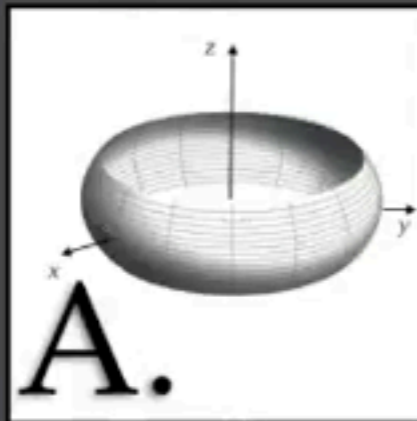


# Good questions

Which graph show the surface parametrized by

$$G(u, v) = \left( \sqrt{1 + u^2} \cos(v), \sqrt{1 + u^2} \sin(v), u \right)$$

for  $-1 \leq u \leq 1$  and  $0 \leq v \leq 2\pi$  ?



TEXT: TO: 22333

MSG: TARAOLM500

## Differential equations and linear algebra

Chris Rasmussen, “The Inquiry Oriented Differential Equations Project”

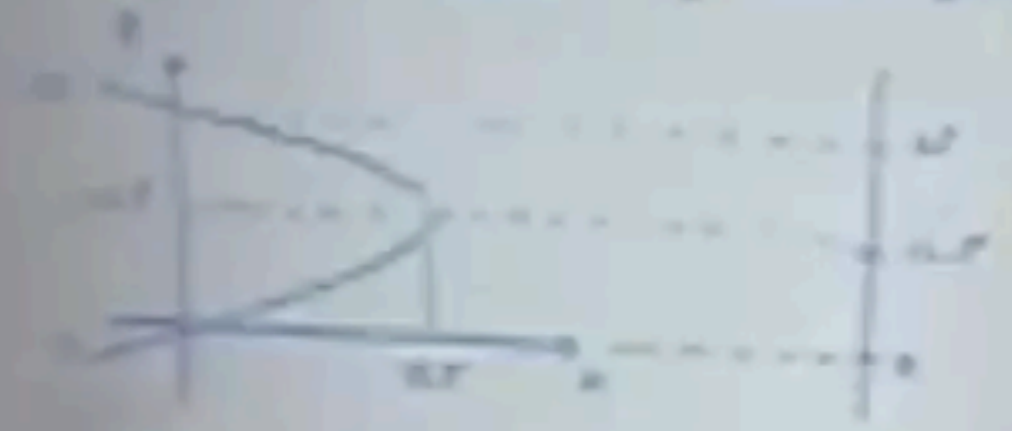
Philipp Hieronymi, “Redesigning a large linear algebra course - a travel report”

Jen French and Haynes Miller, “Mathematical manipulatives: the MIT Mathlets”

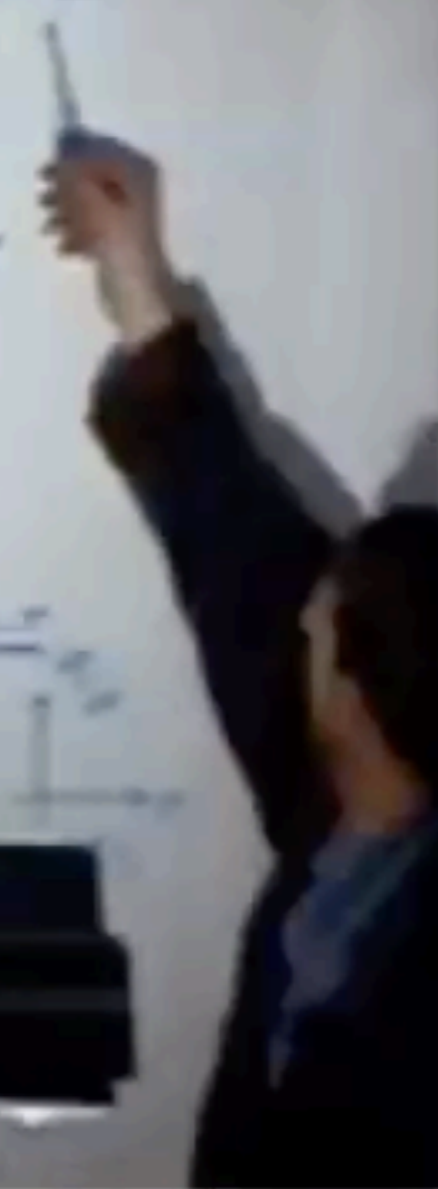


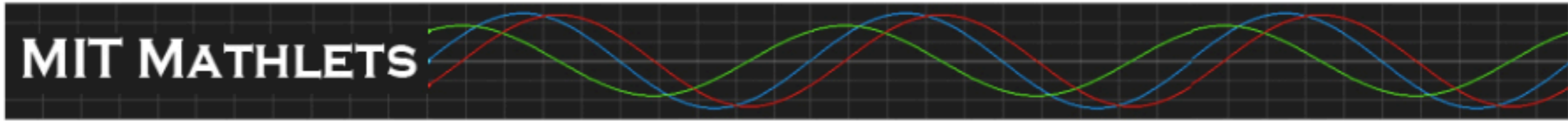
$$f_1(x) = \frac{1}{2}(x^2 - 2) \quad f_2(x) = 0$$

$$f_1(x) = \frac{1}{2}(x^2 - 2) \quad f_2(x) = \frac{1}{2}(x^2 - 2) \sqrt{2x+2}$$



$$\sqrt{2x+2} \quad 0 \leq x \leq 2$$





HOME ABOUT TRAINING MATHLETS COURSES ACTIVITIES DEMOS

## AMPLITUDE AND PHASE: SECOND ORDER II

Mathlet

Description

Activity

Theory

Demo

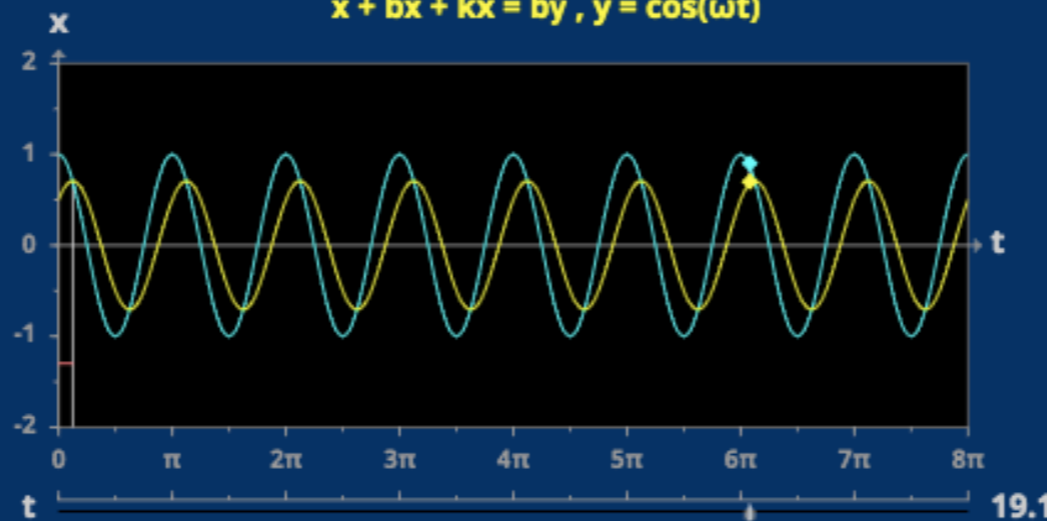
Comments

### AMPLITUDE AND PHASE: SECOND ORDER II

[+ help](#)



$$\ddot{x} + b\dot{x} + kx = b\dot{y}, y = \cos(\omega t)$$



>>

t = 19.1 x =

ω 0 1 2 3 4 2.00

b 0.0 0.5 1.0 1.5 1.00

k 0.0 1.0 2.0 3.0 4.0 2.00

■ Bode Plots

■ Nyquist Plot

$$P = 2\pi/\omega = 3.14$$

$$t_0 = (\Phi/2\pi)P = \Phi/\omega = 0.39$$

## Probability, statistics, discrete math

Jon Bloom and Jerry Orloff, “Rolling the dice: flipping an introductory probability and statistics class”

Sanjoy Mahajan, “Teaching probability and statistics from a purely Bayesian point of view”

Sara Billey, “Incorporating service-learning into math courses”

# Improving free tax service offered by United Way



Team: Melissa Stadt , Irena Chen, and Jessica Fay

How can we most efficiently serve low income and elderly people coming to the library for tax preparation service given a two phase system including an initial preparation and a quality review? Answer: Queueing Theory and Simulations!

## The Topics: Active learning:

David Pengelley, “From lecture to active learning: Rewards for all, and is it really so difficult?”

Annalisa Crannell, “Inquiry and engagement in an interactive classroom”

Ralf Spatzier, “Inquiry based learning at Michigan”

Beth Burroughs, “MAA’s Instructional Practice Guide: Introduction to a new resource”

Alfonso Gracia-Saz, “Ask. Don’t tell.”

## Warm up

Take 45 seconds to look over the following list of pairs of words, but **do not write anything down**.

---

bread/b\_tter

leaf/tree

sweet/sour

phone/bo\_k

chi\_s/salsa

high school/college

river/b\_at

fruit/vegetable

computer/chip

l\_nch/dinner

---

ocean/breeze

music/l\_rics

sh\_e/sock

movie/actress

gasoline/engine

pen\_il/paper

turkey/stuffing

be\_r/wine

television/rad\_o

chair/couch



## The topics: Inclusivity

Darryl Yong, “Active learning 2.0: Making it inclusive”

Ron Buckmire, “Who Does The Math?: Diversity and Demographics in the Mathematics Community”

Alissa Crans and Dave Kung, “Rising to the challenge of diversifying the mathematics community”

## Use of the chat window

# Challenging Scenario:

## Scenario #1

Your calculus students work in groups of 3. Tori's an outgoing – and very good – student, but one day she's in a group with two guys. You notice that she isn't as active as usual. After class, she tells you they kept interrupting her and ignoring her ideas – so she just worked by herself.

What do you do? (Type, Wait, Enter, Read)

## The Topics: Programmatic reform

Robin Pemantle, “Active learning at Penn: 2013—2017”

Annoeskja Cabo, “Co-creating interactive online exercises”

Teena Gerhardt, “Transforming the gateway: Redesigning large introductory-level courses”

# Student Impressions:

“[The class] really drove home the application problems and allowed us to work together to solve these detailed, yet conceptual problems, and helped build a solid foundation of knowledge as I move further on in my education.”



## The Topics: Teacher Training

Emily Braley and Robin Gottlieb, “Supporting graduate students for successful teaching experiences”

Catherine Snyder, Peter Turner, Seema Rivera, “Educating the future professoriate: Summer institute for graduate teaching assistants”

Jack Bookman and Natasha Speer, “The college mathematics instructor development source: CoMInDS”

# Community-building: Modes of communication

The Webpage collects many relevant links.

The chat window offers many ways to communicate:  
It allows

- ... private discussions without disrupting the presentation,
- ... participants to ask questions of the speaker,
- ... or engage in public discussion.

## Other modes:

- Polleverywhere (Matt Boelkins)
- Googledoc “think pair share” (Stan Yoshinobu)
- Text messages (Steve Bennoun and Tara Holm)
- After the seminar participants often continue the discussion

## A facebook question:

"What are some ways to start off the semester with some real two-way communication that can lead to better learning and better teaching? I don't have great answers."

## Answer:

# A Focus on Student Buy-In: Why It Matters and What To Do About It

MIT Electronic Seminar in Math Education



Stan Yoshinobu, Cal Poly SLO  
Math Department, Director of AIBL



**Want to start a departmental seminar on  
inclusive teaching?**

## **A Mathematics Learning Community on Inclusive Teaching**

**P. Gavin LaRose**

**Department of Mathematics  
University of Michigan  
glarose@umich.edu**

**11 December, 2018**

## The seminar continues!

Please visit

<http://math.mit.edu/seminars/esme>

We look forward to seeing you in the spring!

I'll be happy to add you to our mailing list.

... and we welcome your suggestions for topics or speakers

**Thank you!**