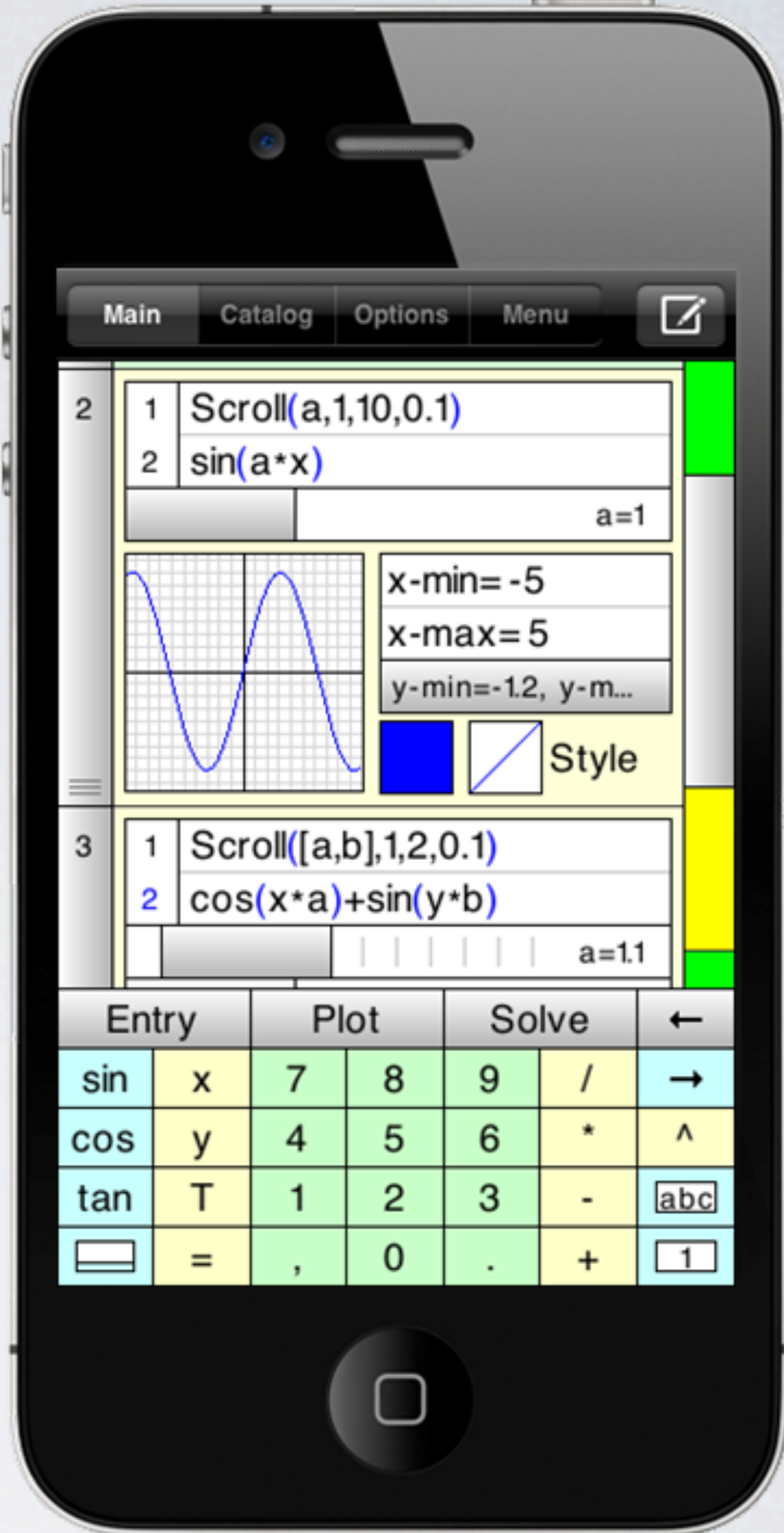


# MOVING THE GRAPHING CALCULATOR TO THE MOBILE PLATFORM

Results of a Two Year Study

Dr. John Ehrke



# EMBRACING MOBILE LEARNING



# ACU MOBILE LEARNING TIMELINE

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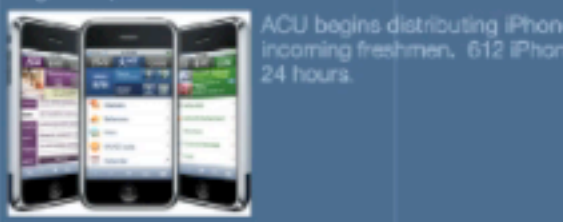


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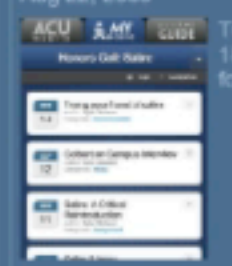
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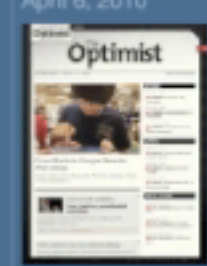
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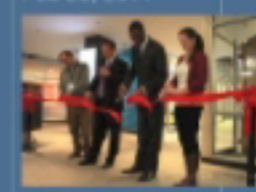
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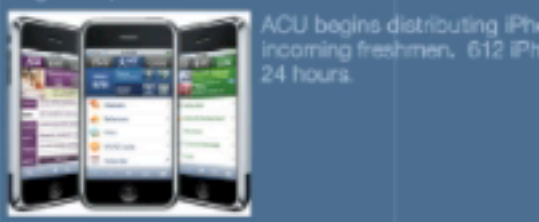


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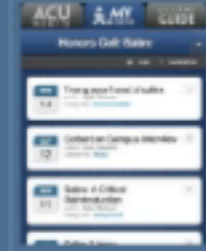
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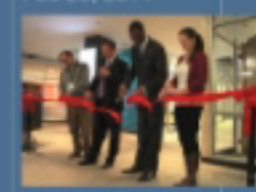
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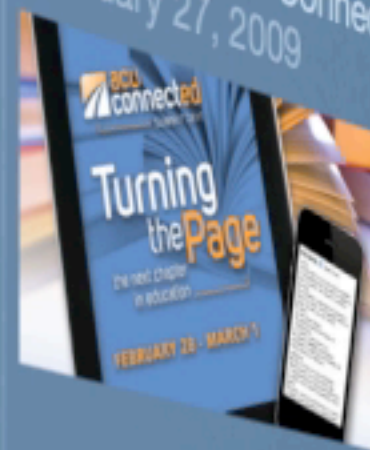
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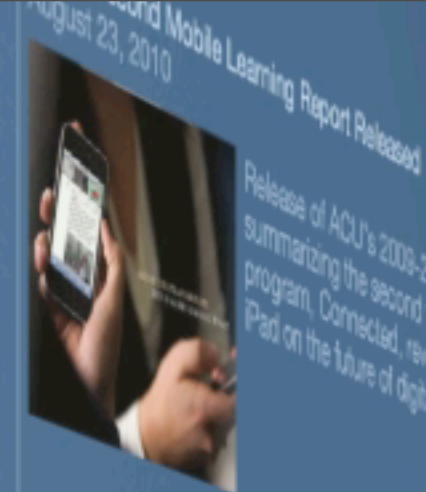
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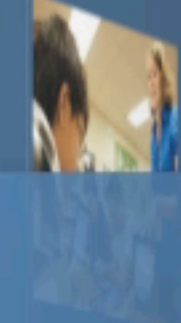


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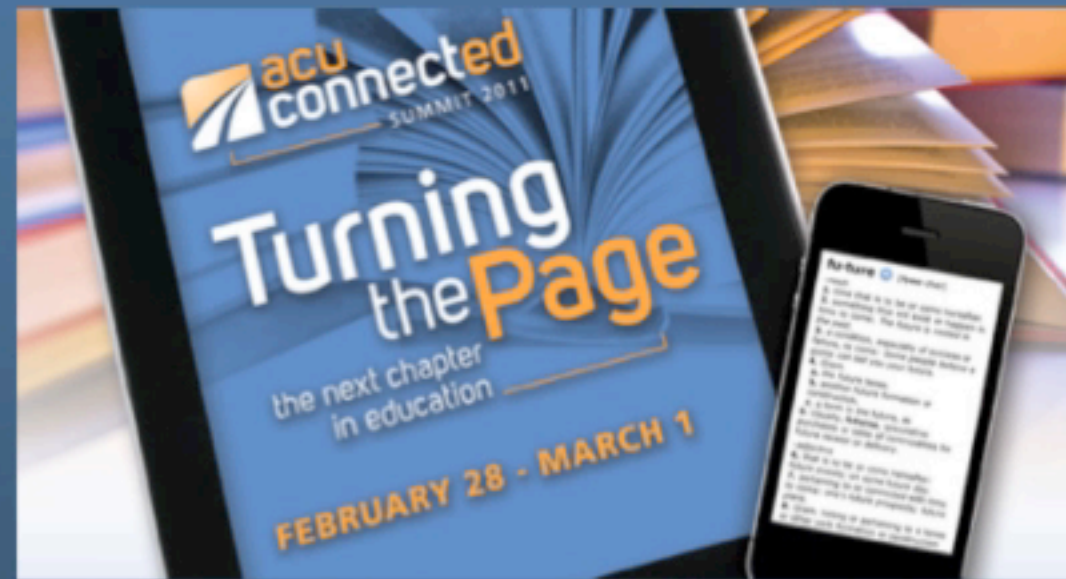
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© 2011 ACU



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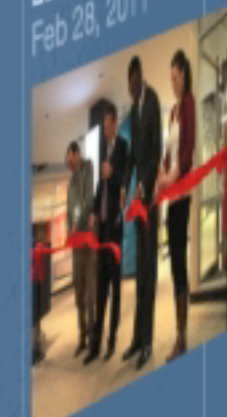
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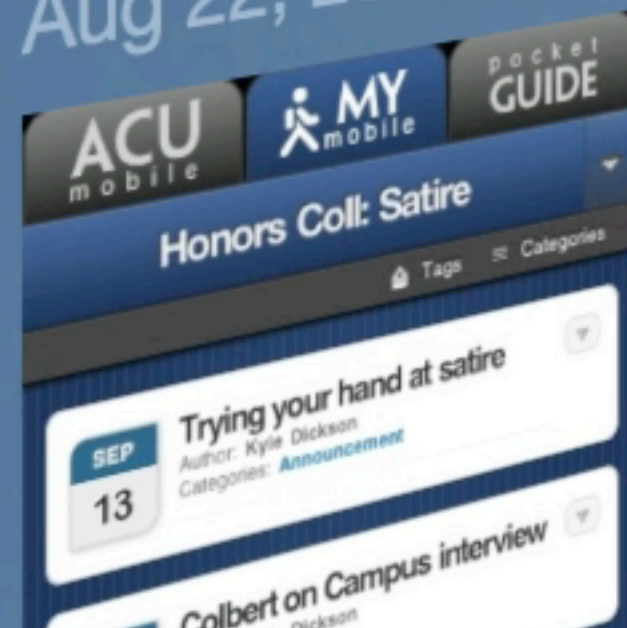
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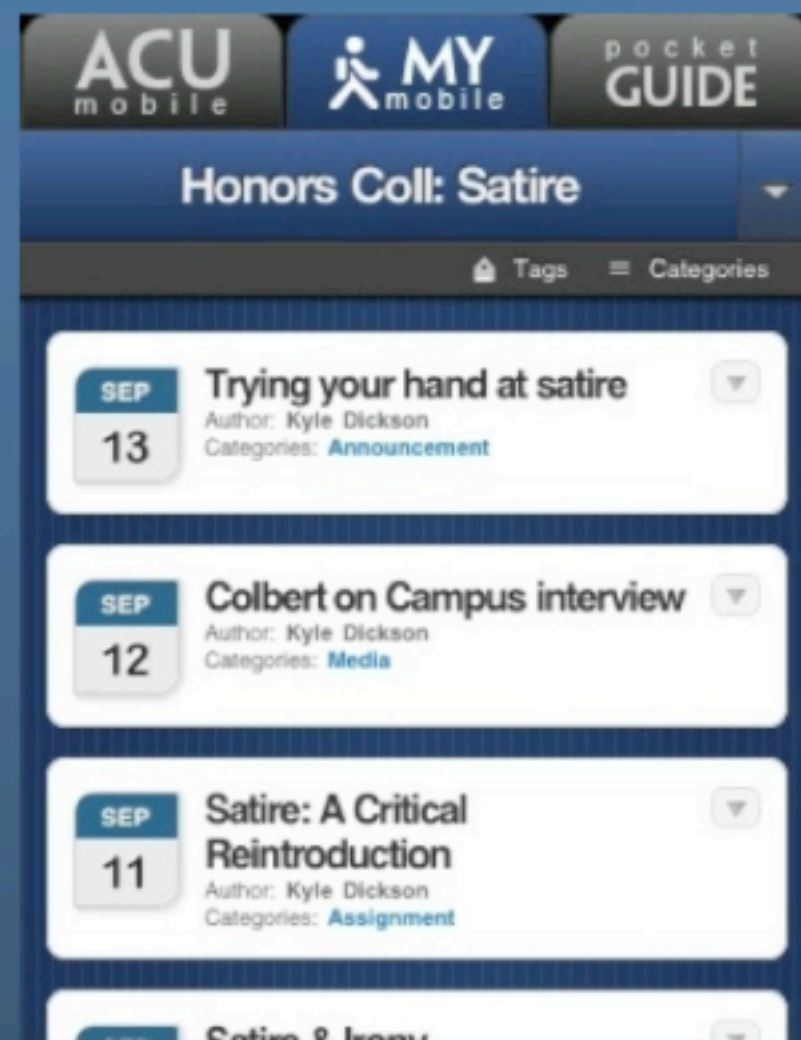


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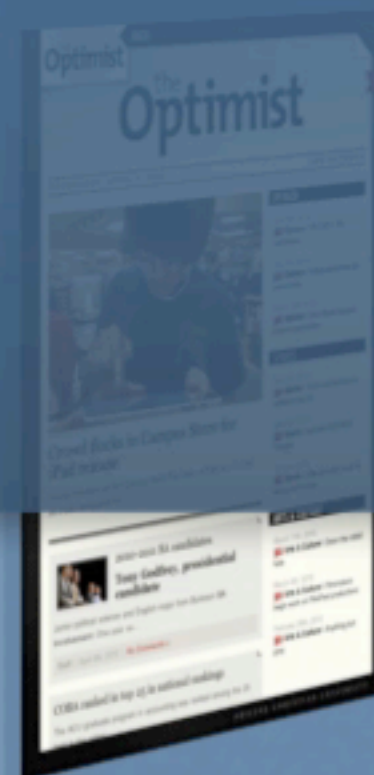
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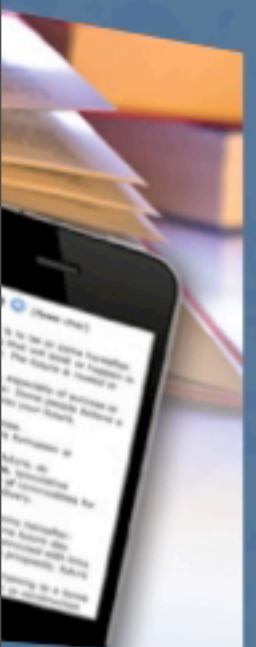
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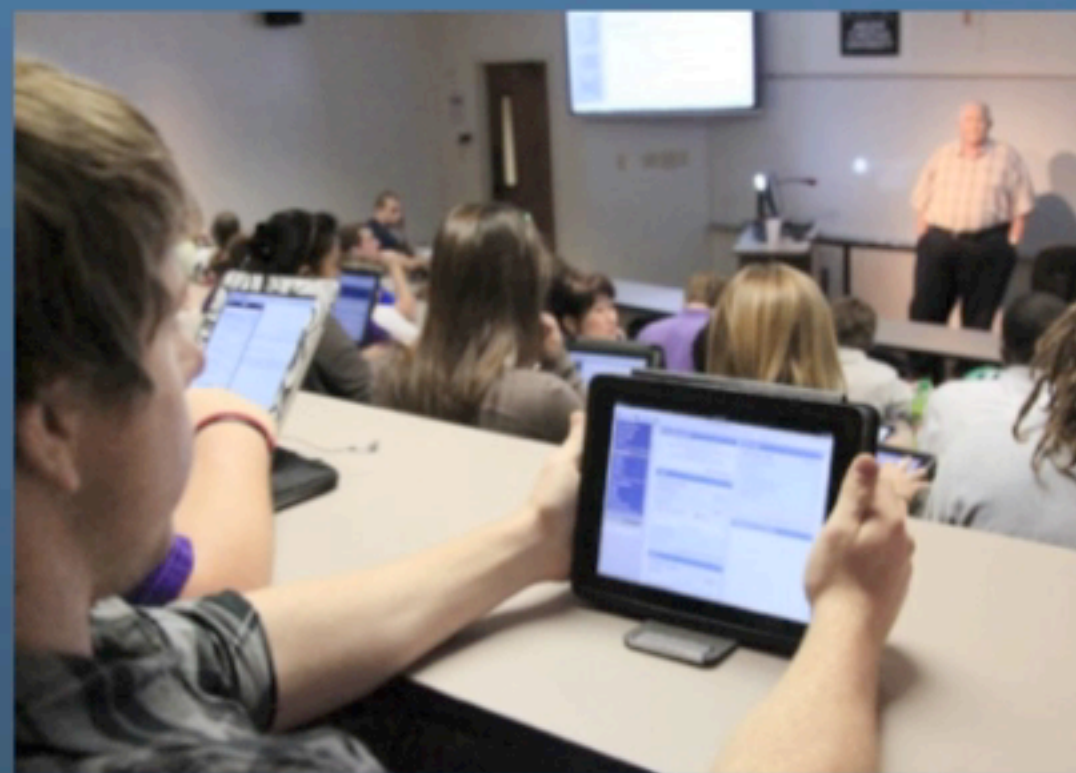
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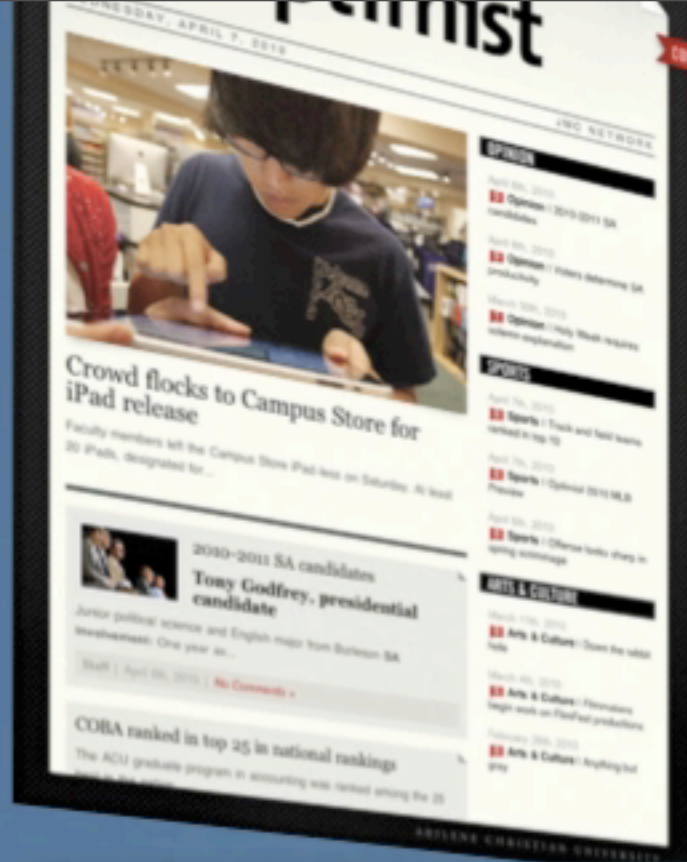
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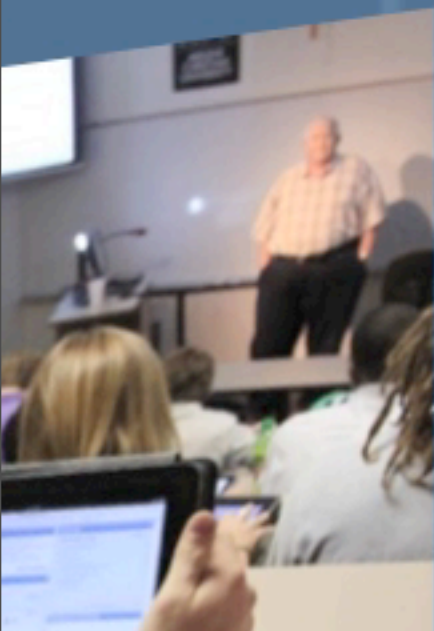
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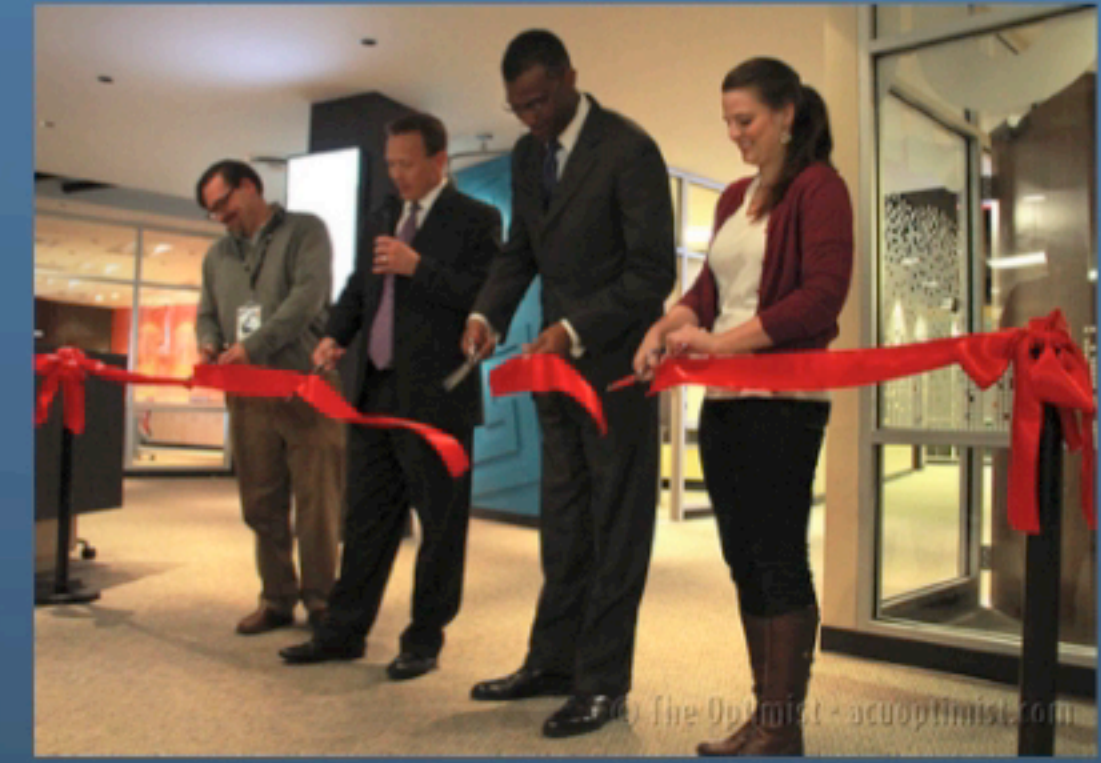
Learning Institute launches first session to train K-12 teachers to integrate mobile technologies and develop 21st century skills in the classroom.

Third Mobile Learning Report is Released  
August 22, 2011



Release of ACU's 2010-2011 Mobile Learning Report summarizing the third year of the mobile-learning program connected, reveals the research efforts of a variety of faculty campus wide.

Learning Studio Premieres  
Feb 28, 2011



The AT&T Learning Studio ribbon-cutting is attended by several hundred students, faculty, and members of the media. Many eager attendees are given tours of the new facility.

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2011

2012

2013

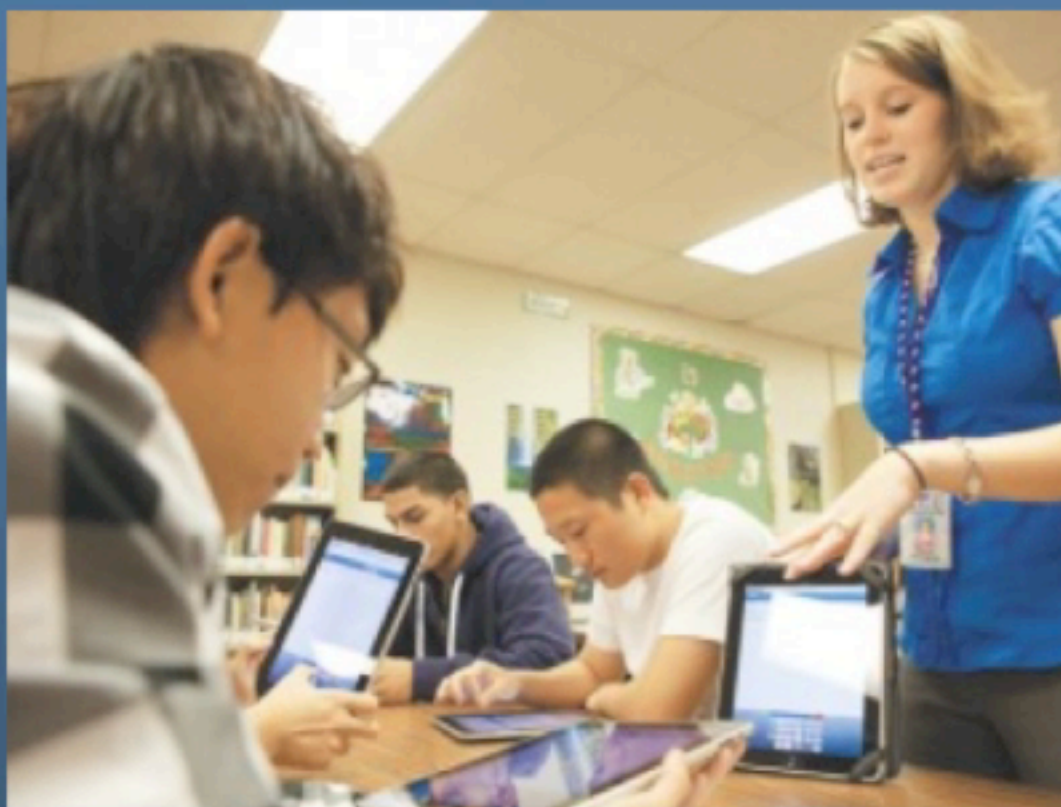
ACU Mobile Learning Institute

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2009-2010 Mobile Learning Report  
second year of the mobile learning  
ted, reveals the campus impact of the  
of digital texts.

## K-12 Digital Learning Institute Launched

Jun 11, 2011



ACU's K-12 Digital Learning Institute launches first summer session to train K-12 teachers to integrate mobile technologies and develop 21st century skills in the classroom.

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## What's Next For ACU?

August 22, 2012



As ACU closes in on its fourth year of the mobile learning initiative, the university has an eye forward...is the new iPad in the future?

ACU Mobile Learning Initiative



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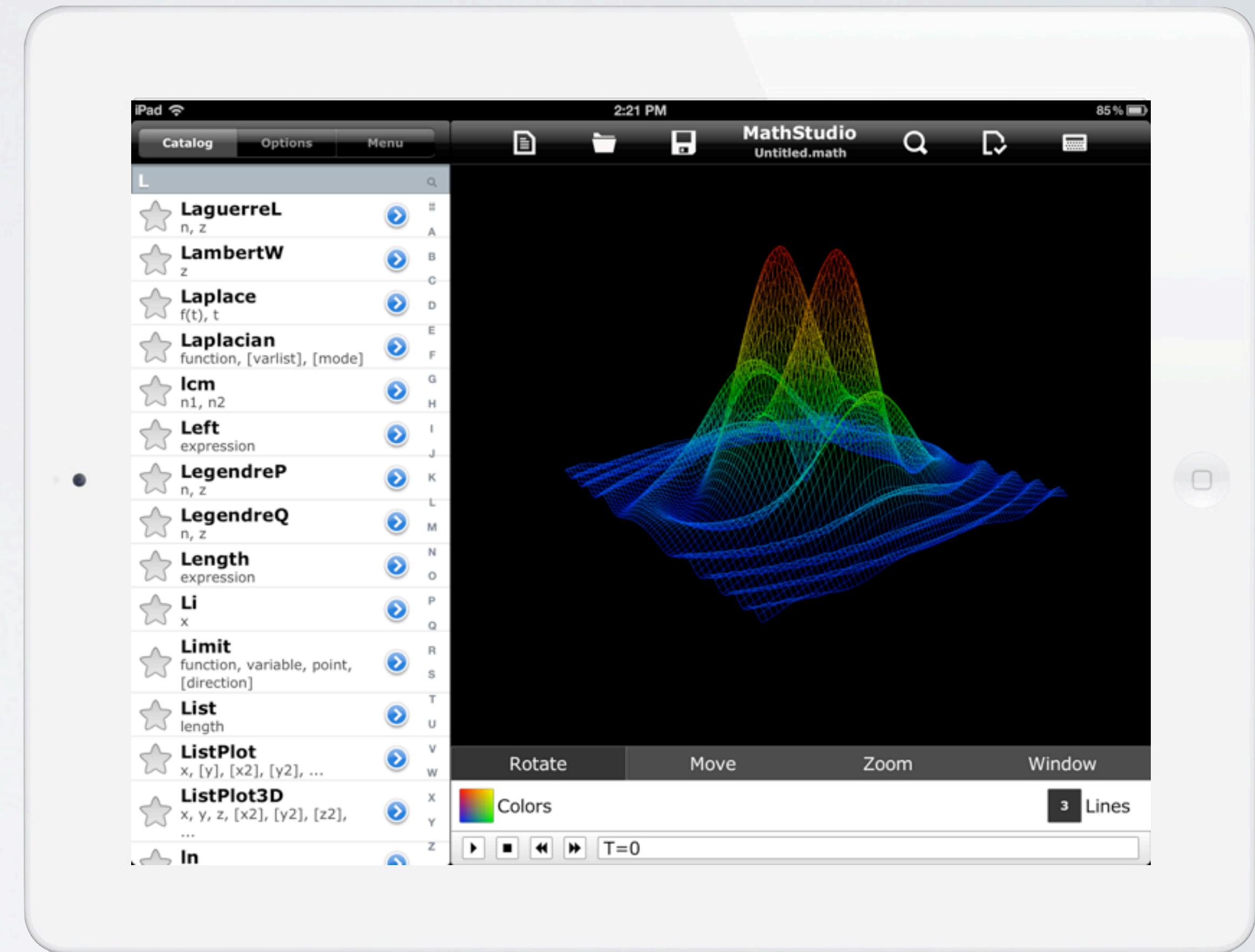
# CRITERIA FOR ASSESSMENT

Embracing a new technology requires we assess the technology based on three criteria

- Effect on the teaching and learning of mathematics
- Changes in instructional pedagogies required to facilitate the technology
- Effect on content knowledge building

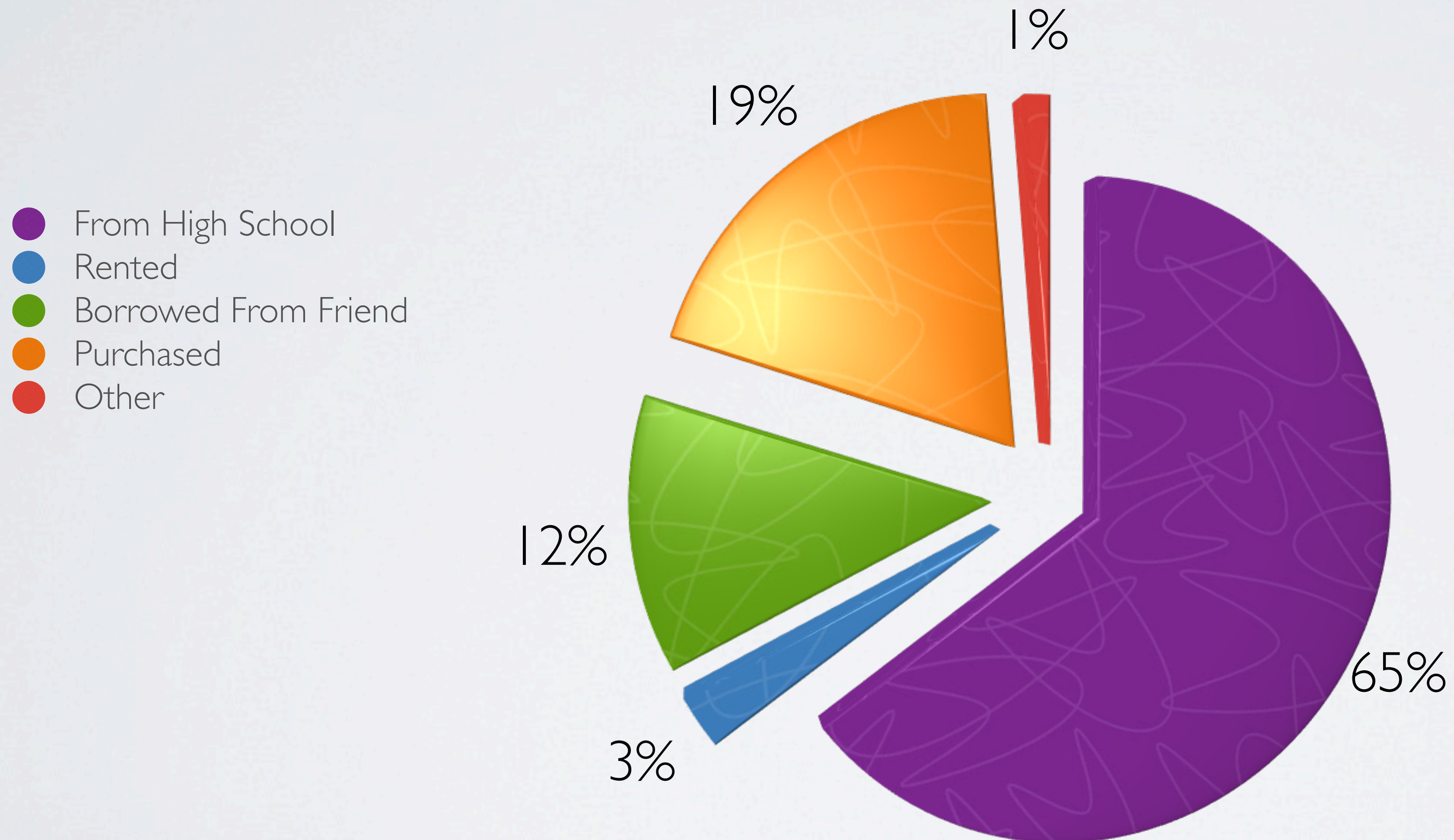
# PARAMETERS OF THE STUDY

- This research was supported by the University Mobile Learning Fellows Program during the time from 2010-present.
- The study was conducted over the Fall 2010 and Fall 2011 semesters.
- Treatment consisted of differentiated instruction based on the use of a mobile computing app, SpaceTime™ (now MathStudio™) versus traditional instruction based on the Texas Instrument TI-84 Plus graphing calculator.
- Treatment group consisted of  $n = 41$  subjects chosen from sections of a general education mathematics course. The control group consisted of  $n = 39$  subjects chosen from different sections of the same course.



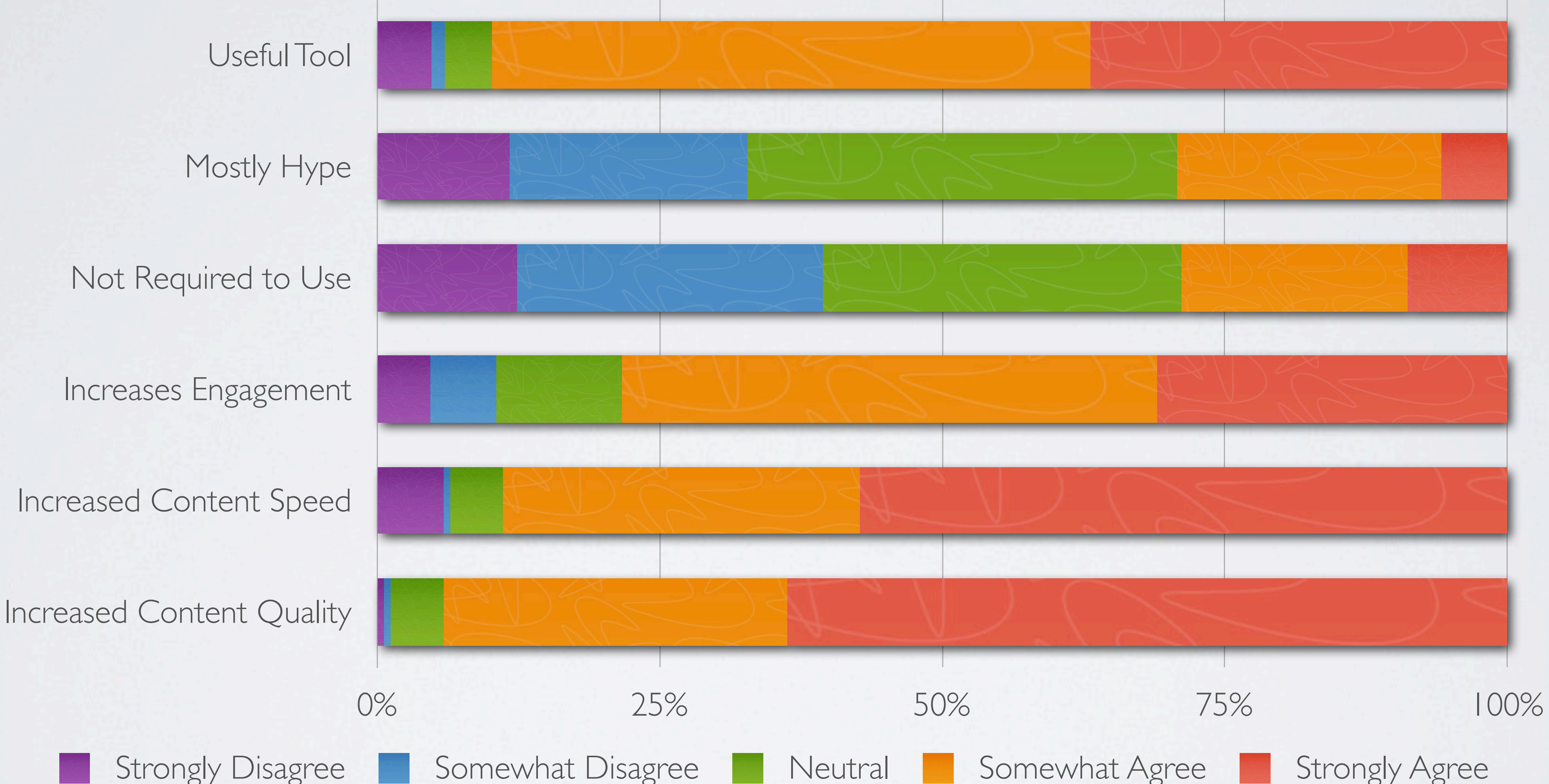


# WHERE ARE STUDENTS GETTING THEIR CALCULATORS?



*n = 171*

# STUDENT ATTITUDES TOWARD MOBILE DEVICES IN THE CLASSROOM



*n = 171*

# MOBILE LEARNING USABILITY SCALE

- 1 = Extremely Hard to Use
- 2 = Somewhat Hard, Didn't Get Better with Practice
- 3 = Average Level of Difficulty
- 4 = Eventually Became Easy to Do
- 5 = Extremely Easy to Use

*MLUS exhibits strong internal reliability*

# CONFIDENCE INTERVALS

## Statistics Construct

Components	Non-treatment	Treatment
Entering Data	4.529 ± 0.231	3.676 ± 0.361
Sample Statistics	4.382 ± 0.243	4.027 ± 0.299
Normal Distributions	4.235 ± 0.355	4.028 ± 0.348
Regression Analysis	3.765 ± 0.394	3.676 ± 0.377

$\alpha=0.05$

# CONFIDENCE INTERVALS

## Finance and General Constructs

Components	Non-treatment	Treatment
Equation Solver	4.158 ± 0.331	4.133 ± 0.306
Financial Solver	4.368 ± 0.367	4.133 ± 0.306
Interest Calculations	4.0 ± 0.454	3.767 ± 0.349
APY/APR	3.895 ± 0.451	3.667 ± 0.371
Ease of Use	3.778 ± 0.335	3.447 ± 0.395

$\alpha=0.05$

# CONFIDENCE INTERVALS

## Post Tests and Final Exam Scores

Exams	Non-treatment	Treatment
Post Statistics	75.14 $\pm$ 5.53	70.04 $\pm$ 5.56
Post Finance	68.33 $\pm$ 6.15	60.67 $\pm$ 6.17
Final Exam	69.88 $\pm$ 5.10	64.72 $\pm$ 2.92

$\alpha=0.05$

# TOP TEN LIST

WHAT ARE THE TOP TEN FEATURES A MOBILE COMPUTING APP SHOULD HAVE?

- Data entry should be reasonably easy and support importing of large real-life data sets.
- The user should be able to choose between command driven UI and a menu driven UI.
- Graphing should be intuitive and leverage multi-touch interfaces and gesturing.
- Graphing should support simultaneous plotting of multiple equation types and support for multicolumn tabular output.
- Graphing should support labeling and annotation.
- The user should never effectively “leave” the home screen.
- The app should have cloud integration and a well designed file system.
- The app should support a variety of export options for graphs and files.
- The user should be able to make mistakes and quickly and efficiently edit those mistakes.
- The user should be able to customize elements of the UI to allow for personalized access.

# CHANGES IN INSTRUCTIONAL PEDAGOGIES

multitouch is a game changer

cloud, cloud,  
cloud, cloud

teacher podcasting

peer review,  
interaction

color, annotate,  
label, personalize

student  
screencasting



Technology tools impact instructional pedagogies in two ways: as amplifiers and as reorganizers. - (Lee & Hollebrands, 2008)