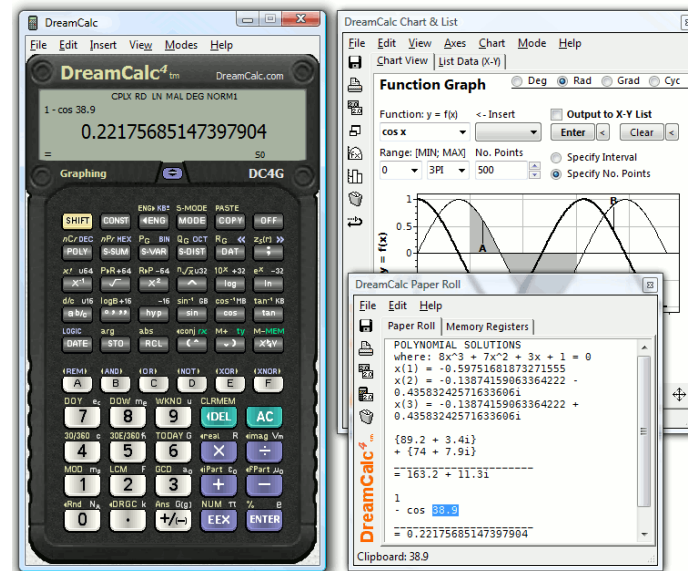
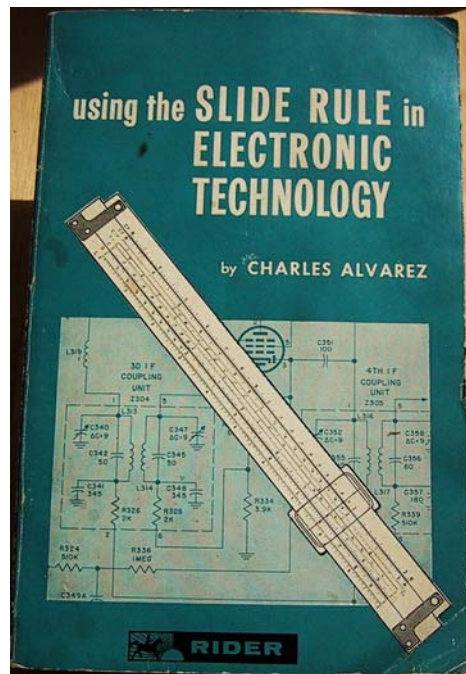


Exploring the Effectiveness of Different Approaches to Teaching Finite Mathematics


Dr. Esenc Balam, Dr. Jamye Carter, Dr. Lisa James,
Dr. Carolyn Simmons-Johnson,
Dr. Mary Alice Smeal,
Dr. Sandra Walker
Alabama State University


“With technology—
Some mathematics becomes more important.
Some mathematics becomes less important.
Some mathematics becomes possible.”


Henry Pollack



Technology and Mathematics

- 
- Technology is changing the way that mathematics is done in all aspects of our life
 - (American Mathematics Association of Two-Year Colleges, 2002)

- 
- Electronic technologies—especially graphing calculators and computers (software)—are essential tools for teaching, learning, and doing mathematics (AMATYC, 2002; NCTM, 2000)

- 
- Technology promotes conceptual learning, especially through the use of visual models (NCTM, 2000)

Review of Literature

- Alternative approaches to teaching mathematics can include distance learning (Perez & Foshay, 2002; Su, 2008), computer-assisted curriculum (Taylor, 2008), and graphing calculators (McCoy, 1996).
- Critical factors for successful online courses include technical support and a combination of campus-based support with the distance learning delivery systems (Perez & Foshay, 2002).
- In McCoy's study(1996) using computer-based mathematics learning, she reported that technology-related tools improved conceptual learning, but computation skills were no different.
- In a study comparing computer-aided instruction, traditional lecture, and online teaching, Wynegar and Fenster (2009) reported that students in traditional lecture classes performed better than all of the other methods

Hypothesis

- The performance of students in finite mathematics differs with each type of instruction

Exploring The Effectiveness of Different Approaches to Teaching Finite Mathematics



Traditional Classroom – instruction via lecture method and community of mathematicians



Graphing Calculator – instruction enhanced via the TI-83



Online Class – distance learning instruction via the computer

Methodology

Finite Mathematics Course

N = 341

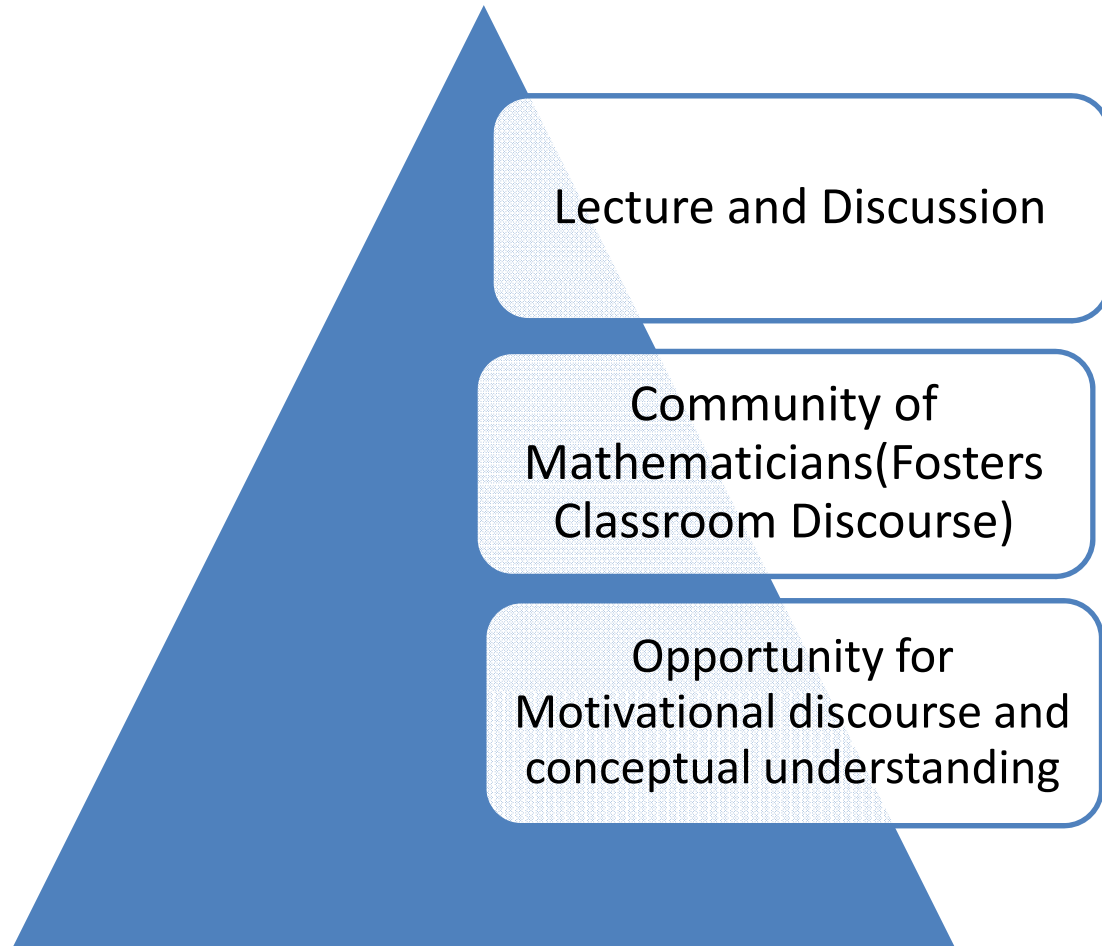
Common Syllabus (7 objectives)

Pre-Test and Post-Test administered

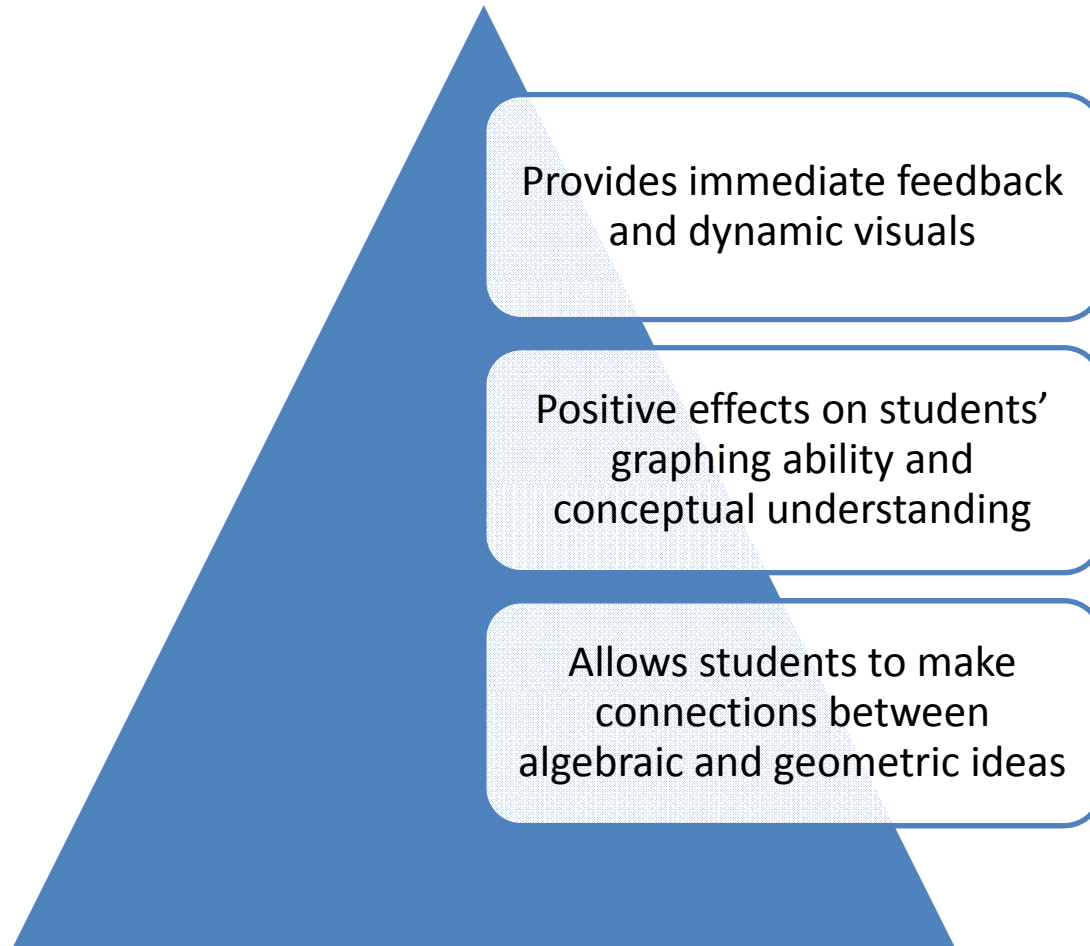
Traditional – Control n=216

Experimental – Calculator n = 115 & Online n = 10

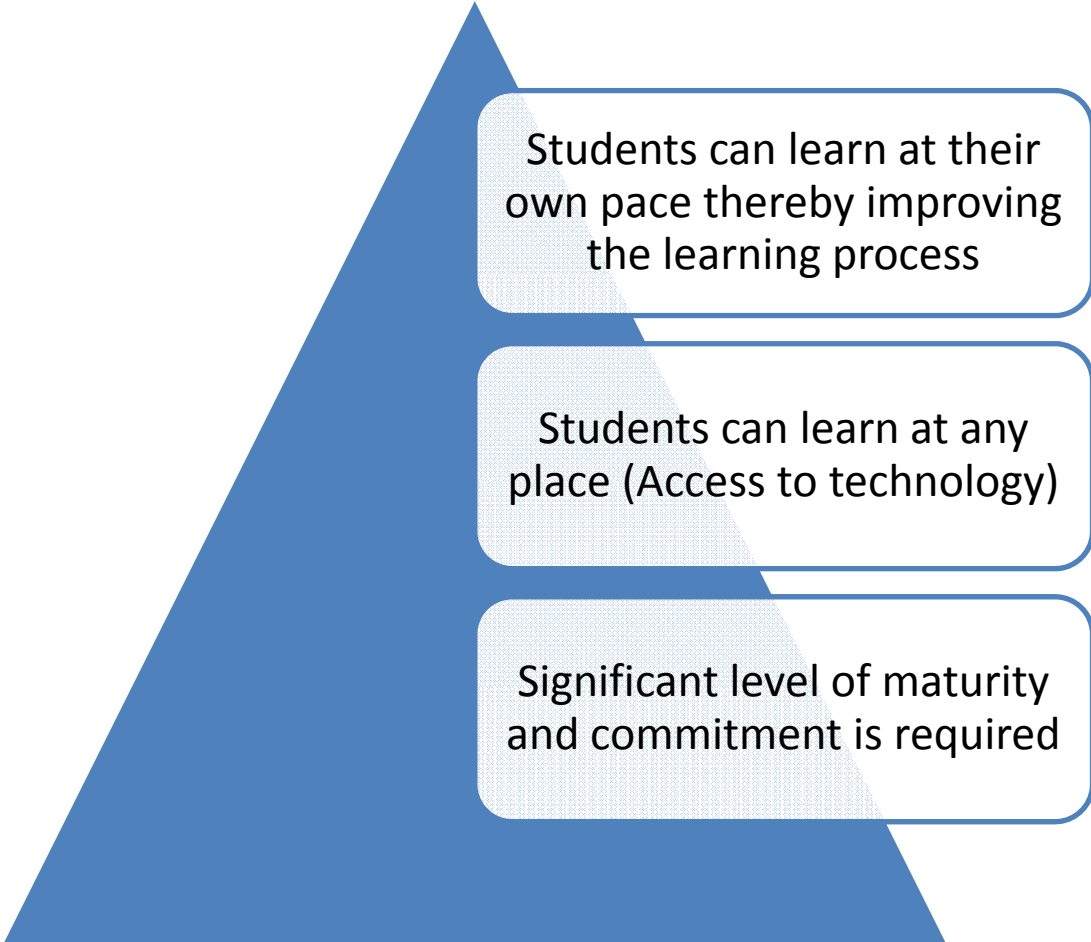
Traditional Classroom



Graphing Calculator TI-83 Classroom



Online/Distance Learning Course



Students can learn at their own pace thereby improving the learning process

Students can learn at any place (Access to technology)

Significant level of maturity and commitment is required



Analysis of Data

Repeated Measures

Within-Subjects Factors

Measure: MEASURE_1

	Dependent Variable
TIME	
1	PRETEST
2	POSTTEST

Between-Subjects Factors

	Value Label	N
METHOD 1	Traditional	216
2	Calculator	115
3	Online	10



Analysis of Data

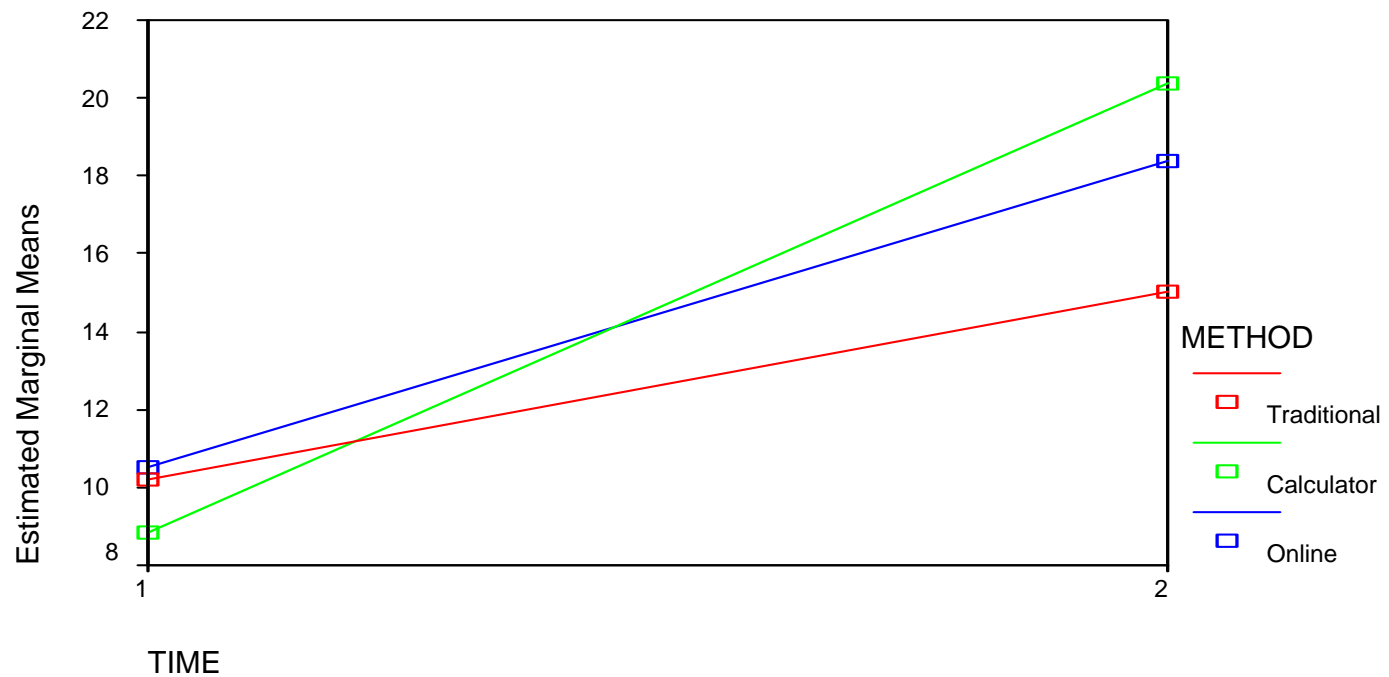
Descriptive Statistics

	METHOD	Mean	Std. Deviation	N
PRETEST	Traditional	10.20	3.333	216
	Calculator	8.82	3.251	115
	Online	10.50	3.659	10
	Total	9.74	3.372	341
POSTTEST	Traditional	15.02	3.521	216
	Calculator	20.38	4.244	115
	Online	18.40	5.103	10
	Total	16.93	4.579	341



Analysis of Data

Estimated Marginal Means of MEASURE_1





Analysis of Data

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
TIME	Sphericity Assumed	2602.000	1	2602.000	285.863	.000	.458
	Greenhouse-Geisser	2602.000	1.000	2602.000	285.863	.000	.458
	Huynh-Feldt	2602.000	1.000	2602.000	285.863	.000	.458
	Lower-bound	2602.000	1.000	2602.000	285.863	.000	.458
TIME * METHC	Sphericity Assumed	1710.121	2	855.060	93.939	.000	.357
	Greenhouse-Geisser	1710.121	2.000	855.060	93.939	.000	.357
	Huynh-Feldt	1710.121	2.000	855.060	93.939	.000	.357
	Lower-bound	1710.121	2.000	855.060	93.939	.000	.357
Error(TIME)	Sphericity Assumed	3076.560	338	9.102			
	Greenhouse-Geisser	3076.560	338.000	9.102			
	Huynh-Feldt	3076.560	338.000	9.102			
	Lower-bound	3076.560	338.000	9.102			

At $\alpha=.05$, $p=.00$, there are significant achievement differences within each group.



Analysis of Data

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	30634.666	1	30634.666	1852.132	.000	.846
METHOD	617.842	2	308.921	18.677	.000	.100
Error	5590.592	338	16.540			



Analysis of Data

Levene's Test of Equality of Error Variances

a

Dependent Variable: POSTTEST

F	df1	df2	Sig.
4.954	2	338	.008

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept+PRETEST+METHOD



Analysis of Data

Univariate Analysis of Variance

Multiple Comparisons

Dunnett T3

Dependent Variable	(I) METHOD	(J) METHOD	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
PRETEST	Traditional	Calculator	1.39*	.379	.001	.48	2.30
		Online	-.30	1.179	.992	-3.65	3.06
	Calculator	Traditional	-1.39*	.379	.001	-2.30	-.48
		Online	-1.68	1.196	.444	-5.05	1.69
	Online	Traditional	.30	1.179	.992	-3.06	3.65
		Calculator	1.68	1.196	.444	-1.69	5.05
POSTTEST	Traditional	Calculator	-5.36*	.463	.000	-6.47	-4.25
		Online	-3.38	1.632	.176	-8.04	1.29
	Calculator	Traditional	5.36*	.463	.000	4.25	6.47
		Online	1.98	1.662	.571	-2.71	6.67
	Online	Traditional	3.38	1.632	.176	-1.29	8.04
		Calculator	-1.98	1.662	.571	-6.67	2.71

Based on observed means.

*. The mean difference is significant at the .05 level.



Summary of Findings

- There was a significant achievement difference within each student group--traditional, calculator, and online.
- The classes in which the graphing calculator were used showed a significant achievement difference over the traditional classes.
- There was no significant achievement difference between the calculator and the online classes.
- There was no significant achievement difference between the traditional and the online classes.



Implications of Findings

- Each approach to teaching produces achievement differences.
- Possibly, one reason the calculator group has a higher mean score is that the calculator helps in eliminating some common errors. Specifically, students are accustomed to checking their solutions.
- Students who take online classes work more independently and are accustomed to reviewing their procedures. This might be one reason why the online group has a higher mean score than the traditional group.



Future Research

- Increase the sample size for the online case study.
- Survey students' attitudes on taking online classes, using the graphing calculators, and using other technology in the classroom.
- Survey students to determine what helps them to succeed in finite mathematics.