

# Improving Student Success in Developmental Algebra and Its Impact on Subsequent Mathematics Courses

William O. Bond

University of Alabama at Birmingham

Greater Birmingham Mathematics Partnership

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# Contributors

John Mayer

Laura Stansell

Walter Johnson

Thomas Ingram

Joshua Argo

Jason Fulmore

Rachel Cochran

Scott Dixon

William Bond

## Where to Get More Information

- <http://www.math.uab.edu/GBMP/>
- <http://gbmp.mspnet.org/index.cfm/>

# Computer Assisted Instruction

- PROS

- Actively engaged with material
- More time spent on task
- On-demand help in lab
- High tech and high touch

- CONS

- Algorithmic learning
- Emphasis on memorization
- Computation rather than thought
- Tenuous connection with Quantitative Literacy

# Audience for Basic Algebra (MA 098)

- Developmental Course (Non-Credit)
- General studies students
- Liberal arts students
- Pre-service elementary teachers
  - Take four 3-credit hour courses
  - Sometimes MA 098 first

# Comparative Study, Fall 2010

## MA 098 Class Formats

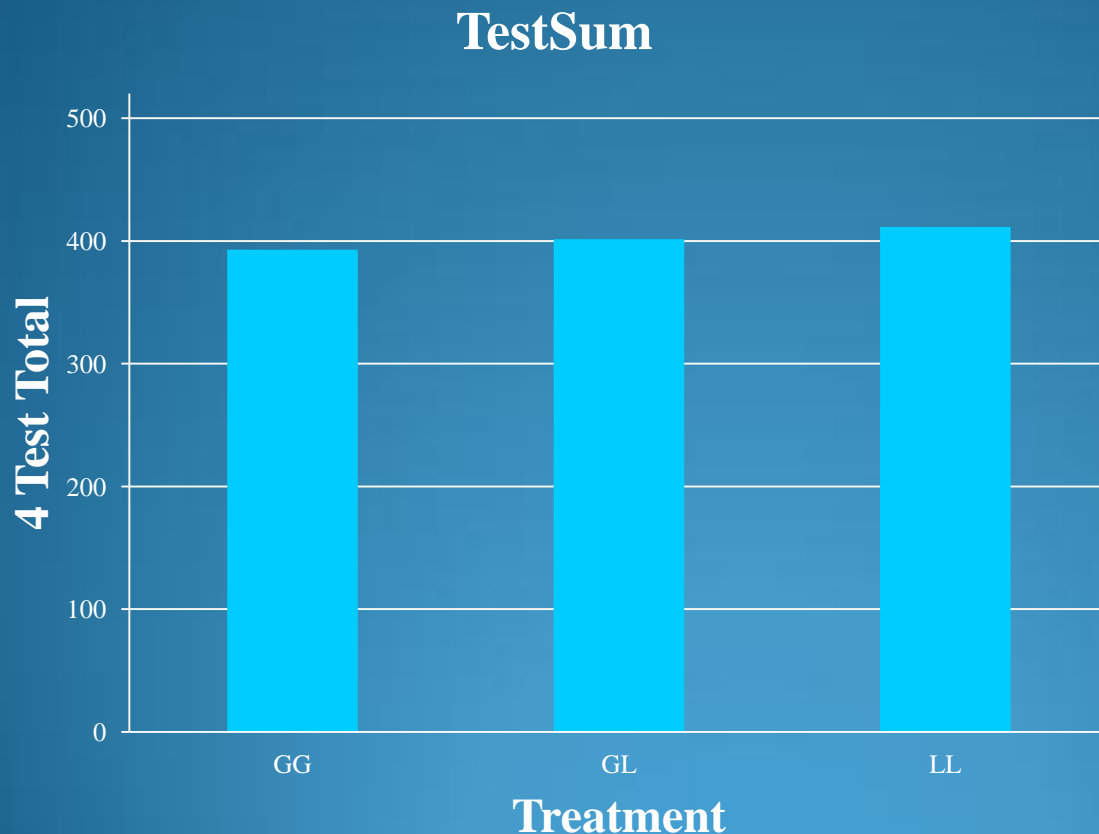
- Same computer assisted lab instruction
  - Determines 79% of final grade
- Three different treatment groups
  - *(LL) Lecture*: Traditional lectures on up-coming material twice weekly
  - *(GG) Group*: Inquiry-based group work with no prior instruction twice weekly
  - *(GL) Blended*: One lecture meeting and one inquiry-based meeting weekly
- Quasi-experimental: random assignment of students to class formats

# Comparative Study Hypotheses

- **Hypothesis 1:** Grades will be similar regardless of treatment (as measured by computerized test sum)
  - Supported by data
- **Hypothesis 2:** Group work treatments will have differentially improved problem-solving and communication skills (as measured by Rubric-Graded Part I, Pre/Post-Test)
  - Supported by data
- **Hypothesis 3:** Group work treatments will have differentially improved accuracy (as measured by Objective Part II, Pre/Post-Test)
  - **NOT** supported by data

# Data Supporting Hypothesis 1

- All treatments had similar grades for sum of first four (of five) tests



N=315

GG=100

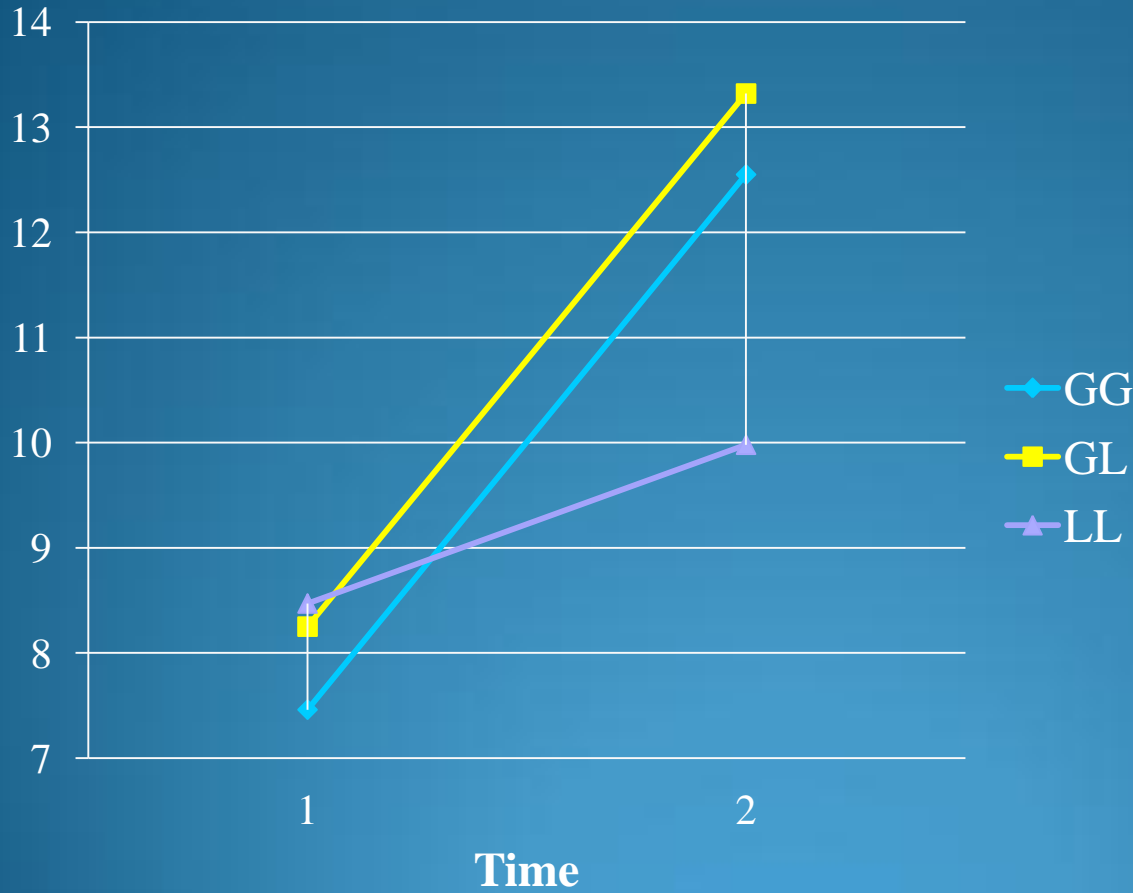
GL=106

LL=109

No significant differences on sum of tests, nor any single test.

# Significant differences on open ended problems pre/post

Pre/Post Part I



N=272

GG =85

GL =93

LL =94

Significant

difference

( $p < 0.05$ ) in favor  
of both Group  
treatments.

Wilks Lambda

Time:  $\lambda = 0.690$

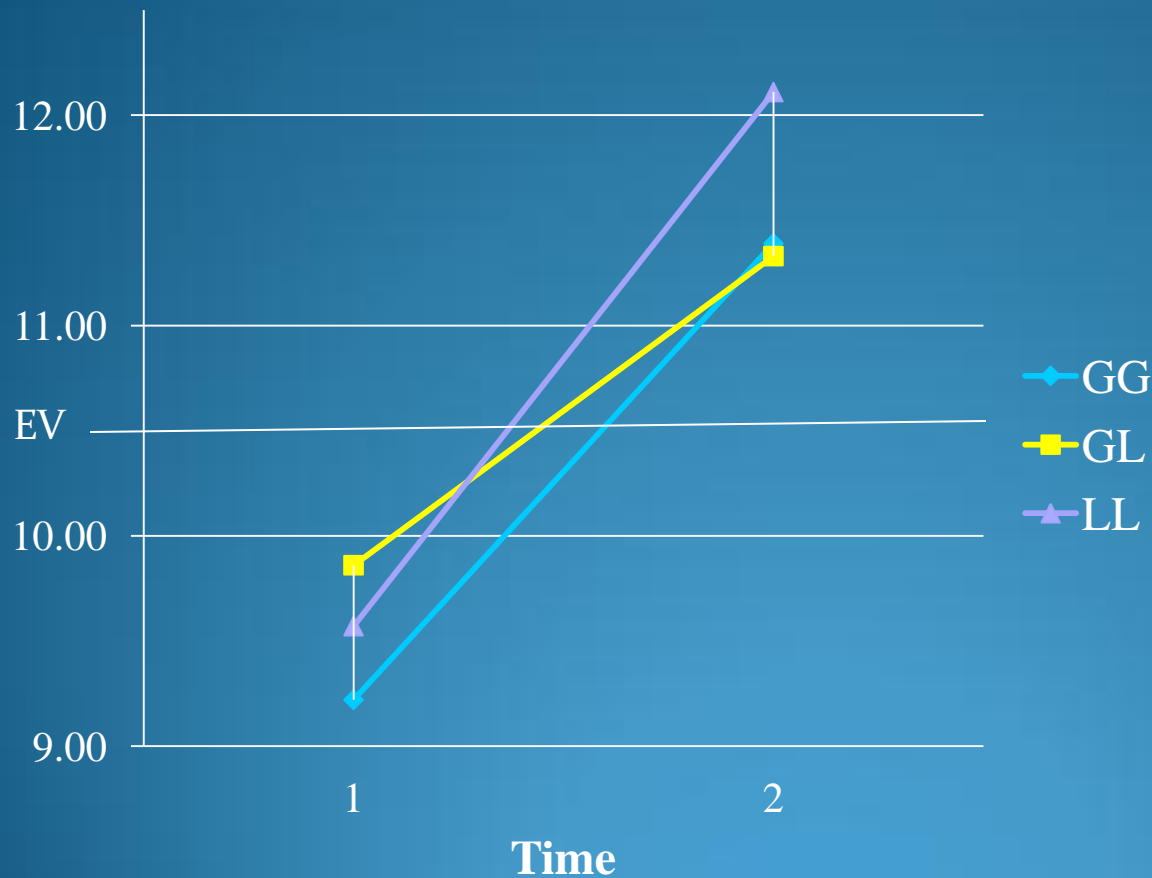
Time\*Treatment:

$\lambda = 0.921$



# Objective Accuracy Analysis

Pre/Post Part II



N=273

GG =88

GL =91

LL =94

Significant Time effect ( $p < 0.05$ ) for all treatments:

Wilks Lambda

$\lambda = 0.690$ .

No significant Time\*Treatment effect.

# Fall 2010 student surveys

Fall 2010 Cohort: IDEA Ratings of Instruction									
Treatment	GG			GL			LL		
	Raw Average		Conver- -ted Score	Raw Average		Con- -verted Score	Raw Average		Conver- -ted Score
	Excellen -t Teacher	Excellen -t Course		Excellen -t Teacher	Excellen -t Course		Excellent Teacher	Excellen -t Course	
Instructor1	2.4	2.2	25	3.7	3.6	45	4.3	3.9	51
Instructor2	4.2	4.0	52	4.3	4.0	52	4.3	4.0	50
Instructor3	2.5	2.6	30	4.8	4.1	56	4.3	4.0	49

**Figure 3.** IDEA Survey: converted scores in the range 45-55 place instructor/course in the middle 40% of all IDEA mathematics student ratings; scores 37 or lower, in the lowest 10%.

# Current teaching approach at UAB to MA098

- Course is now taught with 3 contact hours
- One lab session
- One inquiry session (since evidence supported that it help improve communication skills)
- One lecture (since students were much more receptive to the course as a whole when it involved at least some lecture component)

# Fall 2011 Student Responses To New 098 Format

Several themes emerge from student responses to the survey prompt “Please share your thoughts regarding your experience with the group work format in the MA098 course. The MA098 Teaching Team values your feedback.”

About 75% of students responded positively about the group work

# Some Positive Themes

- “Group work was a cool experience it allowed you to get to know your classmates”
- “I found the group work very helpful. When working together it’s a lot easier to come up with the answer to a complicated problem because someone usually knows something you don’t in order to solve the problem”
- “... I also found it to be a valuable asset because it helped me fully understand and grasp the concept(s) at hand”

# Some (Negative?) Themes

- “I felt that some of the group work was too hard and having to explain how we got an answer was even harder”
- “I didn’t really like it because the problems were hard to figure out with really no instruction from the teacher. Also since the problems involved math we hadn’t learned yet”

# Some Negative Themes

- “I feel that group work really didn’t teach me anything that I needed for the class. I feel that we could use that day to teach more things that is going to be on the test”
- “Too hard”
- “... the math instructor who graded our (group) work was sometimes unfair...”
- “Group work takes too much time in the current format...”

# Student success in subsequent courses

- Based on Student t-test there was only one significant difference between any of the treatment groups regarding student success in future courses (as measured by grade in the next course)
- In the Summer of 2011 students who were in the Group/Lecture treatment for MA098 in Fall of 2010 did significantly better than the students in the Group/Group treatment as measured by their grade in the next course



# Conclusions

- The inclusion of group work class meetings in lieu of lecture does not appear to affect adversely student success as measured by grades
- Inquiry-based group work does have a positive effect on problem-solving and communication abilities

# Future Work

- Add data from Fall 2011
- Track students over time depending on exposure to inquiry based classes

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