

Just Math

Using Math to **Learn** Justice

Vs.

Using Math to **Do** Justice

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Just Math

1. The experiment
2. The results
3. Next steps
4. Credits

The experiment:

service-learning background

- Service-learning Community Grant at Roanoke College, 2005—2006
- Conference of North Carolina Campus Compact at Elon University, Elon, NC February 2006.
- Senior seminar research project at North Park University, 2007—2008 (presented JMM2009)

The experiment:

IRB – a Cautionary Tale

- Internal Review Board and Disaster of 2007
- Colleague's help with IRB approval
- No students were harmed in the making of this presentation!

The experiment: **questions**

- Do students have a different **attitude** towards a general education mathematics class that includes justice-learning?
- Do students **perform** differently – better or worse – when their general education mathematics class includes service-learning and justice-learning activities?
- Do students **retain** more when they have done a real-life application of the material covered?

The experiment: **assessment**

1. Before and after **survey** designed to discover attitudes about mathematics and its usefulness and about personal mathematical ability and enjoyment;
2. Parallel projects given same points and graded along rubrics as similar as possible to enable comparison of **course grades**;
3. Written **summary** evaluating contributions of course activities to collect qualitative impressions;
4. Comprehensive **final exam** to test retention of material over time.

The experiment: **design**

Topic covered in both sections	Control Group Activity	Experimental Group Activity
Personal finances, buying a home	Summary paper: home owning, mortgage crisis, racial inequities in home ownership	Foreclosure notification with HUD-certified community development group
Basic probability, research of primary data in U.S. Census	Map of Chicago area showing two population characteristics and testing for independence	Maps of particular suburbs chosen by local community leaders for need for affordable housing
Introductory graph theory, transportation	One-page paper sketching proposed solution to an injustice	Letter to U.S. Senator addressing transportation bill or other current issue before Congress

The experiment: objectives & rationale

	Control Group Activity	Experimental Group Activity
Summary paper vs. foreclosure notifications	Reflection, processing, critical thinking; break from computation and math anxiety	Processed real-life experiences with in-class discussion; break from computation etc.
Maps with topics of own choosing vs. work needed by community	Data research skills, data communication, synthesizing, choice of topic for motivation	Data research skills, data communication, synthesizing, real-world need for topic
Personal solution paper vs. letter to Senator	Critical thinking, communication, processing semester and applying new reasoning skills	Critical thinking, communication, defined civic action modeled rather than discussed

The experiment: pitfalls (hindsight)

Topics and assignments	Control Group Activity	Experimental Group Activity
Personal finances: summary paper vs. foreclosure notifications		Foreclosure notification volunteer coordinator
Probability and the Census: maps with topics of own choosing vs. work needed by community		Only one neighborhood organization showed up – with a difficult request
Graph theory and transportation: personal solution paper vs. letter to Senator	Not enough time/energy left to make solid tie between graph theory and transportation choices/history; outside speaker for experimental group hip surgery changed schedule	

The results: **initial impressions**

	Control Group	Experimental Group
Time	11:45am-12:50pm	1:00pm-2:05pm
Atmosphere	Enthusiastic	Bored
Personalities	Loud, active	Too cool for school
Expectations	oh no!	

The results:

survey

Before and after perceptions of math, personal competency in math, usefulness of subject

20 Questions, 5-point scale (agree, disagree, etc)

Two Y/N questions: service-learning activities in past math classes

Space for comments

The results:

survey

	Control Group	Experimental Group
20 Questions on attitudes and perceptions	Significant changes in 3 of the 20 questions ($\alpha = 0.01$)	No significant changes

The results:

survey

- Q3 Mathematics makes me feel inadequate. (more disagreement from control group)
- Q7 I am quite good at mathematics. (more agreement from control group)
- Q9 I'm not sure about what to do when I see a mathematical problem. (more disagreement from control group)

The results:

survey comments

Control Group

Three students thought that the U.S. Census project was a service-learning project and reported that it was very helpful to have a hands-on experience with real numbers

Experimental Group

Ten students commented on activities, mostly positive

The results:

survey comments

Real life activities are usually a pain because they are more complicated than the examples from class. However, they can be fun and **teach a lesson about the way the world really is.**

It showed how important the class was by illustrating their future use.

They were effective in my opinion because it was something that I enjoyed doing... rather than math.

This is what I wrote in my summary paper, but basically I think service is one of the most important parts of life and it **helped to see math used in real life and for justice.**

Lakeside CDC foreclosure walks: I thought it was really interesting to learn exactly how to buy a house and all of the time, effort, and money it takes and then to be given the chance to give others information that could potentially help them save the house they have worked so hard to keep.

The results:

survey comments

It was a **good way to use math in real life.**

I did not really understand how the foreclosure activity had anything to do with actual mathematics but I kind of enjoyed the census project and the real life application of that.

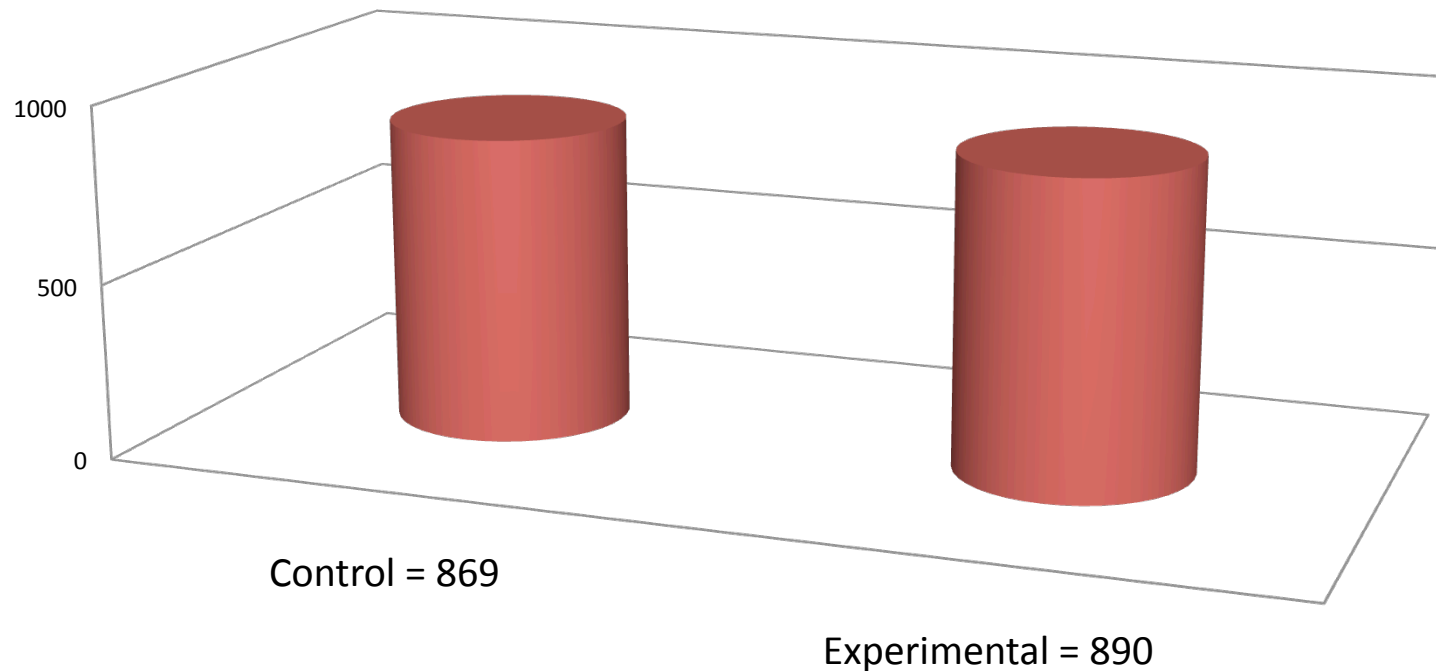
The **service activities helped make the math real.**

They were effective because **I felt like I was doing something new -- I wasn't just re-crunching numbers that someone had put together in a neat mathematical problem. There was always the possibility that I was working with figures that had not been used together before.**

In terms of understanding, these service opportunities weren't very beneficial, but I don't think that they were designed to be. They did, however, **help me to (for once) recognize the significance of mathematics.** For example, one way in which mathematics supplements buying a house is something I found to be very practical and crucial.

The results:

course grade averages



No significant difference in averages.

The results: **summary**

Did course activities help or harm your learning in this course?

The results: **summary**

Did course activities help or harm your learning in this course?

Helped!!

from nearly all students...in both sections.

The results: **summary**

Students were extremely positive about the course; most specific comments addressing course activities were about exams and homework

The results:

summary

Control group:

- Quizzes instead of exams
- Graded homework
- Most enjoyed census project

The results:

summary

Top two interesting comments:

...this was absolutely the best math class I have ever taken and one of my favorite classes of any subject, period.

One other group project would be going on a trip. Let's say, we have done research on the statistics of poor or homeless in this county...better if we have an opportunity to visit homeless shelter...and talk to the people...come back and reflect on it in class.

The results:

summary

Experimental group:

- Quizzes and graded homework
- Three negative comments about the foreclosure walks – choose a different organization; three very positive comments about the walks
- Several positive comments about the census project
- One positive comment about the letters

The results:

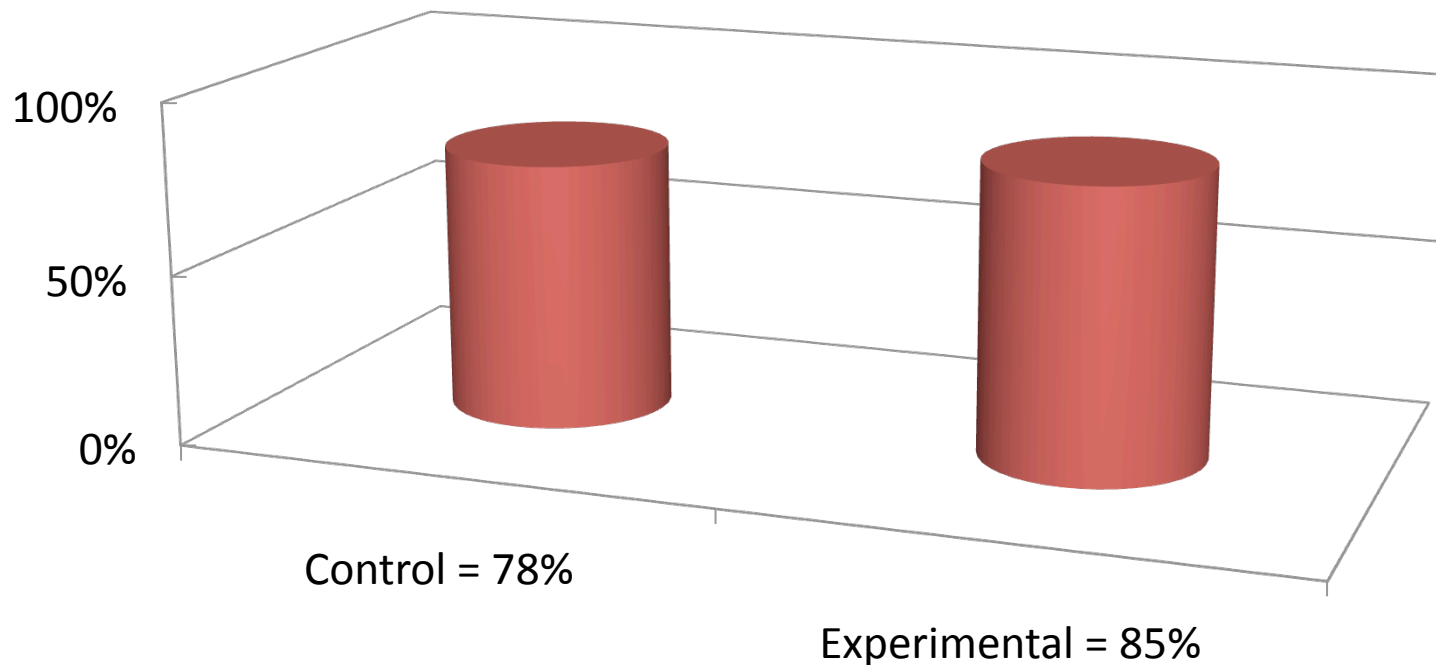
summary

Favorite comment:

...I've always dreaded math classes...I loved learning about practical math and how it can help me and other people, but even more than that, I appreciated that we were able to actually involve ourselves in the community and actually help make a change.

The results:

final exam (comprehensive) grades



Significant difference on the final exam ($\alpha=0.05$)

The results:

answers to original questions

- Do students have a different attitude towards a general education mathematics class that includes justice-learning? **Not much; attitude difference seems more related to material.**
- Do students perform differently – better or worse – when their general education mathematics class includes service-learning and justice-learning activities? **Not significantly.**
- Do students retain more when they have done a real-life application of the material covered? **Yes.**

Next at North Park

- Teaching two sections of justice-learning general education math next semester: **Math in Society**
- Working on creating **general education** requirement for courses with justice focus
- Have created an **on-campus organization** of students, faculty, alumni, staff working together for justice; organization will support curriculum development and extra-curricular work

Future needs and plans

- Work with Family Promise to continue development service-learning edition of *Just Neighbors* multimedia teaching tool on poverty in America, www.justneighbors.net
- Need (will edit) a textbook or text modules to accompany math justice courses
- Expand campus justice organization

Credits and contact information

- **Laura Burt**, librarian extraordinaire, co-designer of U.S. Census project
- **Elizabeth Gray**, psychology professor, IRB navigator
- **Jesse Griffin**, grant initiator, inspiration for first service-learning course at Roanoke College
- **Frank McCann**, coordinator of *Just Neighbors*, www.justneighbors.net
- **Senior seminar class** of 2007—2008
- Contact me at ankney@gmail.com