



Community Engagement for Data Literacy with Non-STEM Students

Michelle Friend, Associate Professor, Teacher Education

Becky Brusky, Instructor, Mathematical and Statistical Sciences

Kalyan Ghmire, Mathematical and Statistical Sciences

Betty Love, Professor, Mathematical and Statistical Sciences

Andrew Swift, Associate Professor, Mathematical and Statistical Sciences

Mahbubul Majumder, Associate Professor, Mathematical and Statistical Sciences



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UNIVERSITY OF
Nebraska
Omaha

How do many non-STEM students perceive math?

- "Most of my math teachers have made me feel dumb or have said things that really made me feel worthless."
- "I went to class every day dejected and ready to accept my failing grade."
- "The class felt like a memory game with no purpose besides pointless tediousness questions."



Why develop a GenEd data science course?

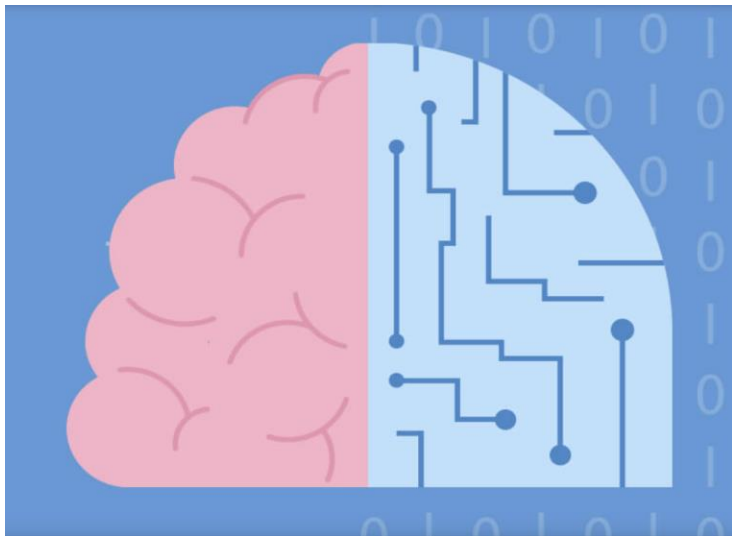


- All citizens must understand data use & manipulation (Pangrazio & Sefton-Green, 2020)
- Algebra not useful (Gordon, 2008)

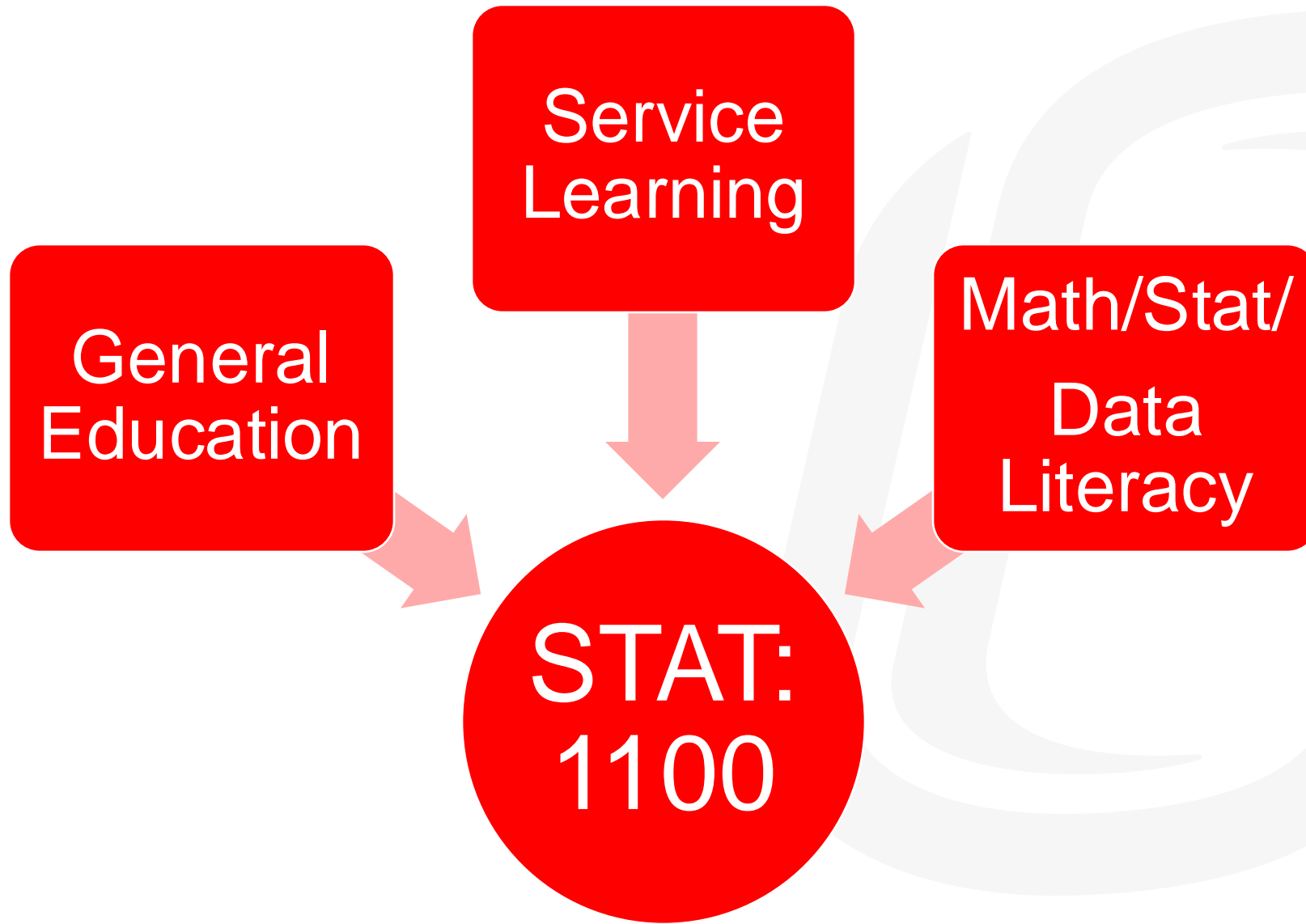
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UNO General Education Quantitative Literacy Learning Outcomes

Graduates will demonstrate competency in using mathematical, computational, or statistical methods to:



- Solve real-world problems
- Draw inferences based on a set of data or quantitative information
- Justify conclusions derived from quantitative information



What is Service Learning?



Barbara Weitz Community Engagement Center

A method of teaching that combines classroom instruction with meaningful, community-identified service. This form of engaged teaching and learning emphasizes critical thinking by using reflection to connect course context with real-world experiences.

Why Service Learning?

- Enhances student achievement
- Engages students in learning
- Develops civic values
- Connects individuals to community
- Addresses civic empowerment gap



STAT 1100: Data Literacy and Visualization



THINK
CLEARLY
ABOUT
COMPLEX
PROBLEMS



DEVELOP
WORKABLE
AND
CREATIVE
SOLUTIONS



UNDERSTAND
CONTEXT AND
IMPACT
OF FINDINGS



APPLY
KNOWLEDGE
AND PRESENT
CONCLUSIONS



CREATE A
STRONG
SENSE OF
ETHICS AND
EQUITY

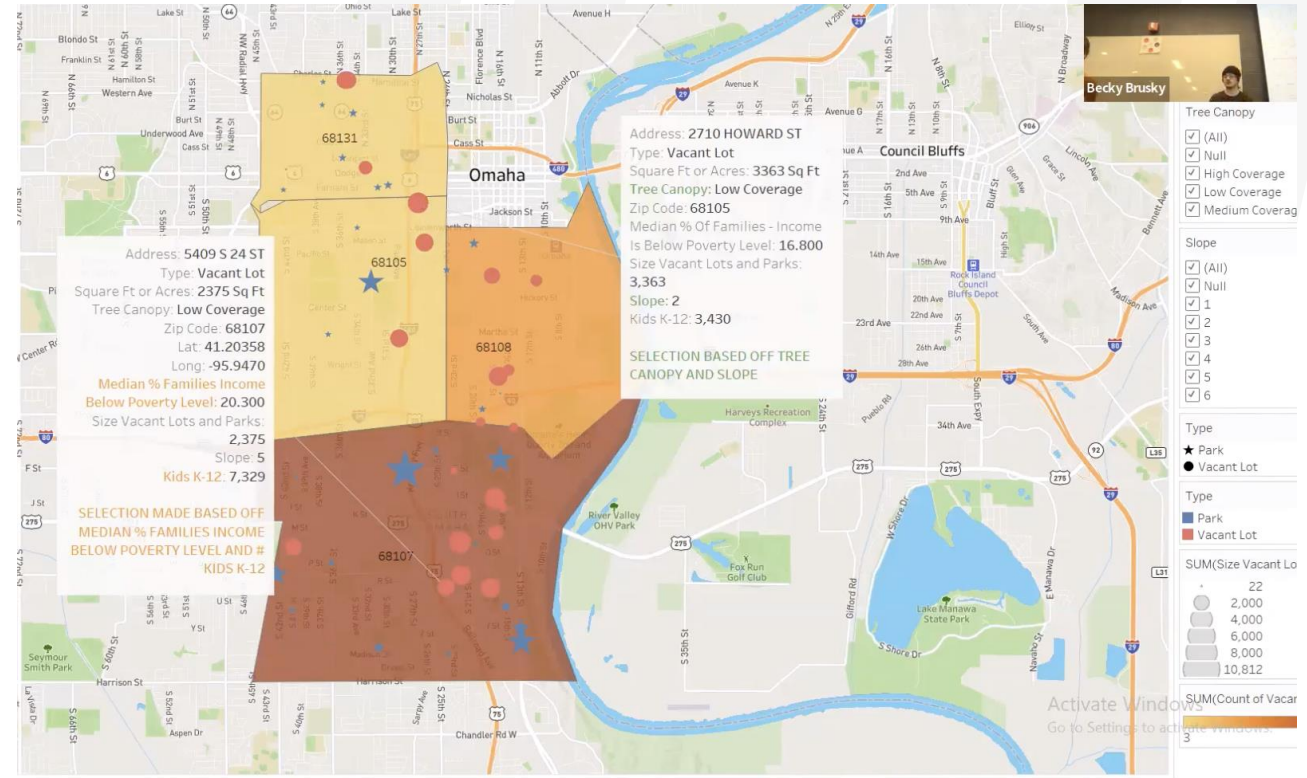
Class Content

Topic	Weeks
Introduction to data & visualization	1
Exploratory data analysis with one & multiple variables in Excel (summary statistics, plots, correlation & regression)	4
Visualization with Tableau	4
Project with Community Partner	6

Keep Omaha Beautiful: Determine Best Location for New Mini Arboretums

Data included the locations, tree canopy, and topographic slope of non-buildable vacant lots in Omaha and the location of existing parks. Using the zip codes for the lots, the students merged with US Census ACS data for socioeconomic indicators.

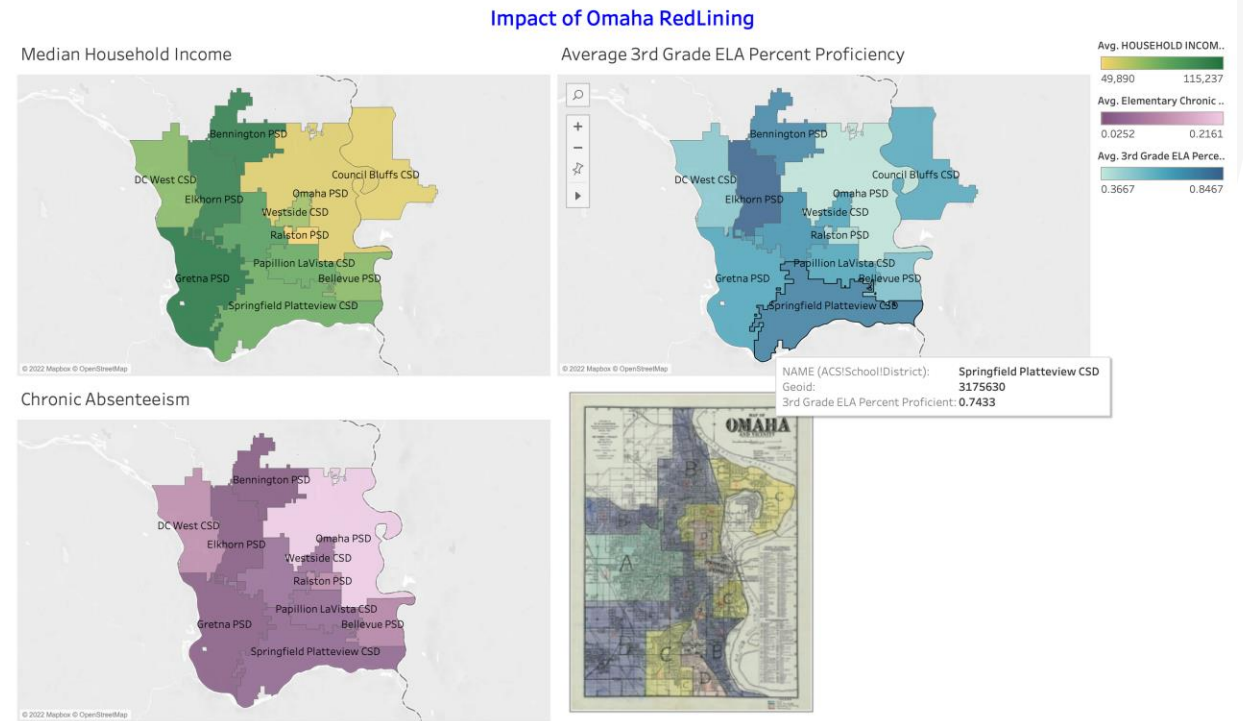
Students determined the top eight locations for mini arboretums.



Raise Me to Read: Redlining and Children's Reading Proficiency

Students used data from the most recent US Census Bureau for the American Community Survey on socioeconomics, Raise Me to Read data and historic redlining maps of Omaha.

The student concluded that the scars from redlining may still impact 3rd-grade reading proficiency scores.

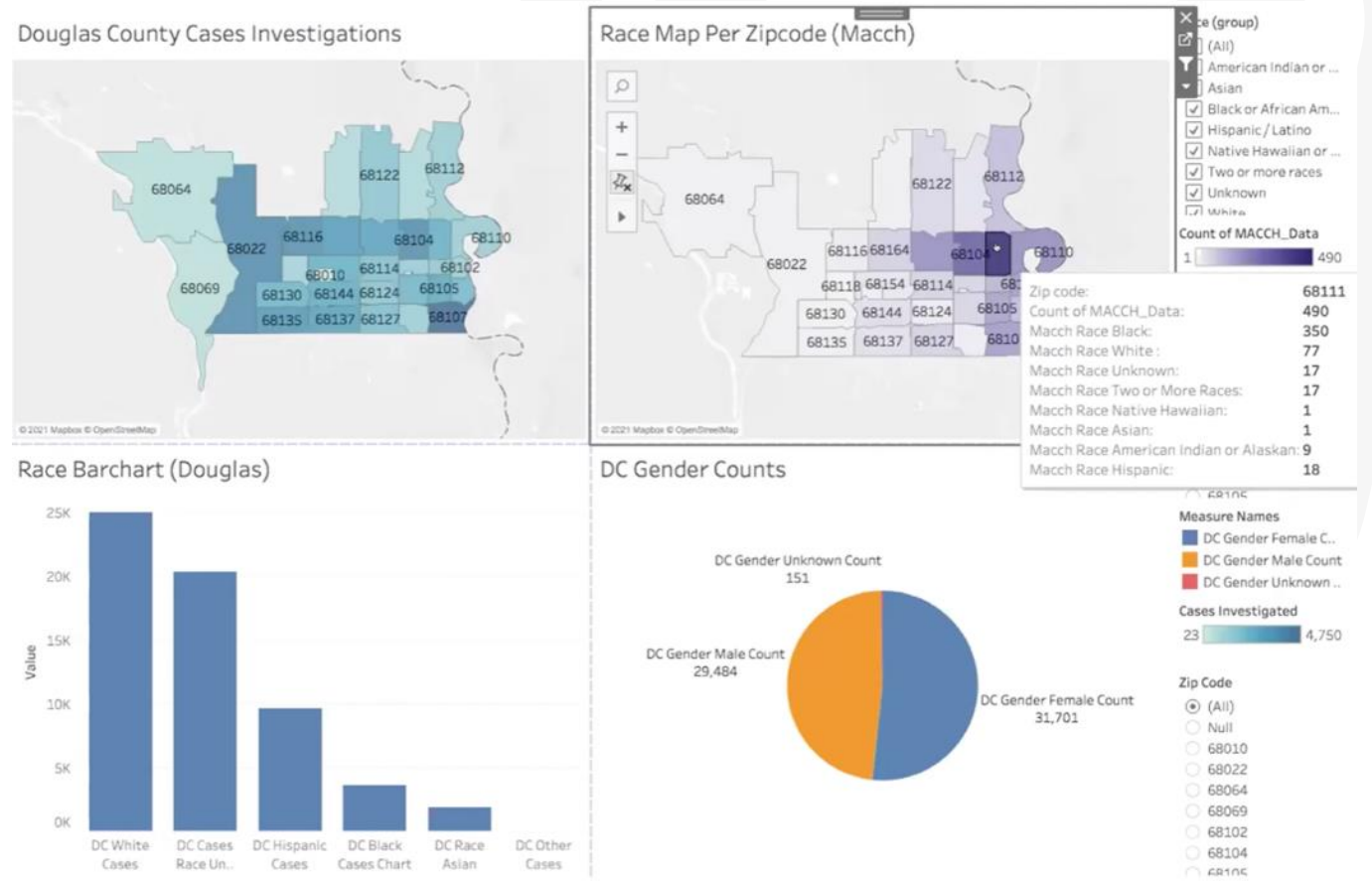


Metro Area Continuum of Care for the Homeless: Disbursement of COVID Rental and Utility Assistance Funds

Students found that in most cases the money was equitably distributed.

One exception was the number of utility help denials for African Americans.

This surprised the community partner.



Research Questions

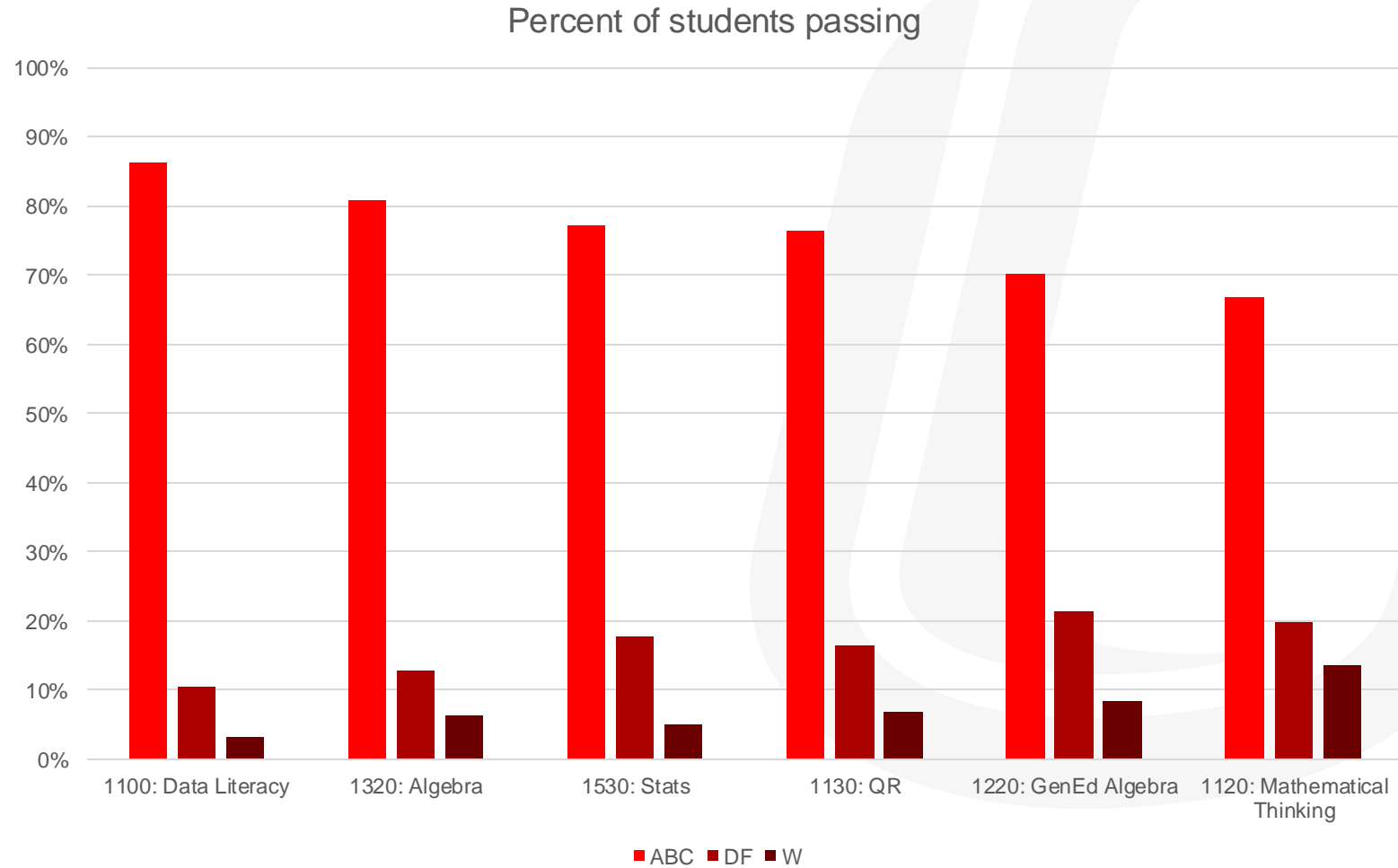
- Are students who take STAT 1100 retained at UNO at higher levels than students who take other Gen Ed mathematics courses, in line with retention of students who take other Service Learning courses?
- Do students in STAT 1100 remain actively engaged throughout the course (e.g. attendance, submitting assignments, continued participation in Service Learning group project), and how does their engagement compare to students in other Gen Ed math courses?
- Do students express more interest in mathematics and STEM after participating in the STAT 1100 course?
- Do students who take the STAT 1100 course plan to continue participating in STEM by taking further STEM courses?
- Does participating in the STAT 1100 course increase students' confidence and self-efficacy with mathematics and STEM?
- Do students who take the STAT 1100 course change their perceptions and understanding of the community?

Data

- Pre- and post-course attitudinal surveys
- Pre- and post-course “mathographies” (Drake, 2006)
- Post-course focus groups
- Grades
- Office of Institutional Effectiveness data

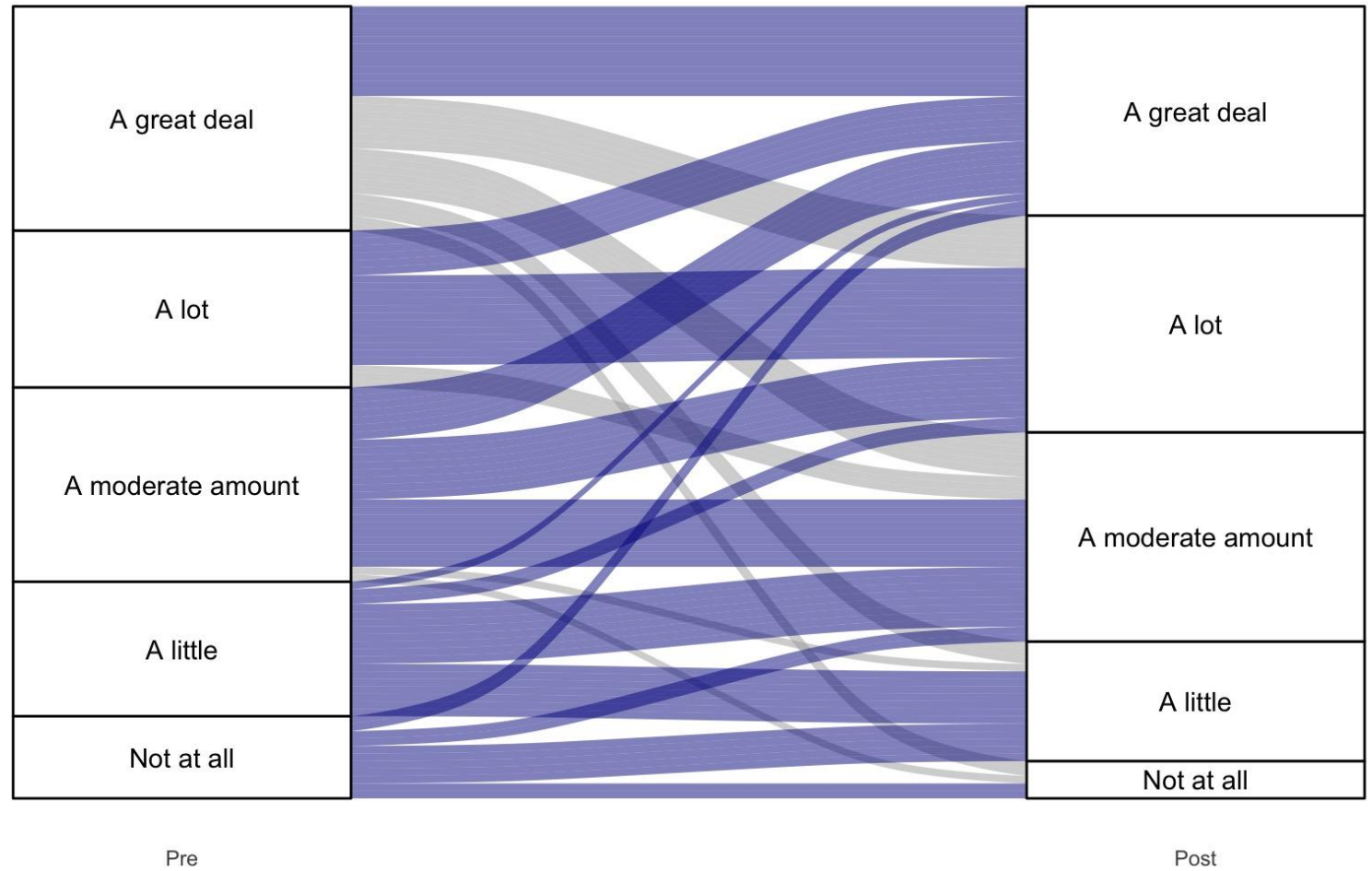


Results: Grades



Results: Utility

Change in response to
"How much do you think knowing data literacy and visualization will help you in your major?"
from beginning to end of course

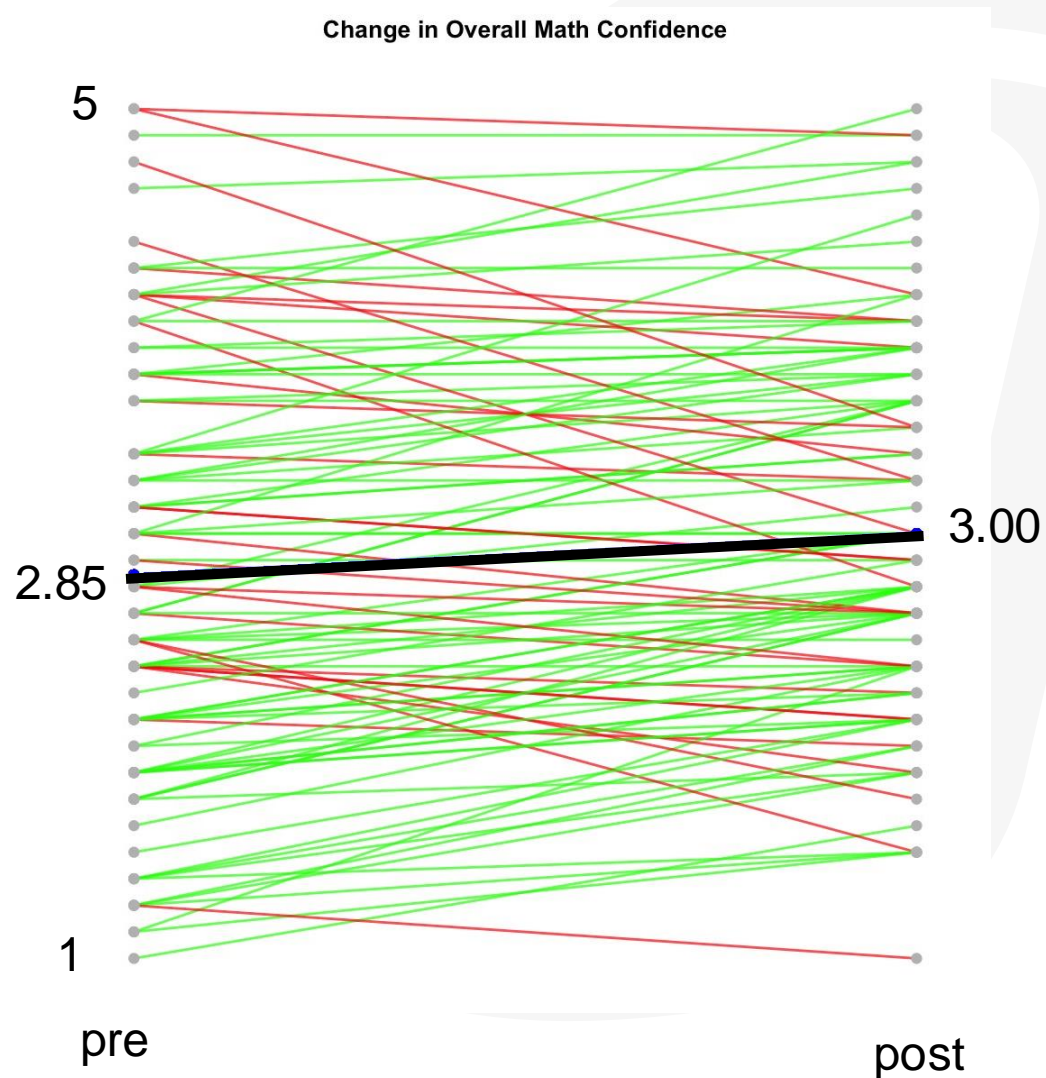


Results: Attitudes

Significant increase in confidence in math ability (n=106, p<.001):

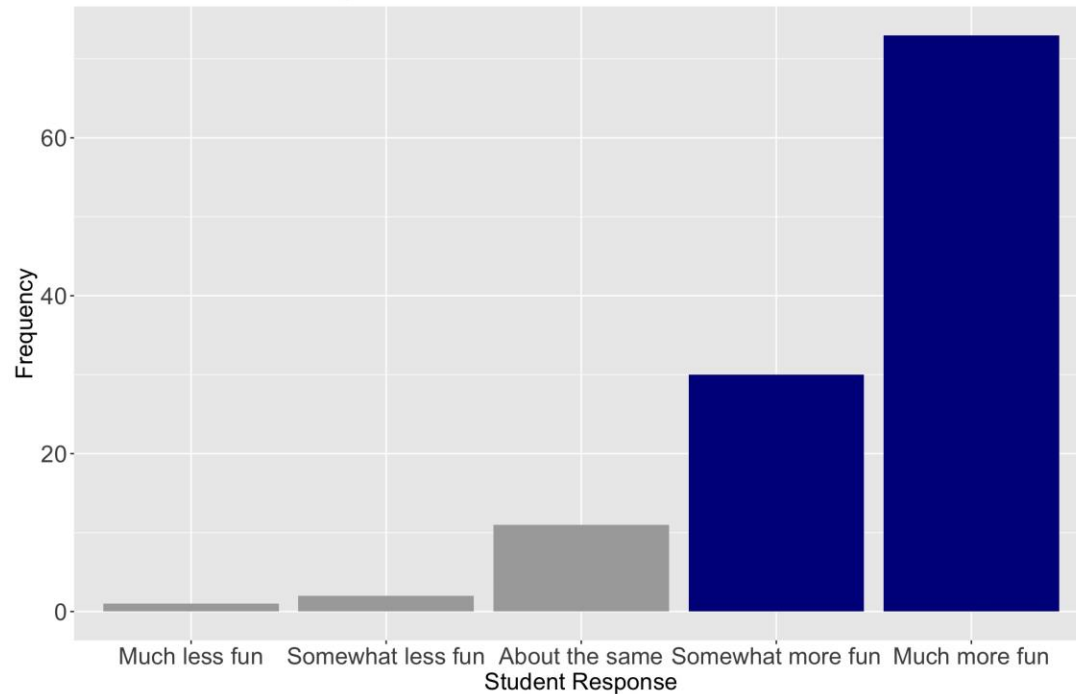
Pre: 2.85/5

Post: 3.00/5

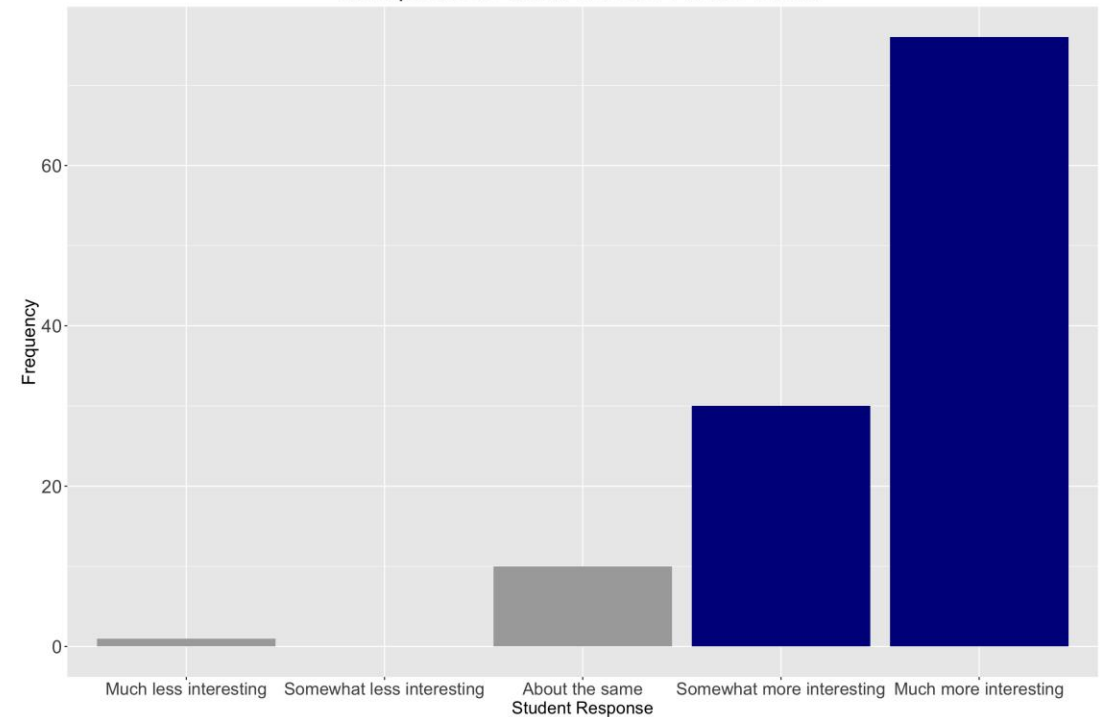


Compared to other math classes....

"STAT 1100 was more fun than previous math classes I have taken"

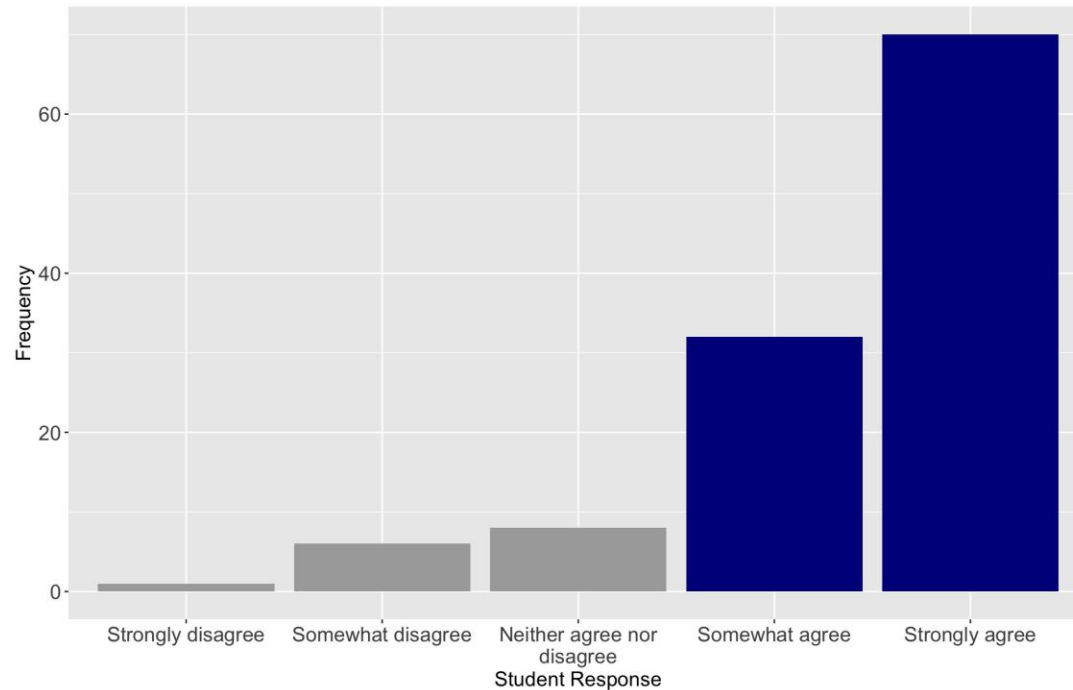


"STAT 1100 was more interesting than previous math classes I have taken"

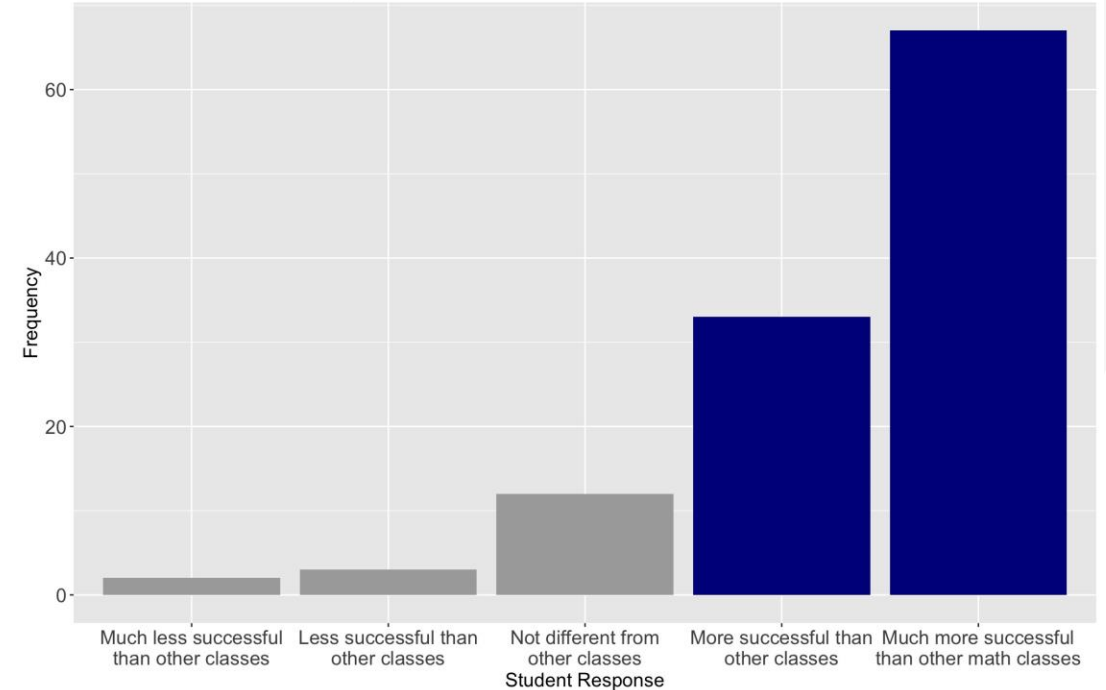


Compared to other math classes....

"STAT 1100 made more sense to me than other math classes I have taken"



"I felt more successful in STAT 1100 than previous math classes I have taken"



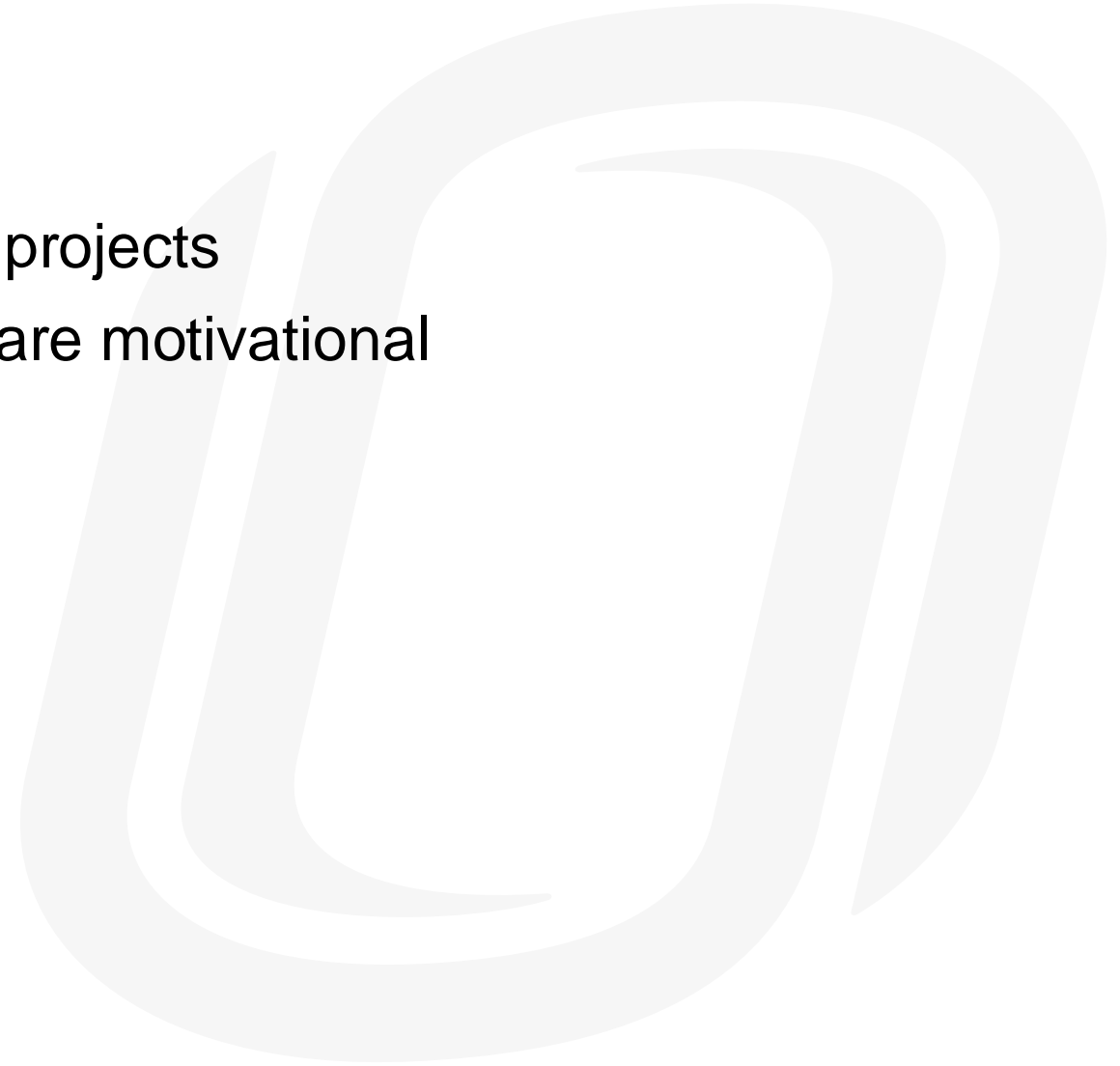
Results: Student Comments

- Combining math with service learning and a dedicated professor should be the model for more math classes.
- I now know that understanding math and applying it to current events is possible.
- I believe that students don't need to be talented or naturally gifted at math but rather need ways to incorporate math in different scenarios or projects.
- I was nervous about having to take this class. Knowing I did well, gives me confidence in myself.
- I really enjoyed [the final project], because I got to do something that actually mattered. I was not just trying to prove to my professor that I could do math.



Conclusions

- Service learning creates authenticity of projects
- Feeling responsible to group & partner are motivational
- Students value supportive environment



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