

# SIMIODE EXPO 2021

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## Adventures in the “Islands” Enhancing Student Engagement in Teaching Statistics

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# Presentation Outline

1. Project sponsorship and timeline.
2. Real and Virtual Environments.
3. Let's go to "The Islands".
4. What can students learn that they don't learn from books?
5. Student reactions, engagement, enhanced experience.
6. Q&A's.



# Project Timeline and Sponsorship



1. Important sponsors:

Center of Excellence in Teaching and Learning (**CETL**)

**Quad-POD** (Professional Organizational Developers)

Four institutions of higher education in Genesee County: Baker College of Flint, Kettering University, Mott Community College and the University of Michigan-Flint.

2. Early attempts – student projects in statistics based on real-data
3. Ideas started in 2016 with a Quad-POD sponsored Faculty Learning Community – “Fostering Student Engagement through a Real-World, Collaborative Project across Disciplines and Institutions”
4. Continued in 2017 through now – the “Islands”

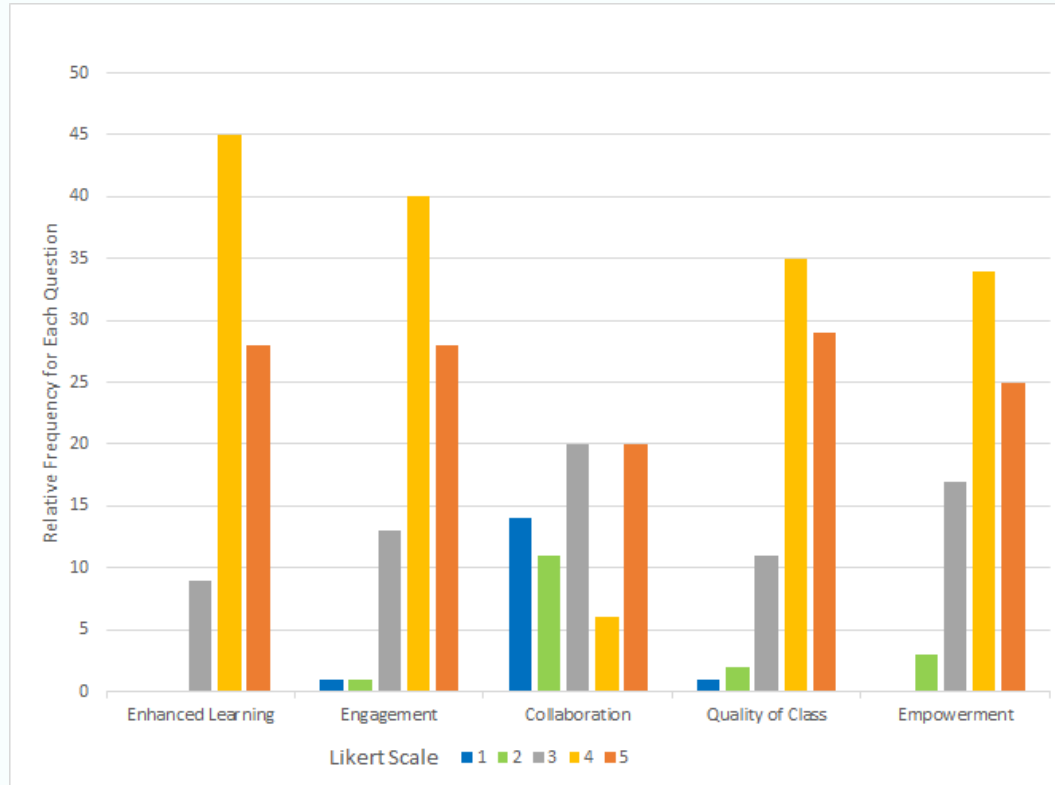


# Using Real Environments – Crafting Engaging Assignments

- ❑ Features of a learning experience likely to enhance student learning:
  - collaboration, open-ended exploration, problem-based learning in real-life scenarios.
  
- ❑ Our example.
  - All four Quad-POD institutions participated
  - Undertaken during the height of the Flint water crisis ([touching lives of entire community](#)).
  - The project asked students to apply class content to the [real-world](#) problem [unfolding around them](#).
  - Offered students an [opportunity to collaborate](#) in classroom and (not so much) with peers [across disciplines](#) (biology, liberal studies – ethics, communications, statistics) and [institutions](#).
  - Most data (lead and water blood levels) were provided by instructors, some information was obtained by students
  
- ❑ Our model can be replicated but studies are [observational](#) and [data are retrieved](#) rather than [collected](#).
  - For example: PFAS contamination, addiction (vaping, opioids, social media), student debt



## Our Flint water example – highly received by students



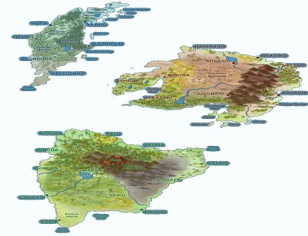
# Exploring the "Islands" – a realistic model for research on human subjects



The "Islands" virtual environment by M. Bulmer and J. K. Haladyn U of Queensland, Australia  
Provides rich experimental design and data collection environment



"Islands" are located at <https://theislands.umn.edu/index.php>



The inhabitants live on three islands. Their lives follow mathematical population models.



They have gender, habits, addictions, hobbies, heights, weights, vitals, they can tell the truth or lie on questionnaires, perform designed tasks, like running a marathon, become sick and recover or die.



They marry, have kids, pets, jobs, income, move between villages and islands, just like in the real world.



You have to ask every individual for consent (ethics), which they can refuse.



## Accounts on the "Islands"

To visit the “Islands” you need to create a faculty account.

- Faculty accounts

Contact Chris Campbell ([campb781@umn.edu](mailto:campb781@umn.edu)) for instructor's access and other questions. You may also contact Ann Brearley or Laura Le, the lead faculty at University of Minnesota for help.

To create accounts for your students, you will go to a small island (north) called Laerer.

- Student accounts

The instructor creates student accounts (from Laerer), by simply adding student email addresses, manually or an Excel file can be uploaded.

Students will get an email from the “Islands” ( [island@maths.uq.edu.au](mailto:island@maths.uq.edu.au) ) with a link to set up a password.

# Let's Go Visit

Instructors have special access through a small island called Laerer.



Start with the VISITOR CENTER near Arcadia, Central Islands



Visit ARCADIA's museum on the Central Islands (between houses 53 and 54) read "The Logbook of the Tengoku Maru"



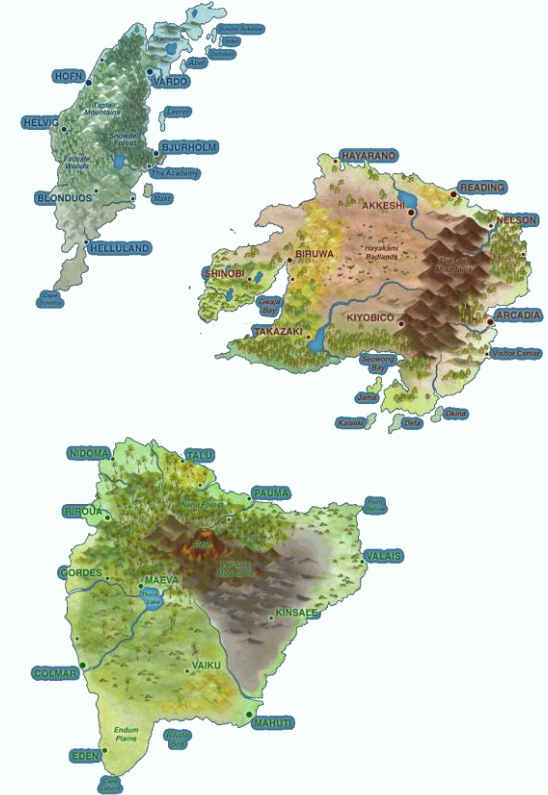
Study at the ACADEMY in the North Island.



Dig into the records in a town hall of VARD0.









Interact with an Islander (obtain consent, complete survey, perform an activity).





# What should students learn? GAISE College Report Recommendations

-  Statistical Thinking
  - Teach statistics as an investigative process of problem solving and decision-making ✓
  - Give students experience with multivariable thinking ✓
-  Focus on conceptual understanding ✓
-  Integrate real data with a context and purpose ✓
-  Foster active learning ✓
-  Use technology to explore concepts and analyze data ✓
-  Use frequent assessments to improve and evaluate student learning ✓



# What can students learn that they don't learn from books



Ethics of statistical research (IRB, the Nuremberg Code).



Statistics as an investigative process; Students:

- Formulate own research questions,
- Design statistical experiments,
- Collect data and learn complexities of the process,
- Record, organize, and analyze data
- Arrive at some conclusion

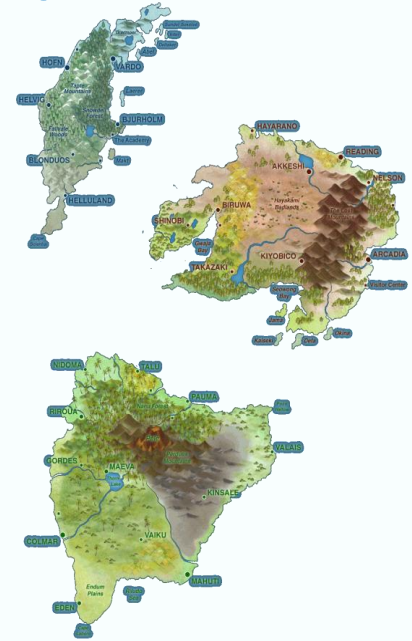


Experience with multivariable thinking:

- Most research questions involve multiple factors



Avoidance of confirmation bias



## Teachable moments – excerpts from student work



(One team) Taking every other house could provide a simple random sample of the entire islands.



(Another team) As each house is numbered, a scientist could choose to create a case study based off every third home.

*I was able to introduce “systematic sampling”, explain that it reduces complexity of data collection in the field but may introduce unintended bias (e.g. houses only on one side of the street could be selected).*



To get a simple random sample, each member of the population in the islands would have to have an equal chance of getting surveyed. A phone or internet based survey is probably best for this, but even then still samples only those with phone or internet.

*Non-sampling errors include omission, duplication, mistakes in reporting, recording, and processing data. Oversampling can help mitigate the problem of insufficient presence of underrepresented groups.*



## Teachable moments – excerpts from student work



One study that could be done on the islands is the effect of quitting smoking has on the likelihood of having lung cancer in the next 5 years. The Study would obtain random sample of current smokers on the island and contain a control group and an experimental group. The control group would be told to continue smoking as they have all their life for the next 5 years

*(directly against Nuremberg Code – no harm, how about telling drivers to use defective TAKATA airbags for the next 5 years),*

while the experimental group would be instructed to never smoke again  
*(good luck!).*

*An opportunity to talk about drop-in/drop-out rates.*



Stephanie Erdman's life 'changed forever' when she lost part of her vision after a minor accident in her 2002 model Honda.



# Student Activity Logs in the “Islands”



Average number of logins – 8/student



Average number of activities – 77/student

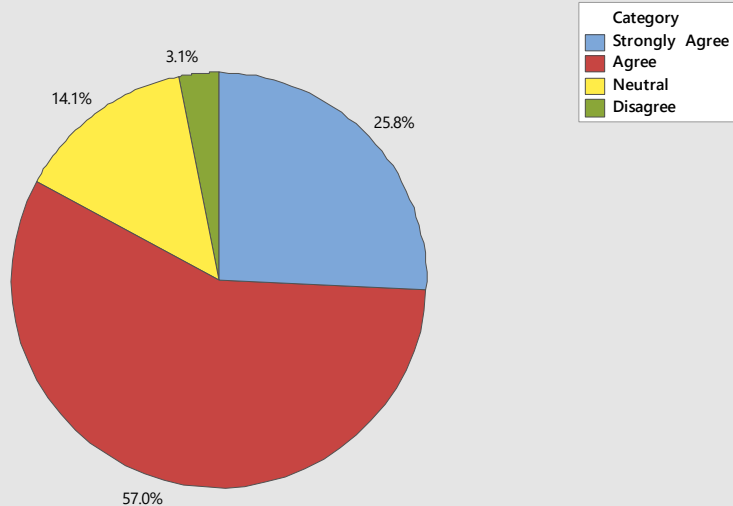


Average number of chats – 29/student



# Student Reactions, Engagement, Enhanced Experience Surveys ( $n = 127$ )

Using the "Islands" made the course more **engaging**.



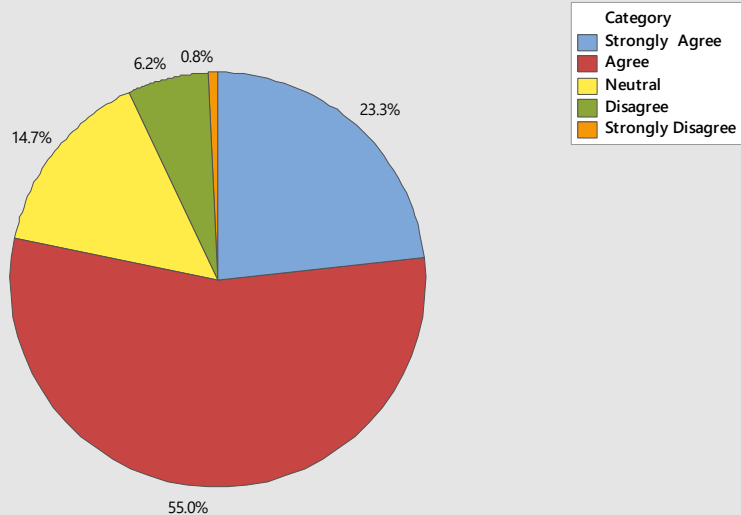
- Helped apply course material to own or real life data instead of using book data
- Good insight into what real life statistical studies must go through in order to gather data
- Engaged me as individual/group to showcase some of the skills I learned within the course to design and conduct a study

- Project presented too early in the course, "Islands" not fully integrated with the course.
- How accurate is the data collected to actual life?
- Needing to wait for the data to be collected is boring.



# Student Reactions, Engagement, Enhanced Experience Surveys ( $n = 127$ )

My **understanding** of statistical research questions increased by working on the "Islands" project.



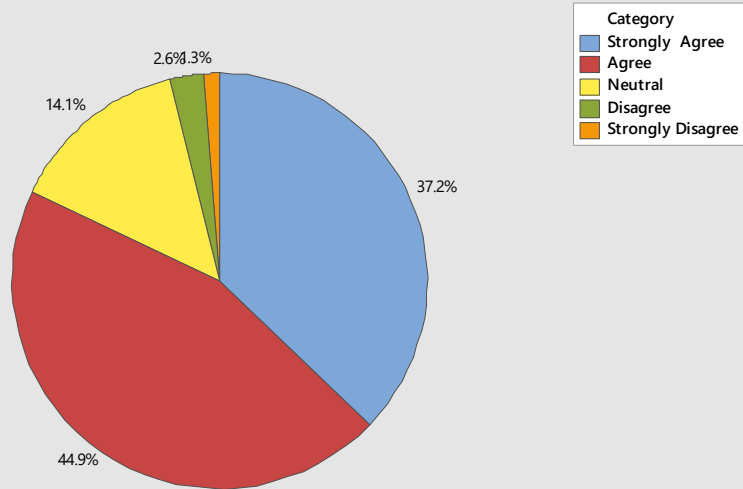
- Allows formulating own questions and use statistical methods learned in class to answer them
- Help in figuring out why questions are asked and statistics are used to solve them
- Confirms my beliefs prior to the project
- Provide a place to test out and apply different methods

- I don't really know what a statistical research question is.
- The project was not explained well.



# Student Reactions, Engagement, Enhanced Experience Surveys ( $n = 127$ )

Supplementing my course with the collaborative project on the "Islands" **enhanced the quality** of my class.



- This project should almost be the main focus of this class, using it as practice/assignments/etc. rather than just supplementing the normal coursework.
- You can only do so much with given examples, but the "Islands" provides so much more.
- Having contextual examples help validate material we learn in class.
- It added a more hands-on experience that was more interesting than just doing analysis on case studies.

- I am not sure how it improves or disproves a quality aspect.





# Student Reactions, Engagement, Enhanced Experience Surveys ( $n = 127$ )

	Recurring Positive and Negative Comments
Positive Comments	<ul style="list-style-type: none"><li>• The "Islands" is a good tool to simulate a real world, environment.</li><li>• Provides opportunity to conduct own research.</li><li>• Helps understand the statistical process of designing the experiment, data collection, data analysis, and drawing final conclusions.</li><li>• Makes the course more engaging.</li></ul>
Negative Comments	<ul style="list-style-type: none"><li>• The "Islands" were not well integrated in the course.</li><li>• Data collection was perceived as a boring, tedious task.</li><li>• There was not enough guidance.</li></ul>
Remedies	<ul style="list-style-type: none"><li>• Use the "Islands" for examples in instruction.</li><li>• Provide better explanation of sampling plans and teach that data collection is a part of conducting research.</li><li>• Break projects into smaller chunks and provide timely and constructive feedback. Spend time in class to discuss student progress. Provide a TA support if possible.</li></ul>



## Student Projects - Examples

*Physical and mental exercises to reduce cognitive decline in islanders 60+ in age.*

*Analysis of the effect of marriage on a person's lifespan.*

*Effects of stretching on run times.*

*Does smoking affect blood pressure?*

*The effect of caffeine on muscular performance.*

*The effect of sleep on students on the "Islands"*

