September 23, 2024 Education Working Group Call

Agenda/Notes:

1. The September call focused on this discussion. Dan Keefe - Is there a code free, GitHub free forecast challenge that could be developed?
    a. https://processing.org/
    b. Nick Record does some of this with his forecasting challenges and courses
    c. Freya's work that could be transformed into a Shiny format - using CI with code under the hood, but where the user is not using code
    d. Dan's technical work - spatial data visualization, starting to do a lot of digital fabrication - "data physicalization". Community is interested in studying the benefits of that relative to digital visualization
    e. Rarely visualize his own datasets. Typically always working with others.
    f. Traditional role Dan's lab played was how to make sense of super complex data
    g. Recently working with Indigenous communities to rethink visualizations
    h. Reflections on partnerships with Indigenous Data Science & Visualization
        i. Working with the Dakota - Upper Sioux and Lower Sioux communities in MN
        ii. Partners with Micronesian community of Romanum who settled in MN.
        iii. Partnering with Prof. Vince Diaz who leads The Native Cano Program at UMN
            - The community worked with a master navigator from Micronesia to learn how to build canoes
        iv. Dan has been building virtual canoeing experiences
        v. Examples
            - Holding on to physical rope/hand carved tiller while using VR. The bodies response to the environment goes deep because you have physical components in your hand
            - Used planetarium space - had physical parts of a boat (mast, spars, rope) to practice a specific maneuver to move the sail from the bow to the stern
            - Being able to explore place-based knowledge away from the place
            - Celestial navigation technique - a way of knowing who you are, a way of life
                - Taught on a mat with shells in a circle that are the rising and setting of the stars
                - Built augmented version of this with the mat and shells crafted by artists in Micronesia - then applied on top is a digital projection
            - Merger between digital and physical
                - Going through a day, the projector is casting a shadow on the physical canoe on the map

- Key to Indigenous data science - Don't think about the limitations - think about what should it look like and then build that.
- Question Dan's group is thinking about - How to form connections across distance and connect the diaspora
    - People feel they need to keep the culture alive while they wait to return.
    - How to move knowledge across generations
- Intergenerational aspect was something Dan hadn't thought about prior to doing this work.

i. As the artist - how is Dan doing visualization
    i. Dan's connection to CS was through the arts and computer graphics - how to take concepts from oil painting and apply it to data visualization
    ii. Can we show more data in a picture if we use oil painting techniques
    iii. If artists have access to every tool in their studio how would they create scientific components.
        - Artists built the building blocks of the computer digitizations
        - Have types of data with different colors, glyphs, etc
        - The put the parts together like puzzle pieces
        - Example - biogeochemistry in the Gulf of Mexico
    iv. Examples of people taking scarves/embroidery to conferences and people wanting to touch it. When we can look beyond the visual size approach, there is more going on

j. How does Dan teach?
    i. Example assignment - design 20 gradients keeping in mind 3 things
        - Accurate perception of data values
        - Intuitive meaning - create an encoding that intuitively describes something (intensification of force, increase/decrease speed)
        - Legibility when used in combination - let it still be understood when there are multiple layers
        - Think about color, texture
        - How do you represent a change in values?
        - Using a visual language designed by the students - there is no coding involved.
        - Start the class with no programming
        - Then after a few classes, then move into visual programming using the program Processing.org
    ii. Example of work with Dan's collaborator - teaching Trig in Hawaii through navigation
    iii. Example - students collected lived experience data. Examples of oppression observed on campus over the week. Made a visualization out of yarn

k. 3 things to take with you
    i. Don't be afraid to reinvent the data science tools (through partnerships can reinvent how we do things)

ii. The human, visual language of science is just as critical as the science - not just for dissemination and outreach - artists clarify data for scientific understanding
    - Example of artists creating the clay data
    - People who are visual experts can help us clarify data for understanding
iii. Teaching - making the tools accessible. Focus on the visual communication rather than on the programming aspect of it.

l. Computer science - makes tools for people.
    i. Assume you have all the computer power you wanted and the computer worked perfectly and you can have any interface - what do you want
    ii. How would I like to do this? (Don't worry about the computer limitations)
        - Then can we create the computer tool to have that process

m. These are examples of modular no coding tools for doing computing. Imagine using something like this in a way that the Sculpting Visualization tool does that Dan showed with plug and play
    i. https://puredata.info/
    ii. https://scratch.mit.edu/

n. When working with younger students in the mind set of "I have to do it the right way" - how to get them out of that mindset?
    i. In Dan's computer graphics class - 1st Assignment has students make their own implementation of this interactive art installation
        - Camille Utterback & Romy Achituv - Text Rain, 1999
        - It's raining letters that come down and stop on whatever they hit
        - The students are asked to create something similar with the letters
        - The letters make up words from a poem - but not consistently, they show up randomly
        - It is really hard for students because they want there to be one right answer
    ii. Put students in situations with problems they need to reflect on to create a tool to achieve a feeling for people