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Using Electronic Textiles to Visualize the Loss of Tribal Lands Over Time

Kristin A. Searle, Liam Fischback, Colby Tofel-Grehl
Utah State University
Kristin.searle@usu.edu, lfischback@gmail.com, Colby.tg@usu.edu

Abstract: This poster shares the design and development of a data visualization project that brings together social studies, Indian Education For All, and computing to center understanding of the loss of tribal lands by the Blackfeet Nation in Montana. Students utilize Circuit Playground Express microcontrollers to program LEDs representing the percentage of original (pre-contact) tribal lands still owned by the Blackfeet Nation at various points in United States history.

Introduction

There is growing interest in incorporating data science into K-12 education. When students engage in understanding, analyzing, and making inferences from data and data visualizations, they are developing data literacy skills. While data literacy involves math, science, and computing, it is frequently situated within social studies. In the United States, the National Council for the Social Studies (2015) College, Career, and Civic Life (C3) Framework has a focus on geography, including the construction and use of maps, graphs, and other data visualizations. By the end of fifth grade, students should be able to know how to use and construct maps and other representations of data. In this data visualization project, we are focused on fourth and fifth grade social studies standards in the state of Montana and Montana's Indian Education For All curriculum.

Background & Project Design

Data visualization in social studies can be used to support the factual histories teachers want to engage their students in (Naimipour et al., 2020). Particularly when these narratives are not the dominant narratives in U.S. history data visualization can be a powerful tool to counteract more dominant narratives, such as those of Westward expansion and Manifest Destiny. For students, making sense of second-hand data can still be a meaningful experience connected to one's own sense of race and place (e.g. Wilkerson & Laina, 2018). Further, Lee and colleagues (2021) present a three-part framework for thinking about how students engage data across the curriculum. They suggest that such engagements can be meaningful personally, culturally, and socio-politically.

The goal of the Shrinking Lands Project is to get fourth and fifth graders in Montana to think about how tribal lands were impacted by treaties with the U.S. government and to visually represent the percentage of indigenous lands occupied by each tribe in the state of Montana today. This project is part of a larger undertaking that intends to bring together Montana's Indian Education For All curriculum with the state's new computer science standards through curricular integration across content areas. The Shrinking Lands project is part of a curricular unit focused on the assimilation, termination, and relocation of Montana tribes. Students are tasked with selecting 3-4 significant treaties for one of the 12 tribes in Montana and then using LED lights programmed with a Circuit Playground Express microcontroller to visualize what percentage of indigenous lands remains after the signing of each treaty. For instance, Figure 1 depicts data for the Blackfeet Nation. The small, gray area represents the present-day lands of the Blackfeet Nation and it is such a small percentage of indigenous lands that it does not even merit an LED light. This design method can easily be adapted for other Indigenous nations in the United States and elsewhere in the world.

The quantity of land held by Montana tribes is readily available through the United States Geological Survey and the websites of individual tribal nations. Because some treaties are over 150 years old, most sources only provided maps of lands held by tribal nations before and after treaties. As this project displays the history of lands held by Native American tribes, we used sources available on tribal websites to obtain land treaty maps from 1850 to the present. Maps of each treaty were used to create proportional maps made of felt, and to calculate the area of each land treaty map. Using the land treaty maps for each tribe in Montana, we then superimposed the maps on google earth and used the measure function to calculate the land area in square miles. After calculating the land area associated with each treaty for each nation, we divided the data by nation to prepare the data to be transformed into ratios that can be displayed using LED lights and the Circuit Playground Express.

Figure 1: Shrinking Lands of the Blackfeet Nation in Montana.

The Circuit Playground Express board features eight programmable ports than can be linked to external lights, which students will use to display changes in land area over time. Using the square miles of indigenous lands as a base, we standardized the ratio for each tribe to be 10/10 and then calculated the ratio of land that remained after each treaty. Because each light represents a ratio of 1/10 of the land area of indigenous lands for that tribe, we rounded each ratio to a whole number. With this standardized ratio, we then took the difference between the area of the indigenous land area ratio and subtracted the land area ratio of the first treaty. The difference between the two land areas equates to the ratio of tribal lands that were lost due to the first treaty. We then performed this same calculation with each subsequent treaty (e.g, treaty 1 land area ratio – treaty 2 land area ratio = ratio of land area taken by second treaty. When this final ratio was calculated, we assigned the corresponding ratio of lights to each treaty land map to display the ratio of land that the treaty reduced tribal lands by.

Educational Implications

Indigenous peoples are an important and overlooked aspect of United States history and that of other settler colonial nations. Developing tools that support youth in thinking through non-dominant narratives is imperative for promoting understanding and empathy across difference. Further, for Montana's Indigenous students, this project provides a way to connect with their own tribal and familial histories.

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