

Running Head: ENGAGING CONTEXTS: DATA INTEGRATION

Engaging Contexts: Data Integration

Hilary Penner
Lewis-Palmer Middle School

a). Data Source:

I choose to integrate data from Reef Environmental Education Foundation (REEF) www.reef.org. I picked this organization because I have been a volunteer for them since 1996. While SCUBA diving I do a fish survey. REEF is a non-profit volunteer citizen science organization, based in Key Largo, Florida, that collects data on fish species and abundance. They provide longitudinal data for anyone to access to make informed policy decisions. The specific data that my students will access is called the -Geographic Zone Report : access here: <https://www.reef.org/db/reports/geo> This link will take students to the Geographic Zone Report For the **Tropical Western Atlantic Region** at the Expert Level (versus novice at fish identification). This will give students the sighting frequency and density of a certain fish species. It will also show how many species of fish have been recorded in that region. Students can choose or I can dictate which countries to compare data.

b). Lesson enhancement:

This activity will support a new standard for me this year: MS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics: Evaluate competing design solutions for maintaining biodiversity and ecosystem services. Under this standard the specific Disciplinary Core Idea I am focusing on is: **LS2.C: Ecosystem Dynamics, Functioning, and Resilience**

- Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.

This (bio)diversity data will enhance this standard by showing students the variety of species in ocean ecosystems. They will be able to see how many fish species have been recorded at each location. They can also see each fish population and of all the species sighted, which species are more abundant than others. A new objective that I can address with this data is Claim, Evidence, Reasoning. When the student can access this data they can start to make a claim about the health of the area's ecosystem. They can also address how that ecosystem maintains its health by looking at the other factors that play into the health of an ecosystem. This data enhances the lesson because it is real-world. Some students may have been to/or are from the locations they research. Maybe they have read about a place in a book or studied it another class.

c). Using Data :

I feel that using real-time and real data is a crucial step to have students understand major scientific skills such as reading graphs, understanding variables, and error margins.

When students see real data and use real data they are experiencing the results of the scientific method. It gives students a tangible way to see what scientists did and what they found out. The rationale behind using this data is that it shows how science is a human endeavor. It adheres to many tenants of the Nature of Science. It can help them process what is the information that the scientist is seeking versus the extraneous information-what is relevant data to collect and what is not. I think it is also valuable to show students the forms used in collecting the data. What did it look like in the "field" and how is that now transferred to a site as data.

This changes my teaching by integrating data because this is something that I have been wanting to do for the last two years. It seemed daunting and I didn't know where to start. Even

with the data from REEF, of which I am familiar with. This is giving me confidence to continue to find sources of data that my students can interact with to assist in understanding concepts.

d) Interdisciplinary context/ STEM / visual representation:

In comparing and contrasting the biodiversity and abundance of fish species of two regions I can see an essential question becoming: What are the differences in populations of people on these islands, the resources they use and what types of resource management do they employ? What sort of economic challenges does the community/ fishing community face?

These questions fit in perfectly with our World Studies curriculum. This research could even be done in that class. The human and community aspect of the location is integral to the variety of species they have in their local waters. While this is not STEM, it is still a valuable integration.

In math class line graphs could be created for each country by picking one fish species from each country and comparing them. A trend line with outliers could be discussed to trace the fish's population over the years. To differentiate for students, a bar graph could be created showing which countries have the most biodiversity of fish species. With REEF, data is addressed in a percentage as sighting frequency so students will need to understand the percentages.

To address the engineering aspect of STEM students will take the top 5 "sighting frequency" fish and build a "SuperFISH" out of cardstock/paperboard/cardboard. The SuperFISH would have any of the five fishes characteristics that make them so abundant/common. The students would pick from a variety of dorsal fin shapes, tail and body

shapes, coloration and mouth shape (indicating their diet). They will need to justify why their new SuperFISH will continue to stay as a frequently sighted fish and how it evades predators and tribulations in its ecosystem.

An activity that could be included in science class is to mark on their graphs when the students saw a sudden increased population of a invasive species, the lionfish. They could track that data against a fish that the lionfish consumes. A discussion about what are the negatives or positives of invasive species could ensue. What are the different levels of non-native species and what does that mean? I could use an article on invasive species and students could participate in a Science Seminar (or Socratic Circle). Analyzing the data and the reasons for differences in biodiversity aligns with language arts and building science literacy, in the form of a BioStory. Students could create “narratives with scientific concepts” (Ritchie, Tomas, Tones 2011) about why a certain location is so diverse or how the invasive lionfish affected the ecosystem. The best part about using data is that it is the technology that students get to interact with as the rest of the Science, Math and Engineering content is integrated.

References

NGSS Lead States. (2013). *Next Generation Science Standards: For States, By States*.

Washington, DC: The National Academies Press. Retrieved from:

<https://www.nextgenscience.org/pe/ms-ls2-5-ecosystems-interactions-energy-and-dynami>

[cs](#)

Ritchie, S. M., Tomas, L., & Tones, M. (2011). Writing Stories to Enhance Scientific Literacy.

International Journal Of Science Education, 33(5), 685-707.