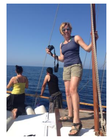
Creating *Journeys*:

NGSS-Aligned Interactive Reading Passages for Secondary Science Classrooms that Integrate Current Science and Engineering Research

Welcome to my Journey…



Dolphin Research Internship, North Aegean Sea Greece, 2015

To meet the demand to create current resources for the instruction of the Next Generation Science Standards (NGSS) released in 2013, I invented a concept of interactive reading passages called *Journeys*, developed a pilot *Journey: Researching Dolphins*, implemented a nationwide teacher feedback system, and produced a final *Journey* online.

What is a *Journey*?

Journeys are easy-to-read interactive reading passages. They are designed to allow middle school and high school students to elaborate on current scientific and engineering topics through real-world scenarios. By integrating multiple scientific concepts, they let students practice data analysis as well as experience citizen science. *Journeys* also promote scientific literacy by using multiple literacy strategies, graphing opportunities, and other multimedia NGSS-aligned resources through interactive *Waypoints*.

Designed for a wide audience with consistent delivery

Job: Provides primer and overall context of STEM careers.

Opportunity: Introduces researchers' work, backgrounds.

Unique: Brings context to scientific phenomena.

Real Science: Outlines research results, data, and graphs.

New Science: Focuses on emerging studies, solutions.

Engineering: Provides context of engineering integration.

You!: Assigns performance assessment, citizen science.

Interactive *Waypoints!*

Formative assessments available as interactive maps, links, and videos aligned to the rigors of NGSS.

MONTANA STATE UNIVERSITY MSSE

Jess Rowell, MSSE 2016

@STEMJourneys

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through Creating *Journeys* in the field…

Research Questions

•How will secondary science teachers of all experience levels find NGSS aligned interactive reading passages, or *Journeys,* relevant?

•How can secondary science teachers use *Journeys* to incorporate relevant and current science topics with NGSSs in their classrooms?

•How will teachers find these resources useful, and in what ways?

Methodology

Meet scientists/engineers in the field, produce *Journeys*
•Research and interview researchers in the field starting 2015.
•Complete a pilot *Journey: Researching Dolphins.*

Survey, interview, and ask teachers nationwide for feedback
•Preliminary Survey, 33 teachers, April, 2015.
Snapshot of what teachers know and need regarding NGSS, as well as their access and preferences to technology.
•Interviews, 16 teachers, December 2015 - February 2016.
In-depth review of teachers' perspectives of literacy in science, NGSS-implementation, and data analysis practice.
•Teacher feedback instrument, 11 teachers, March 2016.
Distributed pilot *Journey* passage to interviewed teachers.

Improve *Journeys* based on teacher feedback
•Update pilot and structure of *Journey* passage with teacher and specialist feedback, April 2016.
•Commence final feedback instrument with available teachers.
•Publish *Journey* on an interactive blog-like platform for future resources development, now and beyond.
•Continue nationwide teacher feedback system for future *Journey* development.

"These *Journey* projects are quite good and an excellent conceptual way to tie so many things together!"

- Dr. Gerald Nelson, Montana State University

together with Participating Teachers and Peers.

Interpretation & Conclusion

Based on interviews and feedback, *Journeys* must be relevant for students in order to solve problems, make predictions, practice current science and engage in citizen science.

Based on surveys and interviews, teachers have highly varied access to technology. *Journeys* will be versatile in delivery and not entirely dependent on technology or hard copy, yet still contain the quality multimedia materials essential for today.

Based on continual feedback on both drafts of the pilot *Journey: Researching Dolphins*, teachers find *Journeys* useful as they "allow students to participate in finding solutions to real-world environmental issues and observe first-hand the approaches, assumptions, and analytical methods used by scientists currently doing this work." (Specialist Review, 2016). *Journeys* give access to real data for analysis practice and various formative assessments through interactive *Waypoints*.

Welcome to your Journey! Student Instructions

For each part of your journey, or leg, read the material and answer the Waypoint questions. Follow your teacher's instructions for how to fill in the document and access the interactive Waypoints.

J is for Job

Bottlenose dolphin. Courtesy Eric Ramos, 2015

You've been asked by the government effects of boating tourism on dolphin a small country in between Mexico a experiencing a 6000% increase in to have some experience observing dol hard it is to spot them because they only come to the surface for air. To sun and light have to be just right detail. Don't forget that dolphins n depending on whether or not they leave to find food. How are you go traffic in a shallow reef if you ha

Your job is to observe, monitor, locations of Belize's Barrier Re Belizean government. The gove tourism and to protect the env the future of the Caribbean Se techniques. You will get more end of this Journey. Before y you're going to need to explo data in order to make a greg

Waypoint Interactive! ...for #

Go to {{this link}} and lo various pins on the map r research conducted in th

1. What systems do mar Oceanographers? Creat ecology.

2. Create a thinking r monitor organisms li

Figure 1: Belize mainland, Ambergris Caye, Turneffe Atoll, Lighthouse Reef, Glovers Reef

O is for Opportunity

Image 1: Eric Ramos OceanInfinity.org

Meet Eric Ramos. He studies dolphin behavior with the Oceanic Society in Belize's Turneffe Atoll outside of the Barrier Reef. Bottlenose dolphins (their scientific name in Latin is *Tursiops truncatus*) have complex communication patterns and he wants to understand their calls to each other, especially when they are looking for food. How does their communication change if their food source is altered? He's got some new techniques for studying this, but we'll get to that soon. What do dolphins eat **and why would they want to be in the reef? The corals and reef system,** including protection for marine mammals to **forage**, or feed, and reproduce. Imagine that the ocean is a desert, and each Caye is like a tiny oasis for dolphin families.

Image 2: Dr. Caryn Self-Sullivan Surfaces.org

Meet Dr. Caryn Self-Sullivan. Dr. Caryn studies manatees and dolphins in the Drowned Cayes inside of the Barrier Reef. She compares populations of both marine **mammals in the shallow waters of the reef and makes observations about how** tourism affects them. "Ever since I was a small child, I've been fascinated by whales and dolphins. My mom saved my first drawings of whales, which I still have. They are dated 1981... I finally got the opportunity to study marine biology after my kids grew up. I was 39 when I started college for the first time... Finally, as a graduate student, I started a long-term project in Belize in 1998. Today, my own graduate students continue to work on the project, known as "Manatees & Dolphins in the Drowned Cayes of Belize." Learn more about Dr. Caryn's project on Facebook: www.facebook.com/BelizeManateesDolphins.

Figure 2: Two marine mammal study sites in Belize's Barrier Reef: Drowned Cayes and Turneffe Atoll. Google Earth

Drowned Cayes
Belize City
Belize Barrier Reef
Turneffe Atoll

Neither Eric nor Dr. Caryn live in Belize. That means they must coordinate their research missions with local residents in Belize and plan far ahead in order to get as much data as possible in a few short weeks a year. You're going to help them out. Once you visit the Turneffe Atoll with Eric, and the Drowned Cayes with Dr. Caryn, **you make some observations about the environment and what is going on.**

Waypoint Interactive! ...for the Opportunity Leg

1. Go to STEMJourneys/forstudents/researchingdolphins and locate the area of Eric's research and Dr. Caryn's research in Opportunity. What is the latitude and longitude of the Drowned Cayes? What sea is the reef protecting Belize from? What are two other observations you make about the geographic locations of these two field sites?

2. What are two questions that you can ask Eric and Dr. Caryn about their scientific careers?

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