SPLASSH (Student Programs Like Aquatic Science Sampling Headquarters)
http://splassh.meteor.com
A Socially Driven Platform About Water

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ABSTRACT

Student Programs Like Aquatic Science Sampling Headquarters (SPLASSH) is a social network for investigating, sharing, and visualizing data involving water. SPLASSH is designed around the Meteor.js web framework, which builds upon Comet technology to push, or deliver content from the server to end-users for real-time interaction. SPLASSH first presented viewers with a parallax scrolling page with information about the project's mission. The second phase of SPLASSH plans to engage users by prompting them to share how they are using water. For example, users will post short status updates regarding their interaction with water, whether they are boating, swimming, fishing, or exploring. After the initial rollout, the third phase of SPLASSH will target two audiences, people curious about water and students and citizen scientists involved in water studies who are interested in sharing their data. SPLASSH will allow general users, students, and citizens to produce, consume, and visualize data while being recognized for their participation through gamification. The various forms of data postings will disseminate findings, network interested parties, and track trends in water use and information.

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INTRODUCTION

Student Programs Like Aquatic Science Sampling Headquarters (SPLASSH) is a social network for investigating, sharing and analyzing scientific data involving water. Why water? Water is a fundamental requirement of life, covers over 70% of our earth, and is the most abundant molecule found in living things. We are connected to our watershed through the water we consume; the lakes, rivers, and beaches that we swim in and fish from; the goods that are produced with and transported through; and the energy that we depend upon in our daily lives. The condition of our waterways is crucial for our public health, environment and economy. In 2011, The Office of Water at the Environmental Protection Agency (EPA) began studying the worth of water to the United States economy. The EPA's initial findings reported that water varies greatly in value depending upon its scarcity and demand as well as by the methods used to calculate its worth (1). The worth of a resource is difficult to determine for reasons best left for discussion in an introductory environmental science course, but what SPLASSH hopes to accomplish is to engage, connect, and enlighten users to the importance of water.

DESIGN

SPLASSH is designed around the Meteor.js web framework, which builds upon Comet technology to push, or deliver content from the server to end-users for real-time interaction (2). Meteor is an open-source technology that relies on the Model-View-View-Model (MVVM) software design pattern to address the stateless (volatile data), unidirectional (communication overhead), and unreliability (network bottlenecks) concerns of the Internet (3). The framework uses Javascript on the client, server, and data modeling sides, enabling developers to quickly produce more features in a shorter amount of time by collaborating on a single programming language. SPLASSH uses MongoDB as its primary database, which is a popular NoSQL (Not Only Structured Query Language) that is not dependent upon relationships between entities, and instead focuses on managing unstructured data that is suitable for SPLASSH entries (4). MongoDB allows for scalability and schema-free design, and takes advantage of the open JSON data interchange format that works hand-in-hand with Javascript (5). Meteor + MongoDB are an ideal fit for SPLASSH in terms of keeping up with the evolving web technologies and the growing demands for data-centric sites in real-time.

DEVELOPMENT ROADMAP

Phase One

SPLASSH first released a parallax scrolling page that portrays a water scene involving fish that experience the effects of runoff pollution (Fig. 1). The scene is unveiled to viewers as they scroll down, eventually displaying information about the mission of the project and the SPLASSH team. Although the scene's message of the importance of water quality is serious, the cartoon-nature of the plants and animals lighten the mood. The parallax tells the story of the effects of surface runoff on an aquatic ecosystem, as symbolically depicted by descending rain clouds, a storm drain, and fish that turn belly-up at the end of the scene. The final view of the parallax scrolling page displays SPLASSH's social media coverage.

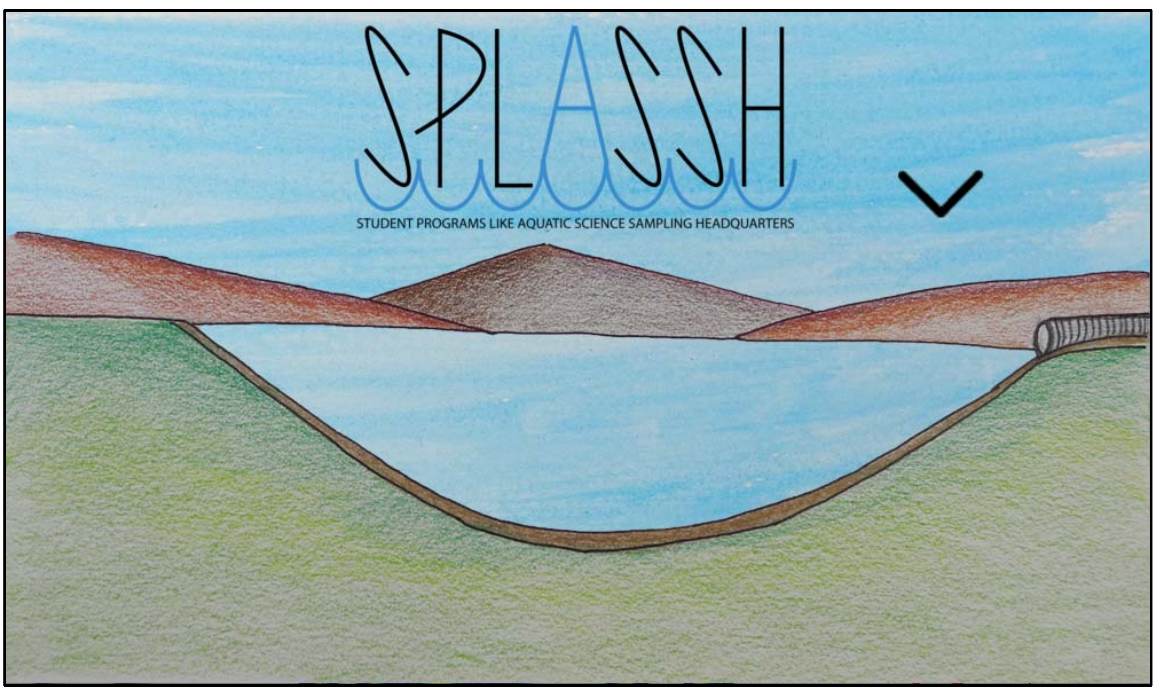

Fig. 1 A.

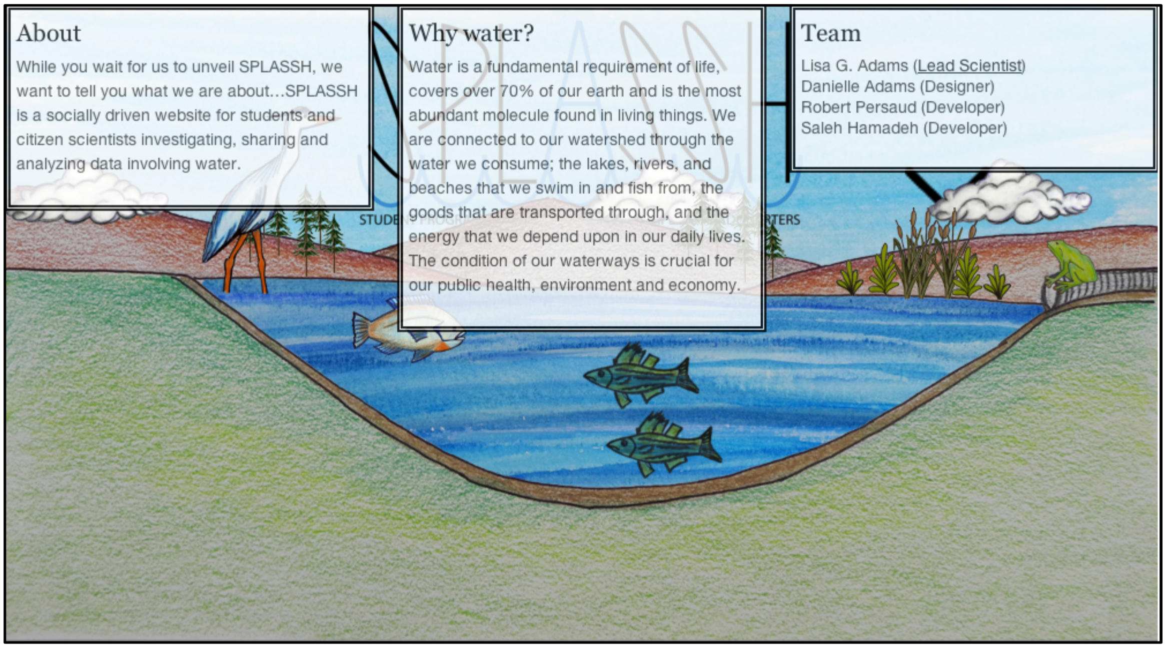

Fig. 1B.

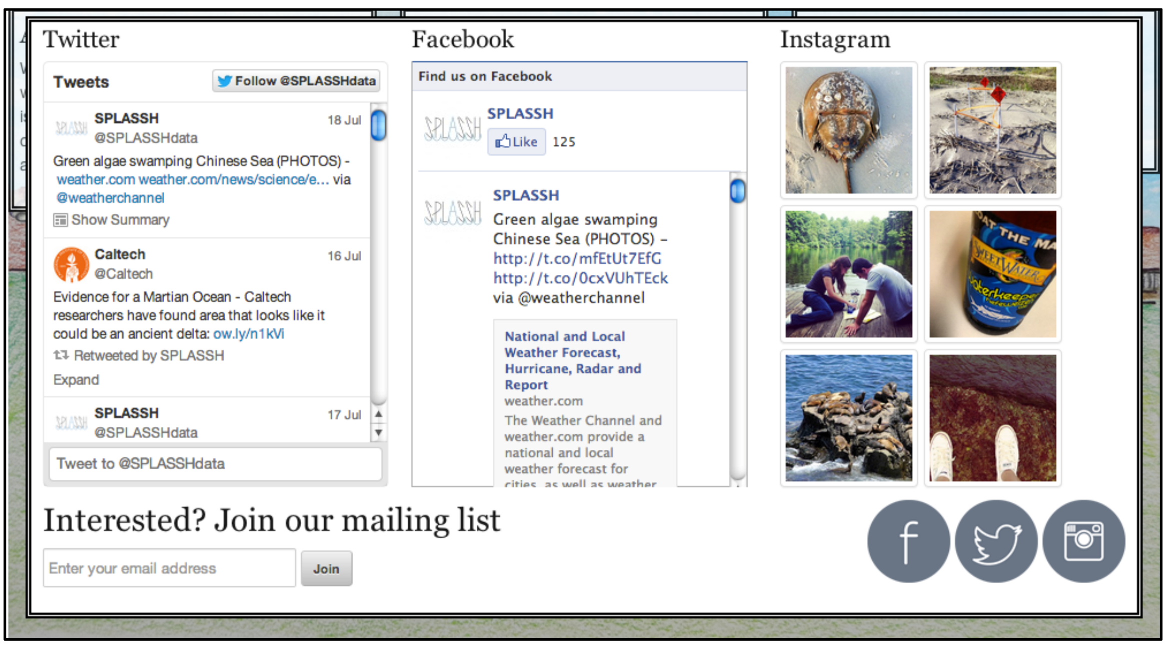

Fig. 1C.

Figure 1ABC. The above shows a series of three screen shots (Fig. 1A, 1B, and 1C) from top to bottom that captures select views of the parallax scrolling page. As the user scrolls down, plants and animals enter the image and clouds descend upon the scene (Fig. 1B). Rainfall is implied as is the surface runoff that is symbolized by the storm drain that results in the belly-up position of the fish (not depicted here), indicating poor water quality. The middle image (Fig. 1B) contains information about SPLASSH's mission and team members. The bottom image (Fig. 1C) shows the live feed of SPLASSH's social media.

Phase Two

The second phase of SPLASSH will engage users by prompting them to share how they are using water. Fig. 2 is a mock up screen that users will interact with when asked, *"what's your water news?"* in a text box, labeled *"make a splassh."* The location of the post will be tracked using the trademark SPLASSH *water droplet* as seen in the lower left of the text field. Below the text field, the screen will display in real-time *"what's trending"* by *"activity"* (boating, fishing, swimming, sampling, etc.), the most visited *"body of water,"* and the *"biggest splasher."* Below *"what's trending," "the ripple"* will be a live feed of posts that will move in a wave-pattern across the screen. The latter half of this phase will involve mapping the geolocations of the posts on to the *"body of water."*

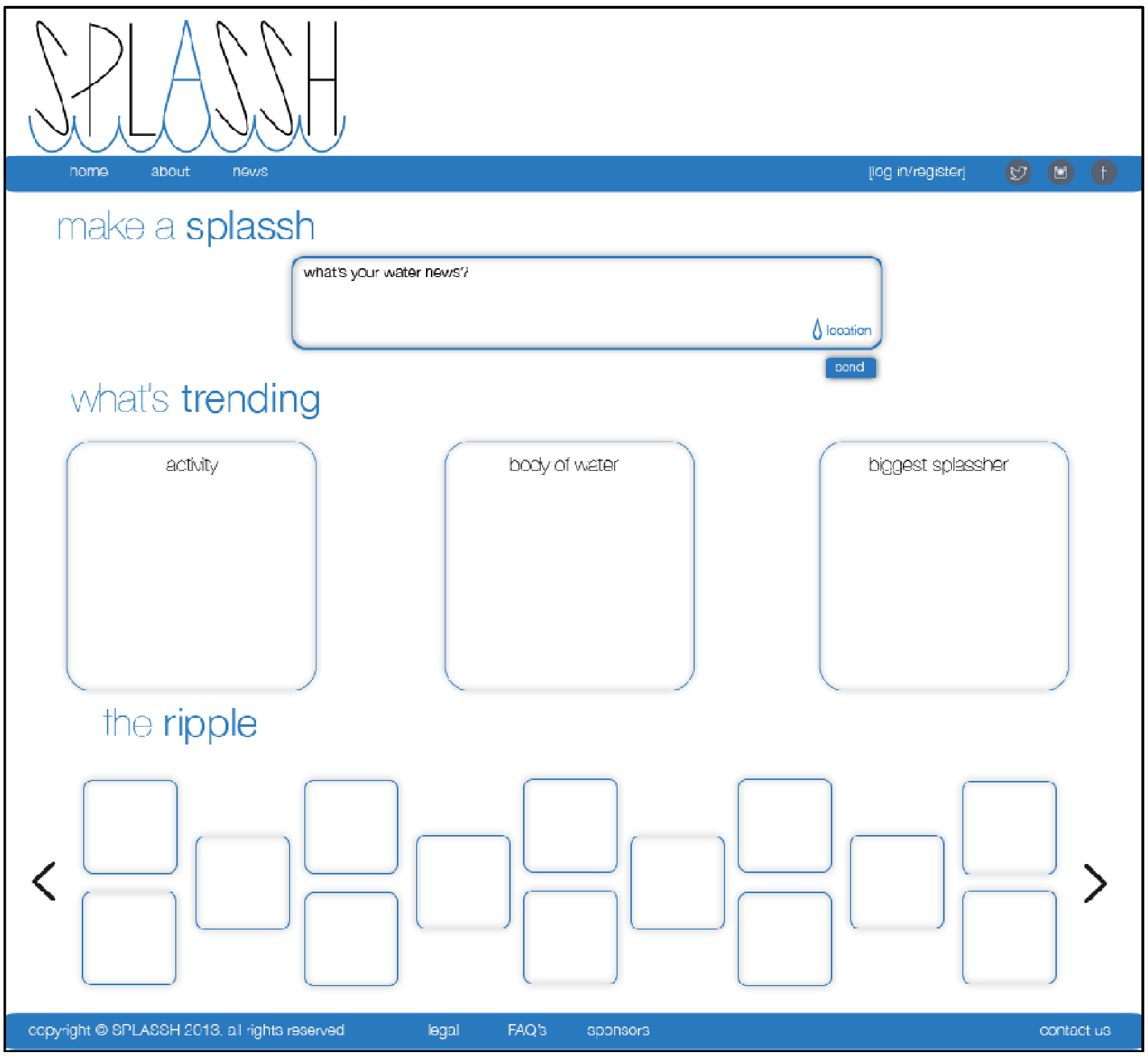

Figure 2. Mock up of Phase 2 illustrates how SPLASSH plans to prompt users to post their water news via the "make a splassh" text field, display trending water news based upon "activity," "body of water," and "biggest splasher," as well as deliver live feeds with "the ripple."

Phase Three

SPLASSH plans to reach out to schools, universities, and science centers, as well as state and federal water resource organizations. The third rollout phase of SPLASSH will target two audiences, people curious about water and students/citizen scientists involved in water studies who are interested in sharing their data.

DISCUSSION

The idea of engaging the public with environmental monitoring is not new, but has gained momentum over the years. Projects like the Monarch Larva Monitoring Program at the University of Minnesota (http://www.mlmp.org) and the Birdhouse Network at Cornell University (http://nestwatch.org) were both funded by the National Science Foundation (NSF) in the 1990's. A more recently sponsored program by the NSF is called BudBurst (http://www.budburst.org/aboutus.php), which was launched by University Corporation for Atmospheric Research (UCAR) in 2007 (6) and recently adopted by the National Ecological Observatory Network (NEON) (7). Project BudBurst invites the public to observe and record the budding, leafing, and blooming of trees and flowers each spring in attempt to better understand the effect of climate change on phenology (8).

Aquatic opportunities for data collection do exist for citizen scientists of every state. For example, in Georgia, the state's *Adopt a Stream* program is housed in the Georgia Environmental Protection Division (http://www.georgiaadoptastream.org/db/about.asp) and serves the community in terms of environmental outreach and increasing the monitoring coverage of local watersheds. Participants are trained to collect water quality data that ensures consistency and some level of quality control, and their data submissions are posted online. There are regional sites as well that accept water quality data, such as the Southeast Coastal Ocean Observing Regional Association (SECOORA, http://secoora.org), which invites students to share their water quality data collected from the Basic Observation Buoy Program (BOB, http://cormp2.das.uncw.edu/dev/). BOB is a simple scaled down buoy made of PVC that serves as platform for students to deploy sensors and probes that are designed to continually sample calm waters (9). SPLASSH differs from these databases in that the data collected will be unstructured and involvement can vary from one posting to regular postings. To date, casual users have not been targeted in existing aquatic programs due to the level of commitment required by most monitoring efforts. SPLASSH will not require any training or commitment to participate and therefore hopes to attract casual as well as frequent users that post and share their news, whether that information is how they are interacting with water or data collected from a body of water. Our goal is that once a user visits the sight, they will continue their involvement with SPLASSH.

SPLASSH plans to solicit information about water and allow students of all levels to produce, consume, and visualize data while being recognized for their participation through gamification, the use of game thinking and game mechanics in a non-game context in order to engage and motivate users (10). In future editions of SPLASSH, snapshots of findings may include short stories or status updates posted by users to supplement or summarize the activity, study, or finding. For example, if a graduate student deployed hydrocarbon passive samplers on a buoy in the Chesapeake Bay, she could post her results primarily identified by the "contaminant" category, that would contain information such as "location" and "type of body of water" as well as the type of contaminants detected. Data contributors may additionally include information regarding the technology/technique used to sample, and the growing metadata would be a valuable sorting tool for users. As more people contribute to the original finding, the "contaminant" category, which is a higher-level parameter, would organically evolve to include a rich dataset of lower level parameters, such as metals, pesticides, pharmaceuticals, and harmful microorganisms, making this finding a reliable data source for years to come.

The 2013 Knowledge Status Report on the Oceans of Data Project (11) describes crosscutting guidelines for user interfaces such as enabling customization for users and ensuring the design is current to satisfy web savvy users. Both of these requirements were addressed in the development of SPLASSH in terms of front-end design and usability. Parallax viewing, Web-font icons, minimalistic typography, and single text fields are incorporated into the mobile-friendly and reactive features of the site. Real-time interaction between users and their posts will allow data visualization of the unstructured data, emphasizing trends and their locations.

Mogk and Goodwin (12) discussed how students learn in the field of geoscience and the importance of field experiences to learning, which the later phase of SPLASSH will aide in the transformation of students from being consumers of data to data contributors. Having students experience the setting of the data collection as opposed to just reading data points provided in a table allows the student to better understand the meaning of the data. Kastens et al. (13) explained that geoscience students experience the interplay between observation and testing hypotheses while in the field setting, allowing the transformation of the whole natural setting into a discrete data value or observation. In essence, the students are challenged with detecting the signal from the noise of the setting and this skill evolves with experience.

CONCLUSION

Encouraging students to go outside and observe nature may promote a deeper understanding and appreciation of the natural world. Traditional field experiences for students usually result in data collection, but often times their data are not recognized or shared with others. SPLASSH will enrich the casual and traditional field experiences by allowing users to post information about water that does not fit the traditional data sites that require conformity in their data entry procedures. SPLASSH will be a social network for water data with the goal of engaging and educating the public on water and its usage, whether it is recreational, economic, or discovery based.

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