

Happily Ever After

Start with the End in Mind



Agenda

- Purpose of the session and plan
 - Pair share
 - Panelists' Strategies
 - Why? Motivation and Dissemination
 - Discuss quotes about reach
 - Collect wisdom to share

Think about your situation. Write a word or short phrase about ...

- a win related to dissemination
- a dilemma or worry you're facing to concluding strong.

*My college alumnae magazine
Does a write-up on the project*

*Park rangers don't have
band-width to conduct
training for new staff*

Then...

- Introduce yourself to a person near you.
Share your win or your worry.



Data Science Making Museums and math

Andee Rubin, Senior Scientist,
TERC, andee_rubin@terc.edu

Scientific Data Visualizations Museums Serving Audiences with Special Needs

Jessica Roberts, Asst Prof.
School of Interactive Computing,
jessica.roberts@cc.gatech.edu

**Rural students
STEM careers for youth
Universal design**

Amanda Bastoni, Director of Career,
Technical & Adult Education at CAST,
abastoni@cast.org

**Environmental education
Environmental Justice**

Martha Merson, Project Director, TERC,
martha_merson@terc.edu





Identifying Audiences

Who needs to know?
How will they remember?



Math Momentum

in Science Centers

Edited by Jan Mokros



Leave a printed legacy beyond academic papers.

Acknowledgments	13
1 <i>Why Math in Science Centers?</i> Jan Mokros	17
2 <i>Getting Started: Math Momentum Begins with You!</i> Jan Mokros	29
3 <i>The Quest for Mathematical Equity</i> Jan Mokros and Ricardo Nemirovsky	45
4 <i>Mathematical Challenges in Science Centers</i> Jan Mokros	61
5 <i>Building Math into Exhibits</i> Jan Mokros and Ricardo Nemirovsky	79
6 <i>Math, Families, and Science Centers: Opportunities and Issues</i>	

Screenshot

About REVEAL**The Team****Culturally Responsive Research****Professional Development**

Introductory Materials

Module 1

Module 2

Module 3

Module 4

Module 5

Math Content**Publications****REVEAL Professional Development Program**

The REVEAL Responsive Museum Facilitation Program is a video-based professional development program that builds on findings from the REVEAL research study. The program was particularly designed for staff who engage with families and visitor groups through informal, conversational interactions, such as facilitation at interactive exhibits or activity carts. Program leaders or education managers can use the guide with their staff to prompt discussion, reflection, and experimentation around critical issues related to facilitating educational experiences in museums.

This program is intended to help educators:

- Strengthen and deepen their awareness and understanding of the complex dynamics of family learning in museums and how these relate to the role of a museum educator;
- Increase their skills in reflecting on their practice to become more effective

REVEAL

Responsive Museum Facilitation

A Video-Based Reflection Guide for Engaging with Families

WOODS HOLE OCEANOGRAPHIC INSTITUTION

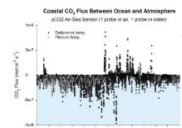
ABOUT WHOI | WHOI PEOPLE DIRECTORY

Accessible OceansABOUT TEAM WHAT IS SONIFICATION **AUDITORY DISPLAYS** BLOG **Auditory Displays**

As part of the "Accessible Oceans" AISL Pilots and Feasibility study, we have inclusively designed several auditory displays for the perception and understanding of ocean data in informal learning environments (ILEs). The auditory displays are comprised of data sonifications and contextual audio supports (dialogue, auditory icons, and music). The data comes from the National Science Foundation (NSF) Ocean Observatories Initiative (OOI) and the display is based on the **OOI Nuggets** developed by Dr. Leslie Smith. The displays were built using a human-centered design approach comprised of multiple steps of building and evaluating auditory displays and their components with input from various stakeholder groups, including the blind and low-vision (BLV) community. Read below for descriptions and links to listen to the project's latest auditory displays, including different versions.

Elizabeth Anc
Scott Pattison, Ivel

Feb

Create usable products**NET FLUX OF CO₂ BETWEEN OCEAN AND ATMOSPHERE**

Version 3 (Synthetic Absorption Sound)

The seven tracks make up an auditory display of the net flux of carbon dioxide between the ocean and the atmosphere. The display is based on an NSF-funded **OOI Nugget**. The sound design of absorption in data sonifications (tracks 2, 3, and 4) has been updated from a "slurping" parameter-controlled sound (version 2.0) to a synthetic filter parameter-controlled sound (version 3.0), based on user feedback.

[Listen online](#) to the 6-minute 21-second auditory display (uses Smaply).

[Access or cite](#) the auditory display tracks (via Zenodo).

Set yourself up

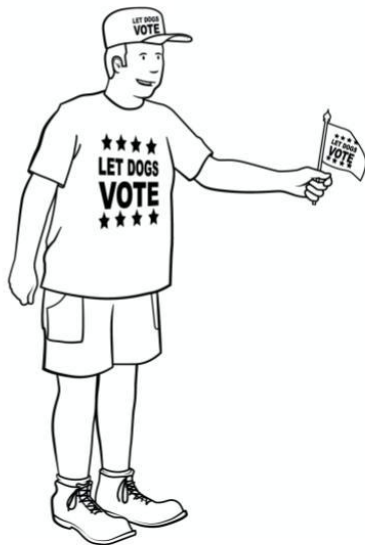
Tools, Partners

Awkward!

no tips, no gifts

When on the clock, federal workers are not to comment on politics. Specific candidates, conventions, and advocacy are off limits. But what it means to be a citizen, to be an agent for change, to live a life that is sustainable, these are perfect topics for park rangers dedicated to interpretation and education.

Don't be offended; park rangers have to avoid certain topics.



Don't be offended if a ranger changes the subject. Park rangers know what they need to avoid talking about and are pretty good about shifting the conversation. Understand that some conversations may be off limits. Some rangers will say, "That's not a topic that I can discuss in uniform." Others may just change the subject.

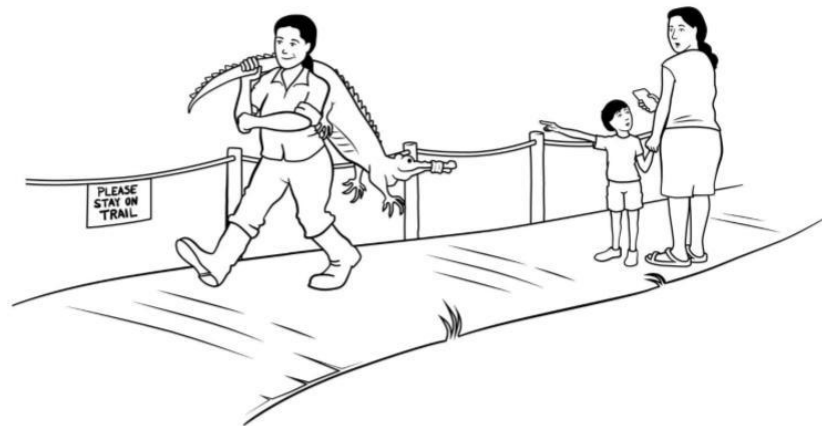
Making Holes?

setting an example

If your research calls for doing something that is typically discouraged, like making holes or collecting plants, visitors will notice and that worries park staff. Setting a bad example makes it that much harder to keep visitors from breaking rules. Putting ideas in people's heads for behavior that could harm the park is not a show-stopper, but it is something to discuss and manage.

Get an artist on board

Talk it out with park staff. You might get a sign, an escort, or a cool magnet for your vehicle to use while you are moving about the park.



Prepare for the Ending from the Beginning

1. Connect with Local News Outlets
2. Think About Video from the Start
3. Promote Your Partners
4. Collect Interviews and Quotes
5. Document your process



About the Project

STEM Pathways for Rural Youth: Developing STEM Identity Through the Outdoors

2022-2024 Outdoor Recreation [Feasibility Study](#)

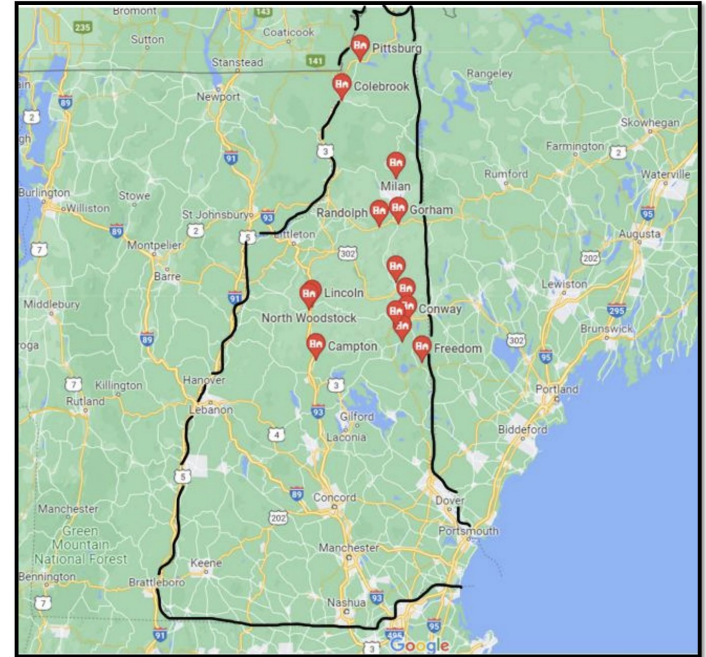
[NSF AISL #2213919](#)

Can outdoor recreation be a lever for developing STEM identity and STEM career thinking?

- 200+ Student surveys
- 54 middle and high school students; Jan-Oct. 96% completion rate
- Statistically significant changes increases in students awareness of STEM



University of
New Hampshire



Connect with Local News Outlets

North Country students kick off year-long feasibility study in Bretton Woods



More than 10 North Country students participated in a training workshop at the Highland Center that included interactive QR search and course demonstrations with New England K-9 Search and Rescue member Doreen Michalak (top right).

...to the study, which will be tracked digital through a phone app over the next year.

The rural town, experiencing the outdoors to offer a national park of their everyday life, whether hunting or fishing for food or climbing or snowboarding for recreation, but they don't always realize the connection between outdoor activities and STEM careers.

The grant received an additional \$50,000 from the Ford and Lucie Tibbetts Fund and was coordinated by the Conservation Fund, the Appalachian Mountain Club and CAST. Participating students will receive payment for their contributions.

...to the study, which will be tracked digital through a phone app over the next year.

The rural town, experiencing the outdoors to offer a national park of their everyday life, whether hunting or fishing for food or climbing or snowboarding for recreation, but they don't always realize the connection between outdoor activities and STEM careers.

The grant received an additional \$50,000 from the Ford and Lucie Tibbetts Fund and was coordinated by the Conservation Fund, the Appalachian Mountain Club and CAST. Participating students will receive payment for their contributions.

CONCORD MONITOR

(https://www.concordmonitor.com)

News > Science (/News/Science/)

Granite Geek: Can you find the math inside the schuss?



Ruby Weeman from Kennett High School during a training session on Jan. 12 at the Appalachian Mountain Club in Bretton Woods. She is demonstrating access to the ORFolio app used to track student progress linking STEM to outdoor activities. Joe Viger / Courtesy



of 12



UNH TODAY (/www.unh.edu/unhtoday/)



Tracking Hidden STEM in NH's North Country Project links outdoor recreation to science, technology, engineering and math

Monday, January 30, 2023

(HTTPS://HTP//MAILTO:
U=HTTPEXTERNAL
HIDDENHIDDEN-
STEM-STEM-STEM-
NHS-NHS-NHS-
NORTHNORTHNORTH-
COUNTIESUNTSUNTR



PHOTOGRAPH BY JOE VIGER.

Is K-9 search-and-rescue a STEM skill? What about hunting, snowmobiling or cross-country skiing? That's what Andrew Coppens (https://findscholars.unh.edu/display/acoppens), associate professor of education, and Jayson Seaman (https://findscholars.unh.edu/display/jseaman), associate professor of recreation management and policy, set out to explore with 40 middle and high schoolers from Coös County at a recent workshop at the Appalachian Mountain Club's Highland Center. The students met Neeke (https://nam12.safelinks.protection.outlook.com/?url=https%3A%2F%2Fmountaintimes.info%2Fmissing-man-found-in-cavendish-with-canine-community-help%2F&data=05%7C01%7Cbhf2%40unh.edu%7C7b3b8ae09093440124e308daffca0506%7Cd6241893512d46dc8d2bbe47e25f666%7C0%7C0%7C63810354036753 a 3-year-old Belgian Malinois, and handler Doreen Michalak from New England K-9 Search and Rescue (https://nam12.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.nek9sar.org%2Fmembers%2F&data=05%7C01%7Cbhf2%40unh.edu%7C7b3b8ae09093440124e308daffca0506%7Cd6241893512d46dc8d and practiced using a mobile app that will help them document "hidden STEM" in their outdoor recreation pursuits.

"Our goal is to connect STEM skills, a critical area of workforce need in the state, to New Hampshire's booming \$2.7 billion outdoor recreation industry," says Coppens. "We want to understand how their outdoor recreation could catalyze promising educational and workforce pathways." Funded by the National Science Foundation, this research (https://www.cast.org/our-work/projects/outdoor-recreation-connecting-rural-youth-stem-careers) is led by CAST (https://www.cast.org/news/2022/investigate-outdoor-recreation-positive-stem-identities-pathways-rural-youth) with Seaman and Coppens as co-principal investigators.

Think About Video From the Start



[OR Video Draft](#)

Promote Your Partners



Virginia Kurtz Schrader
Director/Principal, Mount
Washington Valley Career &
Technical Center

[How a high school in North Conway is training students for jobs in NH's growing outdoor tourism industry](#)

Collect Interviews and Quotes

"Before this project I didn't want anything to do with STEM, but now I want my future to involve STEM."



Before this project I didn't want anything to do...

#Sharing & Teaching



October 26

PROJECT WORK

Interview a Researcher

Make a Project Blog

Plain-language descriptions of the work you are doing

Visuals of in-process designs and of outreach efforts

Check out our Blog!

What is Data Mapping?

By Jon Bellona | June 20, 2022

Data mapping refers to the design choices of applying values from a data set onto any number of controls of sound. Controls may include modifications of digital sound synthesis, audio samples, audio effects, and spatialization, among many others. Data mapping and choices around mapping play a critical role in sonification. In sonification, choices in data...

[Read More](#)

The Parameters of Sound

By Jon Bellona | June 22, 2022

Data sonification commonly involves taking data-numeric values-and assigning those values onto sound parameters to highlight particular aspects of the data. Making choices about the ordering and controlling of sound parameters over time is as old as music notation. In fact, standard music notation highlights certain aspects of sound in its writing. For example, music notation...

[Read More](#)

Sound Design

By Jon Bellona | June 23, 2022

Sonification involves the field of sound design, which is the craft of developing

RECENT POSTS

- » [Auditory Display: Carbon Net Flux Between Ocean and Atmosphere, v2](#)
- » [Auditory Display: Daily Vertical Migration Gets Eclipsed, v2](#)
- » [Auditory Display: 2015 Axial Seamount Eruption, v2](#)
- » [Auditory Display: Axial Long Term Seafloor Inflation Record, short version](#)
- » [Auditory Display: Axial Long Term Seafloor Inflation Record, v2](#)
- » [Auditory Display: Extratropical Storm Hermine, v2](#)
- » [Accessible Oceans Featured on Ocean Observatories Initiative Website](#)
- » [Accessible Oceans Featured in LA Times Article](#)
- » [Spearcons and the spectrum of speech comprehension...](#)
- » [Audio Display Prototype: Extratropical Storm Hermine](#)
- » [Creating Accessible Media on a Qualtrics Survey](#)
- » [Audio Display Prototype: Axial Long Term Seafloor Record](#)
- » [Audio Display Prototype: 2015 Axial Seamount Eruption](#)
- » [Sonification Click Track for Media Synchronization \(Part Two\)](#)

Questions? Comments

Reflect on the examples you just heard.

Are they sparking new ideas? How might you adjust your plan?

In whose hands will your work live on?

What will be different in 5 years?

Pair Up. State your vision to your partner.

***In five years, my work will be evident in [fill in]
[Name] will be key to achieving impact in five years.***

**The partner asks, “
Why?”
And Why again
And Why again (5x)?**

Leverage current projects
to plan the next project

Screenshot

About REVEAL

The Team

Culturally Responsive Research

Professional Development

Introductory Materials

Module 1

Module 2

Module 3

Module 4

Module 5

Math Content

Publications

REVEAL Professional Development Program

The REVEAL Responsive Museum Facilitation Program is a video-based professional development program that builds on findings from the REVEAL research study. The program was particularly designed for staff who engage with families and visitor groups through informal, conversational interactions, such as facilitation at interactive exhibits or activity carts. Program leaders or education managers can use the guide with their staff to prompt discussion, reflection, and experimentation around critical issues related to facilitating educational experiences in museums.

This program is intended to help educators:

- Strengthen and deepen their awareness and understanding of the complex dynamics of family learning in museums and how these relate to the role of a museum educator;
- Increase their skills in reflecting on their practice to become more effective

REVEAL

Responsive Museum Facilitation

A Video-Based Reflection Guide for
Engaging with Families at Interactive Exhibits



Elizabeth Andanan, Andee Rubin,
Scott Pattison, Ivel Gontan, Crosby Bromley

February 2017

Build research on top of development

Build on Partnerships to Develop New Projects



ABOUT MISCI ▾ PROGRAMS ▾ EXHIBITS ▾ VISIT ▾ JOIN & SUPPORT ▾

Donate



Screenshot



Design Zone

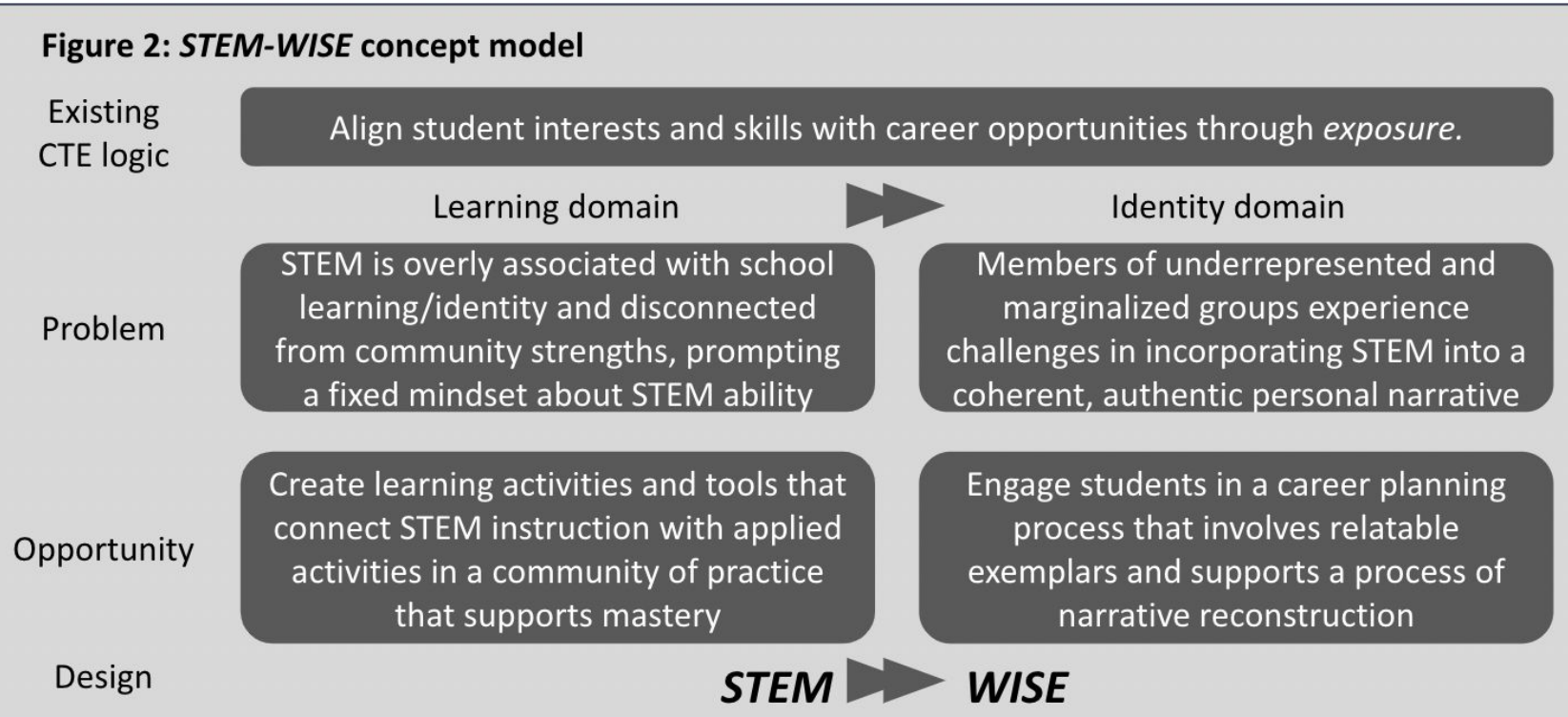
What does it take to create an addictive and fun videogame? How many beats per second does a DJ need to get bodies moving on the dance floor? What goes behind creating a roller coaster or a skate park that produces the most fun and biggest thrills? Discover the secrets behind how videogame developers, music producers, roller coaster designers, and other creative problem solvers do what they do.

Permanent Exhibit

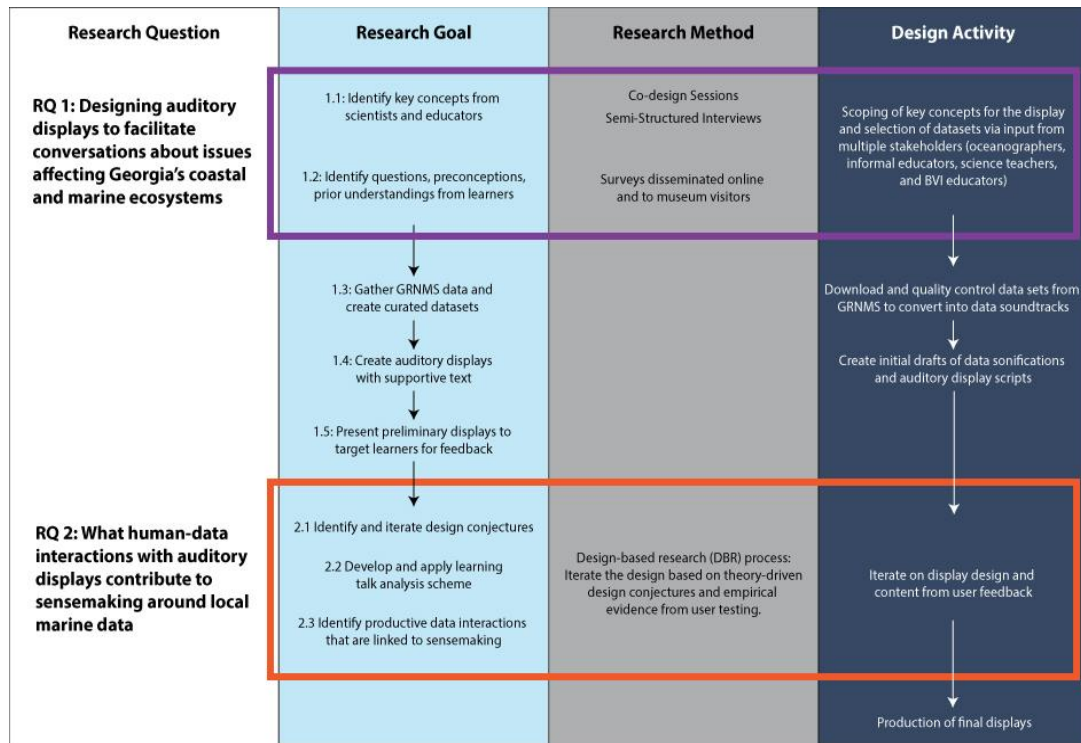
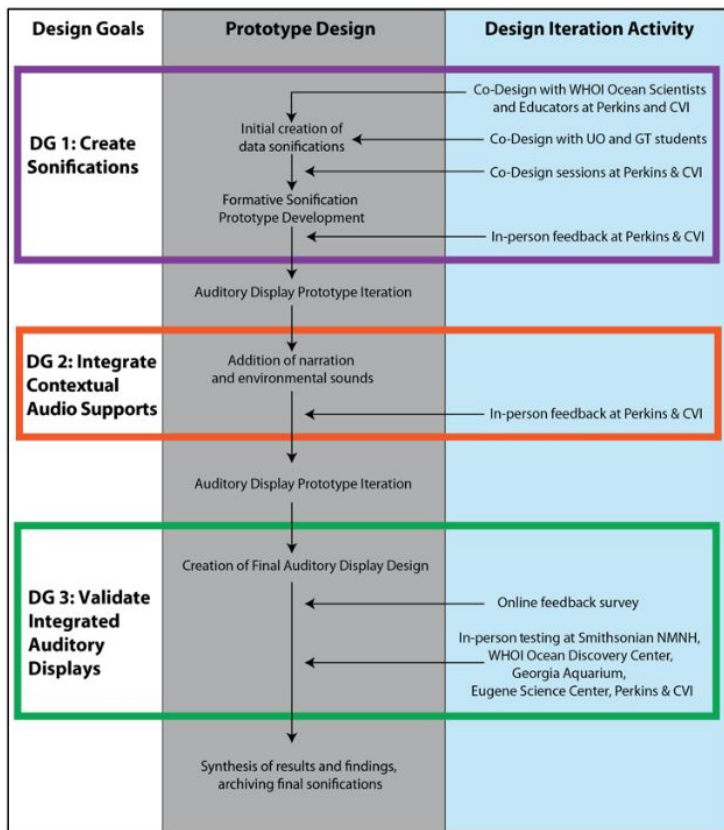
miSci's Jane Golub Gallery

Don't be afraid to switch programs (AISL to DRK-12)

Figure 2: STEM-WISE concept model



What parts of your process are portable?



Discussion

Consider the quotes (next slides).
How would subscribing to this idea influence
your work?

Don't Be *Such* a Scientist

TALKING
SUBSTANCE
IN AN AGE
OF STYLE

Randy
Olson



The four organs are indeed a major secret to reaching the public.

The object is to move the message out of the head and into the heart with sincerity, into the gut with humor, and if you're skillful enough, all the way down to the lower organs with sex appeal.

Hollywood once produced a movie for 8 million dollars and budgeted 50 million to market it. In education, we take the opposite approach. We spend 99% of our resources doing the work and just 1% of effort toward sharing.

Don't Be *Such* a Scientist

TALKING
SUBSTANCE
IN AN AGE
OF STYLE

Randy
Olson

SECOND
EDITION



HAPPILY EVER AFTER

More ideas, any on closure for teams

Recommend resources

Collected wisdom—reactions to the session

