June 24 - 26, 2016

**REPORT #1: *SCAPE Water Quality Curriculum Development Workshop***

**INTRODUCTION**

SCAPE—Sustainable Communities and Place-based Education—is an environmental education project that combines online learning and field observations linked to living classrooms across the Colorado River Basin. Students and community members learn about human health threats that arise from pollution to the Colorado River System, STEM-aligned methods for measuring in-stream flow, and techniques for sampling water quality parameters and gathering indicator species to investigate potential sources of pollution.

The project is currently funded by a $192K environmental education grant from the Environmental Protection Agency (EPA). Arizona State University faculty from the School of Life Science, the Herberger Institute for Design and the Arts, and the Julie Ann Wrigley Global Institute of Sustainability are partnering with high schools across the Colorado River Basin.

Per the original grant application to the EPA, a schedule of regular reporting has been established. This report is the first of several reports that will track the development of the project and provide detailed information for the evaluation team from the University Office of Evaluation and Educational Effectiveness (UOEEE).

This two year project is organized in two phases: Phase 1 focuses on curriculum design and testing; Phase 2 includes teacher training and the roll-out of our environmental education curriculum to 10 pilot schools across the Colorado River Basin.

Our first workshop was held on June 24 – 26, 2016 at the Deep Creek School, a private camp 7 miles west of Telluride. This prototype will be beta-tested in the 2016-2017 academic year by two master high school science teachers, Rex Lybrand from the Telluride High School and Casey Jones at the Orme School. Telluride is located at the headwaters of the San Miguel River, part of the upper Colorado River basin; the Orme School is near the headwaters of the Agua Fria drainage, a tributary of the Gila River which meets the Colorado River at Yuma, Arizona.

**WORKSHOP #1 PARTICIPANTS**

The 3-day workshop brought together research scientists, environmental educators, two regional high school teachers, educational media designers, and a computer networking expert to brainstorm and produce guidelines for a prototype curriculum. Participants included the following:

Dan Collins, Professor, ASU (PI)

Kaard Bombe, Videographer

Hilairy Hartnett, Professor, ASU (Co-I)

Casey Jones, Director of Sustainability, Orme School, Mayer, AZ

Damien Jones, Educator / Spiritual leader, Navajo Nation, Gallup, NM

Laurie Lundquist, artist, TI Board member

Rex Lybrand, Science teacher, Telluride HS, Telluride, CO

Laura Kudo, Co-Director, WEP, Telluride Institute, Telluride, CO

Vicki Phelps, Co-Director, WEP, Telluride Institute, Telluride, CO

Karl Topper, Director, VFLC, Telluride Institute, Telluride, CO

Monica Elser, Environmental Educator, GIOS, ASU (Co-I)

Helen Rowe, Ecologist, Director, McDowell-Sonoran Preserve (Co-I)

Shaun Ylatupa-McWhorter, Data Visualization and Cloud technology expert

***SCAPE* WORKSHOP #1 SCHEDULE**

The program ran from 8:30 am – 5:30 pm for three days with supplemental evening sessions. Here is a synopsis of the activities for the three days:

|  |  |  |  |
| --- | --- | --- | --- |
| **Day/Time** | **Location** | **Activity/Key Questions** | **Notes** |
| Friday morning | Deep Creek  Stone House  Back Deck | Welcome song and prayer led by Damien Jones, Navajo spiritual leader. | The Deep Creek School is located 7 miles west of Telluride at the intersection of CO State Hwy 145 and Deep Creek Road. |
| Friday morning | Deep Creek  Ice House | Introductions and Overview. Sharing “best practices.” What is the “state of the art” for water quality testing—both professionally and in advanced HS classrooms? What should a 21st c. curriculum look like? | Continental breakfast. Each participant shares EE modules for water quality testing. Group brainstorm. |
| Friday noon | Deep Creek  Stone House  Back Deck | LUNCH |  |
| Friday afternoon | Confluence of Deep Creek and the San Miguel River | Field work with both traditional equipment and digital equipment. How can we manage the logistical challenges in the field? Equipment versus data management. Analysis of outcomes. | Rex, Karl, and Vicki. Work in Deep Creek and San Miguel River—with everything from kick nets to digital probes. Dress appropriately. |
| Friday evening | Deep Creek  Stone House | Uploading data to the cloud. Sample collaborative work session. | Shaun (session leader) |
| Friday evening | Deep Creek  Stone House | DINNER | Vegetarian and meat lasagna, salad. |
| Saturday morning | Deep Creek  Ice House | Review of cloud data. Visualizing the data using Google Fusion tables. How does WQ data from across the CR Basin complement local field work and traditional classroom/lab work? | Challenges of combining field work with lab work and cloud-based data analysis. Collaboration across the CR Basin. |
| Saturday noon | Deep Creek  Stone House  Back Deck | LUNCH | Brown bag lunch provided |
| Saturday afternoon | Deep Creek  Ice House | Custom Lesson plans for each school and overall curriculum. Similarities and differences of approaches (e.g., Yuma versus Telluride or Pinedale). | Google docs and products used to create master document and “bespoke” curricula for each school. SWOT analysis to tease out current practices and possible opportunities. |
| Saturday evening | OPEN | OPEN | OPEN |
| Sunday morning | Deep Creek  Ice House | Crafting the pitch to HS teachers. Sample presentations. What would inspire YOU to adopt the curriculum?. | Continental breakfast  Wikis, powerpoints, talking points, slide shows , thumbnails, oral presentations of lesson plans |
| Sunday noon | Deep Creek  Stone House  Back Deck | LUNCH | Picnic along Deep Creek |
| Sunday afternoon | Deep Creek  Stone House | Final recommendations/goals to be implemented at Telluride High School and Orme School | Final deliverable. |
| Sunday afternoon | Deep Creek  Stone House  Back Deck | Closing ceremony led by Damien Jones, Navajo spiritual leader. |  |
| Sunday evening | Deep Creek  Stone House  Back Deck | DINNER | BBQ chicken, salad |

**DAY ONE (June 24)**

**Highlights of Individual Presentations and Group Discussion**

The first day began with a sunrise ceremony led by Navajo spiritual leader, **Damien Jones**. Damien led a prayer asking for a successful workshop and, along with his family, sang a traditional Navajo song.

Following breakfast, the group gathered in the Icehouse for a series of presentations.

**Damien Jones** gave a powerpoint presentation that detailed the heartbreaking history of interactions, broken treaties, genocide, environmental decimation, and forced marches and relocations imposed by the US Government upon indigenous peoples from the mid 19th century to the present day.

**Monica Elser** discussed her work in environmental education. In her wide ranging discussion, she detailed her involvement at ASU’s Global Institute of Sustainability (GIOS) in which the focus is on:

1. Systems thinking
2. Future visioning
3. Consideration of Stakeholders and different perspectives
4. Action orientation
5. Respect for diversity
6. Values-based thinking

She asked the questions: “how do we move forward to solutions that address the economic, environmental, and social challenges in a sustainable manner?” and “How do we FRAME the problems/solutions?”

She grounded her remarks in two stories—one concerning the invasive zebra mussels in Flathead Lake in Montana; the other focused on the dichotomous (contradictory) recommendations of the NPS (or Fish and Game?) regarding native fish that prefer the warmer waters of the Colorado versus the sport fish that prefer colder water.

High School, outward bound, upward bound.

Kids. What should we do? How to play well? How do we introduce students to environmental issues. It’s not just a matter of introducing water chemistry. What are the ethical dimensions, the unintended consequences of environmental policies? It comes down to people and an egalitarian approach to teaching.

She recommends the PROJECT WET curriculum guide, *Healthy Water, Healthy People*, that emphasizes the relationship between the environment and people. She also likes “Expeditionary Learning”

Laura commented about the difference between “questions and problems”. Yes, a problem might arise, but if we “reframe” the issue to students by asking “what are the questions?”, this can lead to a more productive and active interaction with the students. (DAN: Do I have this right, Laura?).

**Karl Topper** and **Vicki Phelps** discussed “Monitoring and Sampling.” Vicki described the Riverwatch program in which over 180 schools from across the state have participated in gathering water quality data using legitimate water science protocols. Locally, schools in Telluride, Norwood, Nucla/Naturita have been involved to various degrees in collecting water data. However, she indicated that there was a flaw: there was no collection insight, no shared wisdom, no shared purpose.

Vicki also discussed the process of sampling macroinvertebrate populations along the 72 miles San Miguel River—which descends from its headwaters at over 14,000 feet to its confluence with the Dolores River at 4500 feet. The river flows through a wide range of habitat—with a wide range of physical, biological, and chemical diversity. Consider, for example, the differences between Telluride and Uravan, Colorado. Or there can even be wide variation within a few hundred feet. She indicated that our field trip to collect macroinvertebrates in late June was “a bit early.” Ideally, we’d be conducting our sampling in October and we’d collect three different times.

Vicki discussed BMI—Benthic Macroinvertebrate Identification. Defined “benthic” and “macro” and discussed how the “richness” of a sample referred to the variety of species in the sample. “Tolerance” varies with respect to pollution—more tolerant species can survive in lower quality water. “Dichotomous keys” are used for keying out species. “Data collection” might involve photography, measurement…but as few variables as possible.

Monica commented that the protocols were appropriate for high cold streams. (DAN: we also discussed importance of providing site-specific curricula and instrumentation appropriate to each school).

Rex floated the idea of the “River Continuum”—a concept that tells “the story of the river from its headwaters, its DO (dissolved oxygen) and temperature regime…it’s a living, breathing thing that yields a story.”

Laura enthused that “bugs are cool” and are great for inspiring and involving kids.

Karl said something about how nature is in control…and we need to actively engage…”pick up a rock” (to reveal macroinvertebrates living in the stream).

**Rex Lybrand** began his presentation with a review of his background teaching and guiding on the Ocoee River (threatened by historical copper mining) in Tennessee and at Bainbridge Island near Seattle, Washington. He is an advocate of “backwards design”—where lessons are derived from a passionate engagement in the real world (e.g., outreach, overnights leading to engagement with the environment…then with chemistry). He reviewed some of the new classes/curricula at Telluride High School.

He mentioned the book “Sacred Balance” by David Suzuki…he uses this book with his science classes. In this book, David Suzuki argues that the real bottom line, and society's challenge today, is not debts and deficits, but the need to live full and meaningful lives without destroying the Earth's biosphere, which supports all life. [https://www.amazon.com/Sacred-Balance-Rediscovering-Place-Nature/dp/1550546910](https://www.amazon.com/Sacred-Balance-Rediscovering-Place-Nature/dp/1550546910%20)

Karl commented: “place-based approaches provide relevance to the lives of students…and provide an alternative to conventional grading.” Self-motivation is key.

**Casey Jones** provided curriculum examples from the Orme School where he is the Director of Sustainability. He presented an overview of the School within the context of a 16 year drought. They have a one week intensive “fine arts week.” Diverse student populations.

His goal: “students need to learn to make choices that lighten their impact.” (do I have this right?)

He typically works with classes of 9 kids. It’s very hands on. Lots of opportunities in the immediate vicinity of the Orme School of field trips and water quality studies.

Project: “Resources Out of Place” (what was this again?)

Monica: We should help identify local resources for each school. GLOBE.org could be a good resource. She also mentioned the *Upper Agua Fria Watershed Partnership* <http://www.uafwp.org> as an example of the kind of localized resources we could identify to supplement the SCAPE curriculum.

Casey: There is a 3 day camping trip every Fall. And a 10 person group for 10 days (?). Important to show sensitivities to diverse cultural experiences.

Laurie: Mindfulness

Rex: The full food cycle—psychologically, emotionally, connected. Food gives scale. Sustainable food systems and water.

Monica: Teachers will pick and choose themselves.

Karl: Upper Colorado/lower Colorado River conversation between individual teachers. Advise sooner and provide connections to teachers.

Monica: Will take and adapt. Tech versus traditional.

Rex: Coordinate via Skype. Water quality data can be shared the same day.

Monica: Project Bud Burst. <http://budburst.org/>

Shaun: What is the benefit of comparison?

Rex: River continuum. Reverse engineering entire system. Generate questions. They try to create the reality of the River Continuum. It’s a challenge to kids…they identify project that engages a local stewardship issue. Perhaps through a club?

**Shaun Ylatupa-McWhorter** reviewed some of the challenges in creating a robust online system that can be shared by the SCAPE project schools.

Outline of necessary steps:

1. Frame the subject
2. Gather data (DAN added this step)
3. Compile the data
4. Analysis (based in data/adds value)
5. Load / reporting (?)

Choices:

1. Technology
   1. delivery system,
   2. numbers of participants (100 – 400),
   3. Access,
   4. Security,
   5. Culture
2. Data
   1. Different parts of the
   2. What are we collecting? (e.g., images, numbers, geographic location, date)
   3. Data representation
3. Statistics
   1. E.g., how do we know salinity off the charts in Yuma?
4. Work flow
   1. Where is the burden assigned?

Table Schema

Problems & Solutions

Questions & Responses

Making Meaning

Hilairy: Importance of non-electron based records. (translation: paper records).

Monica: Google products very popular with teachers. Good access.

Shaun: Microsoft 365 Power BI (business intelligence). Cloud-based solution: <https://technet.microsoft.com/en-us/library/mt282164.aspx>

Karl: Kids have their own Google accounts for the most part.

Monica: National Phenology Network / Nature’s Notebook: https://www.usanpn.org/natures\_notebook

(Dan: In follow-up emails, Monica also suggested Cornell e-bird and GapMinders (https://www.gapminder.org).

Vital Signs: <http://vitalsignsme.org/>

Riverwatch: <http://cpw.state.co.us/aboutus/Pages/RiverWatch.aspx>

Laurie: Live Seed (DAN: Laurie…is there a link or organization for this?).

Laura: Colorado Avalanche Information Center: <http://avalanche.state.co.us/>

Hilairy: Google. (DAN: pro or con?)

Karl: Project Bud Burst: <http://budburst.org/>

Hilairy: Spatial data…not temporal monitoring.

Artwork as activity next to stream.

Vicki: Surf your watershed (EPA): <https://cfpub.epa.gov/surf/locate/index.cfm>

USGS versus EPA

Monica: Teacher written lessons—translating EPA data from website. <https://www.epa.gov/students/lesson-plans-teacher-guides-and-online-resources-educators>

Dan: <http://www.globe.gov/> (global environmental data hub—“enter and visualize data”)

**DAY TWO (June 25)**

Instrumentation. Rex Lybrand, Karl Topper, and Vicki Phelps introduced the array of equipment available—analogue test kits, digital probes, and macroinvertebrate collection kits--for water quality testing.

The group reviewed various digital probes purchased for the program from Vernier. They also discussed the pros and cons of using more traditional kits (such as the Hach water quality test kit) which is more “analogue.”

Rex in particular has used the Vernier kits extensively for not only chemistry (where our interest lies) but in subjects like physics. In every case, one of the primary attractions is the ability to easily share the data.

Hilairy recommends the following parameters be sampled: Temperature, Conductivity, pH, and Dissolved Oxygen (DO), and Turbidity.

A discussion regarding the utility/wisdom of gathering Nitrites/Nitrate data ensued. In Hilairy’s opinion, the concentrations are too dilute to be significant. (DAN: In certain areas adjacent to agricultural sites or recreational sites—e.g., golf courses—wouldn’t the Nitrogen load in runoff be important to measure?).

Other factors considered included: BOD (Biological Oxygen Demand), suspended solids/sediments as measured using a Secchi tube (or Vernier probe), total hardness (alkalinity), discharge/flow.

Karl: Flow (CFS) or discharge. Important for insects.

Hilairy: Turbulence/flow also impacts DO. Also, there is so much variability, uncertainty, very difficult to make meaningful comparisons.

Hilairy: Take a look at the “Leaf Pack Project” out of the Stroud Center in Pennsylvania. The method provides a combination of field and lab experiences based on exo-samples where leaves, pine needles, etc. are packed in bags left in the stream. These bags tell the story of stream health via the bacterial story / oxygen consumed / macroinvertebrate count of particular sites. This is a great Citizen Science example—the Leaf Pack Project at the Stroud Center in Avondale, Pennsylvania.

Dan: I could see this model at the core of our project…it has not only the field work component where students create “leaf packs” (20 gram nylon nets filled with leaf litter from particular sites and left in a stream for 3 weeks), but also could be conducted by larger groups in a conventional classroom setting where leaf packs are shared with teams. Also, the data network is also in place for this project where schools from across a given system are comparing notes and data. See this very informative video: <https://www.youtube.com/watch?v=ozQu8nlsYQw> ;

main website: <http://www.leafpacknetwork.org/> ;

Here is link to list of participating schools: <http://www.leafpacknetwork.org/lpn/macro2.asp>

Link to equipment: <http://www.leafpacknetwork.org/lpn/resources/equipment.shtm>

Hilairy: bottles, syringes, carbon samples could be sent to HH for analysis

Note: Consumables should be school responsibility

Laura: Safety protocols around water need to be outlined and conveyed to students.

Dan: What were the comments Hilairy made regarding “filter in a syringe” …or “caulking guns” from Checker Auto??

Karl: Recommends Hach system. Procedures included in the kit and include step by step instructions. Good for 12 – 20 students. You can also set up multiple stations.

Casey: When you purchase, make sure you get back up of consumables and waste containers.

Hilairy: Hach has replaceable membranes for test instruments/kits.

Vicki: With respect to BMIs (Benthic Macroinvertebrate Identification) there is a standard Riverwatch form. Also, Matt Dare of the Forest Service works closely with WEP/VFLC.

Monica: Life stages important. Locations. Different moments in life stages impact different food webs. Each habitat presents different resources at certain life stages. Some go from egg > adult (incomplete metamorphosis). Others go egg > larvae > adult.

But working at the level of the ORDER is probably sufficient.

Dissecting scope versus compound scope…every high school should already have a compound.

(Dan: See discussion of differences here: <http://theydiffer.com/difference-between-compound-and-dissecting-microscope/>)

Protocols for Field Work important

--dress appropriately

--sunscreen, hat, water bottle

--boots

--change of shoes and socks

Right equipment (such as waders) = ENGAGEMENT by students

Science mentors, lab coat,

Pre-field

Preserved specimens

Charts

Other resources:

--Trout Unlimited can donate waders

--Hilary Cooper

--Cooperative Learning

--small group

--peer to peer interaction

--mentorship

--each one / teach one

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DEBRIEF from FIELD TRIP

After lunch on Saturday, the group walked down to the confluence of Deep Creek and the San Miguel River. Donning waders and carrying kick nets and digital gear, we all tried our hand at sampling water for the presence of macroinvertebrates and various chemical constituents.

A sheet from Vicki was used for our discussion which included the following:

--documentation of habitat with Life Zone, riparian vegetation, canopy cover, transecct

--sites 100’ above and below initial collection site

--ice cube trays are useful for separating orders, families

--sheet used for recording relative sensitivities of macroinvertebrates.

--average depth

--presence of organic/inorganic matter in sample

--physical habitat along the bank een u

Vicki: Contract for teachers who are written into the grants

Monica: Restrictions on I.T.

Hilairy: Personal field notebooks.

Shaun: How to manage the process? Tablet on the shore? Small clamp on pole? Wifi/blue tooth? Laminated cards attached with rings? Consistent units of measurement.

Monica: What does WEP stand for? (Dan: Watershed Education Program…a program of the Telluride Institute). <http://www.tellurideinstitute.org/watershed-education-program.html>

What about salinity? Differences between headwaters, the “salt dome” in Paradox, and the high salinity of the River at Yuma. Different between monitoring and education. ADEQ, USGS data.

**Laura Kudo** presented on WEP

See .ppt from Laura (Dan: can I get from you, Laura?) and video. Here’s a link to the video: <https://vimeopro.com/user2927550/telluride-institute-environmental-studies>

Monica: Goals and objectives. Importance of meeting for further funding.

Dan: What was the “curriculum for Island” (rising sea level????). I don’t have it in my notes.

**Hilairy Hartnett** presented her work on “Investigating Carbon Transport and Transformation in Rivers.”

A tale of two rivers—integrating teaching/research with a field teaching component.

Upstream/downstream patterns.

Field measurements included pH, temp, conductivity, alkalinity, DO, NO3, NH3, P04, Fe, NPP, (Dan: I may have botched this…it would be good to link entire presentation to the SCAPE website).

Monica: Many of the processes are natural. “’People did it!’…well, not necessarily. What’s important to things living in the stream?”

Hilairy: Carbon concentration in my lab. Dog food for organics ??? Impacts on aquatic foodwebs.

Laura: Online component—Ask the professor?

Monica: Globe.org model.

Goal: Conceptual model and a hypothesis based on their data.

Dan: Like the Vital Signs model.

Monica: We should create a lesson from Hilairy’s data.

As per Laurie’s notes:

Base knowledge—most important: River ecology, river trophic lands and food webs, chemistry, nutrient cycling.

Goals (reflect original EPA proposal…fill in the blanks):

1. Connect local data to system wide knowledge.
   1. Connect to existing data / local field station
   2. Capture original data
2. Behavioral Change
   1. History of the River / current uses
   2. Reservoirs / personal connections / recreation
3. Use Digital Tools
   1. Develop questions related to data
4. Increase environmental literacy and stewardship
   1. What does this mean?

Data > information > understanding (knowledge) > wisdom (Dan: from PRISM I think)

Other resources:

Data Nuggets.org (Michigan State University)

Pete McBride (photographer). Chasing Water (2011) <http://www.imdb.com/title/tt1880147/>

Mountain Film, Telluride. Making Movies That Matter.

Corvina Etsitty (Dine high school teacher in Many Farms, AZ).

NGSS – Next Generation Science Standards

**DAY THREE (June 26)**

Damien Jones – Closing Ceremony with Family.

**Curriculum Discussion**

Monica: Can’t be everything to everybody

We need to take into account different teaching styles and science background (for example, if no background in basic chemistry, some kind of pre-lesson, in-service training may be called for.

Goal I – Local to System wide knowledge

--gather, manage, analyze, and compare data

--use maps

--describe local conditions

--what knowledge, process, skills are needed for success?

Goal II – Behavioral Change

--history

--personal commitment

Goal III – Digital

Goal IV – Stewardship / Environmental Literacy

--projects may go beyond “science” approaches

--photovoice -- <https://en.wikipedia.org/wiki/Photovoice>; <https://photovoice.org/training/>

<https://www.academia.edu/13059795/Portraits_of_Water_-_participatory_photography_in_Rajasthan>

--poetry

--journalism

Meaning < > Inquiry

Data, Information, Knowledge, Wisdom

Basic Knowledge – what pre-learning/foundational knowledge is needed?

--basic river ecology

--photosynthesis

--macroinvertebrates

--energy

--trophic levels

--basic water chemistry.

Rex: With A/P students he can ask student to fill in the gaps, but with beginning or lower performing students, there will need to be remedial lessons/modules.

Hilairy: Basic lesson plans are available

Monica: There are resources we can provide to help specific groups of students.

Casey: 10th/11th graders will have had Biology, maybe Chemistry. Can do all things of the course of the year. Most schools require three science credits to get through High School.

Dan: Can this course be structured to satisfy one science credit? What would it need to include?

Hilairy: Dissolved oxygen – we can make materials available.

Monica: Short videos can be effective. Pre-existing resources from places like Kahn Academy.

Dan: See for example this crash course in biology / ecology here: <https://www.khanacademy.org/science/biology/crash-course-bio-ecology#crash-course-ecology-2>

Karl: Basic knowledge – standards. Challenge of time > what products? What equipment? How to keep students on task. There is a difference between typical class size of 25 – 30 and the WEP model which is easier to manage.

Hilairy: What is the sweet spot? Is four Units enough?

Casey: Train teachers @ Orme (Dan: Are you offering?? ☺) Classes versus environmental science club.

Dan: How “baked” is scope? Can we back into specific units?

Monica:

Rex: “Beginning with the end in mind.” Video products – story of local landscapes, build these into finished curricula. See “Center for Teaching Case Studies” in Buffalo, NY.

Dan: See the website here: <http://sciencecases.lib.buffalo.edu/cs/> Here is the full text of the book “Start with a Story: The Case Study Method of Teaching College Science.”

<http://pal.lternet.edu/docs/outreach/educators/education_pedagogy_research/start_with_a_story.pdf>

Hilairy: My story versus … \_\_\_\_\_? Scale. Importance of telling a story of place.

Laura: How does this happen? Motivation for inquiry. Who what how where why > wisdom

Casey: “Every time a student turns on a tap, they recognize the miracle.” This is the goal.

Monica: What can my story be in the future?

Karl: Ivey school—International baccalaureate (??). Inquiry/frame. Unit of study. 2 week module. (Dan: Can anyone remember the context/intent of this reference?)

Monica: Kits to collect those classifications

Damien: Communities, Melanie at ASU ([Melanie Bertrand](https://webapp4.asu.edu/directory/person/2211774) and Youth Participatory Action Research?): (Dan: See program link here: <https://asunow.asu.edu/20151105-asu-project-helps-empower-civic-involvement-marginalized-youth>)

Social Studies—Pre-1900 for Native America, Grandmother Rock Point, How did Utes sustain?, Sand Hill massacre, Youth Participatory Action Research

Social Justice.

Bill Ayres, Teaching with Conscience.

Ayers, William (2016). Teaching with Conscience in an Imperfect World: An Invitation (Teaching for Social Justice). New York: Teachers College Press, Columbia University.

Protecting Freedom. From Commodity to Community.

Monica: What’s most…

Casey: Summary. Major themes.

Monica: Existing lessons and resources.

1. Frame—the lesson from a story…the story that is revealed through the collection of the data. Photos, story.

Laurie: Making Movies that Matter (Telluride Mountain Film Fest) led until recently by Ellen Shelton. Ben Knight, Suzanne Beraza (Reel Things Productions—Bag It, Uranium Drive-In)

Writing across the curriculum. Video essays. 2 -3 minutes. Ouray girl. Powerful products. We are endocrine disruptors. Story boards.

Monica: Water Resource—U of A Water Research. Project WET.

Kerry Schwartz—Director of Project WET. <https://arizonawet.arizona.edu/users/kerry-schwartz>

A lot of work done in Yuma, AZ. A suite of products.

Karl: Identify the driving question. Assessments show the underlying concepts. Rubric. Menu of choices.

Monica: Hashtag = SCAPE

Jorge might be helpful here.

Jorge Ramos is a PhD Student in Ecology at ASU: [https://webapp4.asu.edu/directory/person/1544378](https://webapp4.asu.edu/directory/person/1544378%20)

Citizen Science

Cloud

Queries

Hashtag…advertise, use

Gaming

Rex: Archival (? Can’t read my note. Dan)

Monica: Synthesize (all feeds). Jorge has written a compiler??

Hilairy: Process maps relate to science as well…(?)

NGSS – Next Generation Science Standards

Monica: Datanuggets. <http://datanuggets.org>

NSF Beacon: NSF Center for the Study of Evolution in Action. <https://www3.beacon-center.org/> (Dan: Nice article about datanuggets and science teaching K – 12).

Datanuggets: real data

3 options for teachers:

1. Interpret existing data
2. Plot interpretations
3. Create the plot

In our case, we have an existing plot in Hilairy’s data.

Helen: Students should have the opportunity to plot their own graphs.

Laura: Basic knowledge/vocabulary. Holistic picture of Colorado. History, culture. Community (Damien). Prior data. Films about region. Thoughtful discussion guide. Inquiry questions. Place-based approach. A specific reach vs. tributary. Local history / local data. Questions. Inquiry.

Stewardship > Stories > Purpose

Hilairy: Learning cycle

What preexisting knowledge

What misconceptions?

How to re-integrate

5 “E’s” …

Engage

Explore

Explain

Elaborate

Evaluate

(Dan: See “elaboration” on the 5 Es here: <http://enhancinged.wgbh.org/research/eeeee.html>)

Dan: Our own model from Decision making.

Helen: EPA model – awareness > action.

Who is our audience?

What are we doing?

--multi-faceted curriculum that could address different schools and student populations

--Hands on experience collecting data locally

--Promoting awareness/sense of place and our own impacts

Monica Elser & Dan Collins – Compilation of materials from Final discussion

**Final Remarks**

**Recommendations (boiled down from sticky notes by Monica and Dan)**

* Write “data nuggets” with existing knowledge
* Collect the information generated by workshop, organize, and share it.
* Twitter feed#
* List deliverables and a rubric for evaluation
* Facilitate a “real” dialogue between the schools of the project –Skype, data parties, Adobe connect, Blogs, Google Hang-out
* SCAPE wiki
* “Intro” video available to all participating teachers (promotional)
* School profiles on the SCAPE Site
* Curriculum must be multi-faceted to meet a diverse set of schools.
* NO CHILD LEFT INSIDE
* The overarching theme of OUR > in connection to water: Lytoatxahnashchíín (Navajo word)
* Use data as a lab report
* Use ALL data as a lab report “meta nuggets”
* Have a single template for lab reports
* Provide a list of basic knowledge vocabulary list, glossary; resources
* Clear indexing & cross referencing
* Geographical representation of the data
* Teach SCALE of the CO River watershed (maps, models, etc.).
* Personal teacher to teacher connections
* Peer to peer interaction across the watershed
* Solid “starting date” for 2016/2017 school year – including delivery of equipment
* Specific kits, customized for each school
* Resources for macro-invertebrates (keys, list, photos, etc.)
* One content management system for all material – HUB hosting?
* Cross-disciplinary ideas & connections
* “River Continuum” as a model/metaphor for overall organization (Rex Lybrand)