Telling the Stories of Chemistry in Your Community Through Student-Created Videos (and Other Means)

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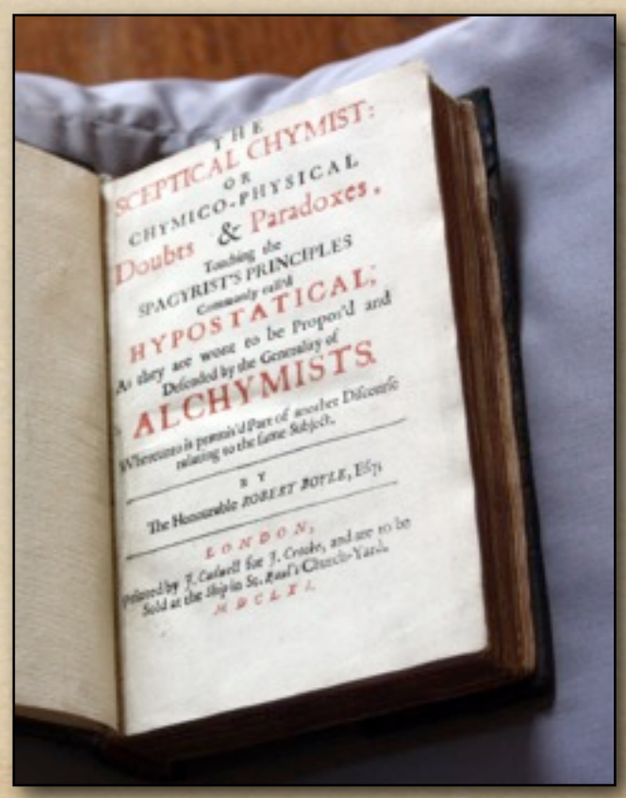
American Section of the
Société de Chimie Industrielle

Chemical Heritage Foundation

Air Force Association ...THE FORCE BEHIND THE FORCE

Who is this Presentation For?

- Teachers interested in involving students in an authentic, meaningful, challenging project (Project-Based Learning).
- Teachers who wish to incorporate video, blogs, wikis, and other Web 2.0 technologies into their classes (21st Century Skills).
- Teachers who value student-created content, student-centered classrooms, or students as scientists and historians (Citizen Science).



What are the Stories of Chemistry in Your Community?

- Metals and Materials: Mining, refining, rock quarries, cement, glass, steel, building materials, fabrication (welding), road salt, dry wall, bricks, tiles, liquid air.
- Artisan Workshops: Glass, ceramics, bronze, etc.
- Consumer Products: Cosmetics, perfumes, dyes, inks, bottles, paper, aluminum recycling, electronics.
- Food Processing: Soda bottling plant, food packing plant, brewery, chocolate factory, sugar, table salt.
- Energy and Environment: Coal mining and coal power plants; oil wells, refineries, and petroleum products (plastics, fertilizers, etc.); drinking water; pollution control; air quality.

More Elemental Stories

- History of Mining: Historic mine sites, museums, and mineral exhibits.
- History of Chemistry as a Science: Greek Matter Theories, Medieval Alchemy, Atomic Theory.
- Nucleogenesis: Physical history of the elements.

Background & Overview

- Walden Elementary Science Demonstration Program
- Examples of student presentations (Process & Outcomes)
- The Elements Unearthed: Concept, Rationale, and History
- Examples of sites we've visited
- Process & Outcomes
- Tips and Suggestions (what we've learned)

The Elementary Science Demonstration Program at Walden School

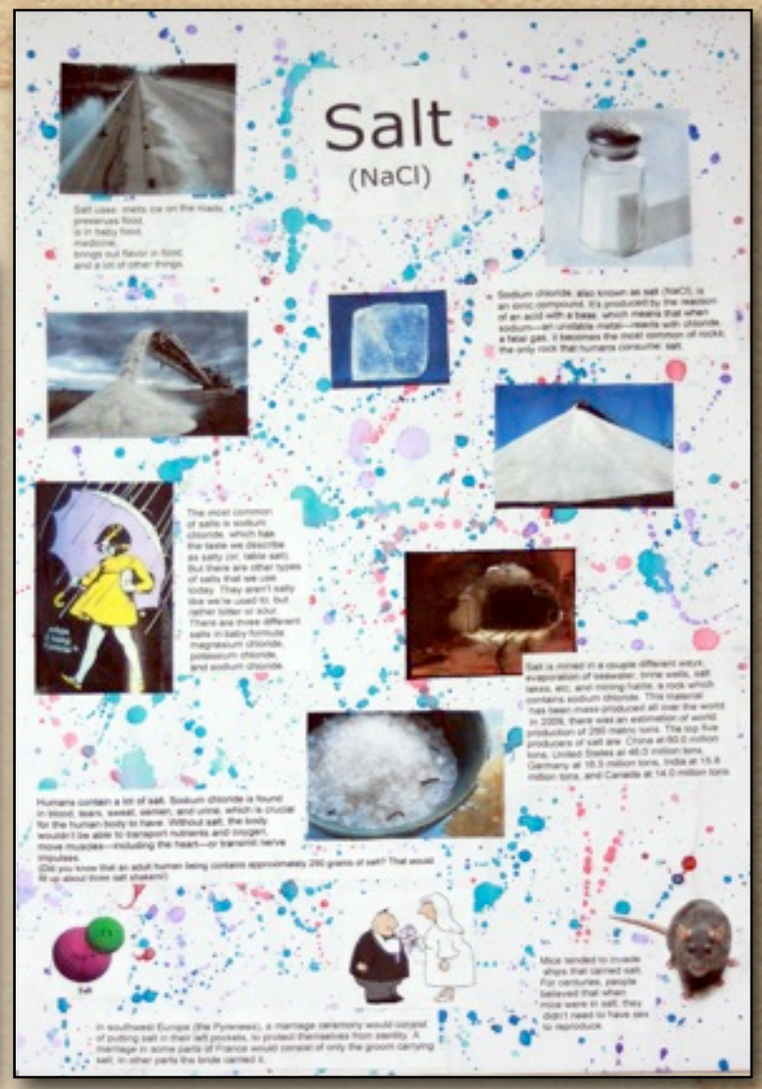
- Rationale: Students learn a subject most deeply when they are required to teach it to someone else.
- The "Feed a man a fish" analogy, extended.
- Sam and Cael.

Science Demonstrations

- Provides role models for younger students. Ex: Dallas and Lexie.
- Asks students to apply what they've learned through developing presentations with print documents, multimedia, hands-on, and inquiry components.
- Examples: Cabbage pH, Silver Tarnish, Salt the Slug Game.

Project Steps:

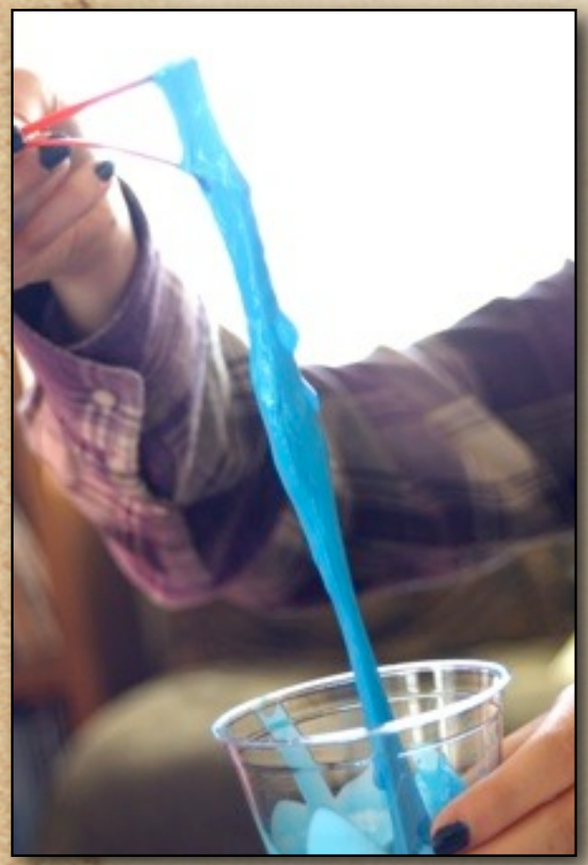
- 1st Term: A - Research (MS Word notes).
  B - Writing (print media: poster, brochure, newsletter).
  C - Blog Post.
- 2nd Term: Demonstration choice, scripting, practice, and presentation (either to elementary or to peers) with peer evaluation.



Project Steps, Cont.

- 3rd Term: Improvement and enhancement:
  A - Presentation skills: Smooth, deep, engaging.
  B - Visual components: Posters, handouts, equations.
  C - Multimedia: Video, slides show, game.
  D - Participation: Inquiry, hands-on, kinesthetic.
- 4th Term: Culminates in a Weird Science Showcase for parents, siblings, and the public.

Examples of Presentations



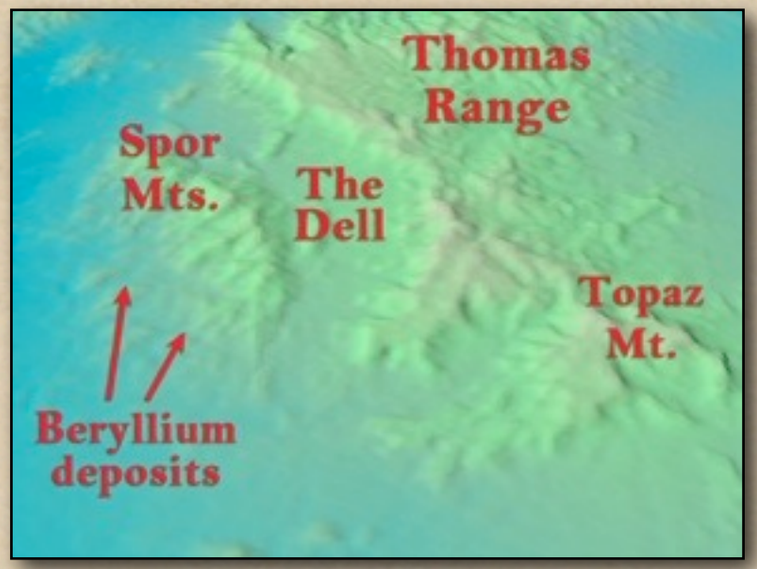
- Making Gak
- Cabbage pH
- Gunpowder
- Copper Properties
- The Alchemist's Dream

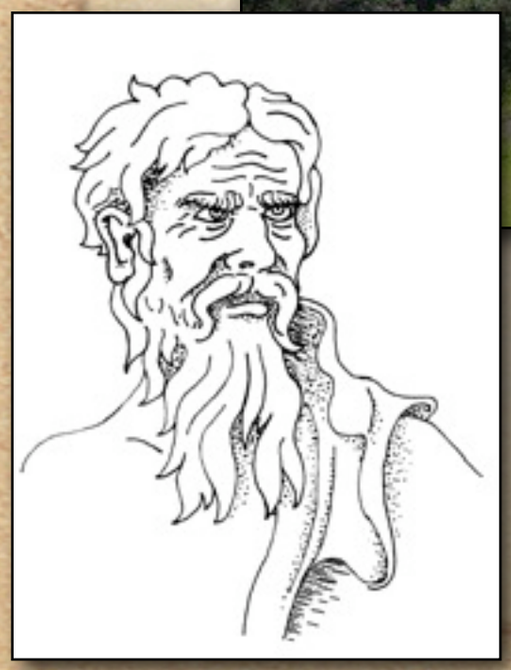
Presentation Videos

Sonora, Marni, and Morgan demonstrate acids, bases, and red cabbage juice as a pH indicator.

Student teams teach elementary classes about chemical reactions, materials, science history, and energy production.

The Elements Unearthed





Elements Unearthed: Concept

- Document the history, sources, uses, mining, refining, and hazards of the chemical elements and industrial materials through Internet videos.
- Use community-based teams (students, community members, etc.) to document local history.
- Collaborate with Subject Experts: scientists, engineers, or historians from local museums.
- Integrate video and Web 2.0 technologies with science, history, geography, art, and writing.
- Primary audience is the student teams, secondary is science teachers and their students, tertiary is general public.

Val Roberts, a 31-year old Deseret farmer, kneels beside well he drilled where he wants to build home, but cannot get federal loan because well exceeds set arsenic standards.

By Vern Anderson
Associated Press Writer

Arsenic Ruling Upsets Millard Area

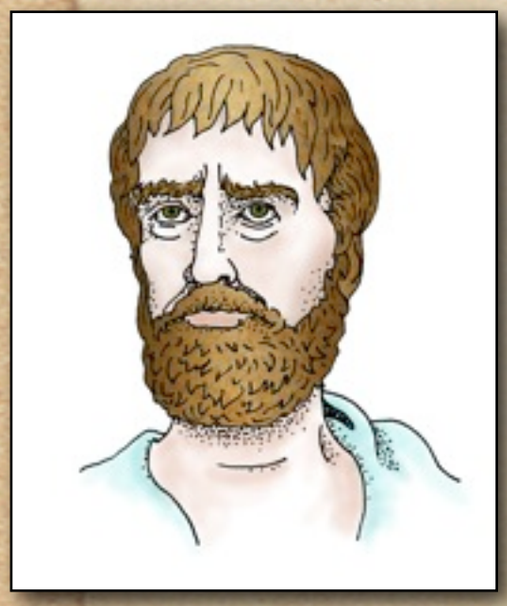
Our Project: Rationale

- Enhance chemistry literacy, a one-stop shop for information. Ex: Arsenic in Deseret water, HazMat Hell Week.
- Preserve local chemistry history. Ex: Tintic Mining District, Novatek.
- Encourage students toward STEM careers.
- Improve resource decisions nationally.

Elements Unearthed: History

- 2007-08: Experimental visits - learning how to do this (feasibility).
- 2008-09: Improved procedure - Subject Experts, Wiki collaboration, checklists, better equipment .
- Summer 2009: Research Fellowship at the Chemical Heritage Foundation and additional site visits, interviews with experts, and media collection.
- 2009-10: Edit footage and images into final videos. Ex: History of the Periodic Table, Beryllium.

Current Progress and Future Plans



- Recording more experts: Cripple Creek, CO; Reed Nixon (nuclear navy); Bingham Canyon Mine; Uranium mining & refining.
- Continue to edit videos (over 20 topics) and incorporate demonstrations while building video skills at Walden School.
- Phase II: Collaborate with students in other schools; they film the videos, we do the editing , add images, animations, etc.
- Phase III: Create ancillary materials, such as a series of DVDs, lesson plans, games (Flash and iPad/Android), a book, etc.

Example: Cement Manufacturing

- Ash Grove Cement Plant, Leamington Canyon, Utah.
- Subject Expert: Jeff Peterson, Plant Manager.
- Visit to quarry: Explosion!
- Tape the entire process from mining through calcination, kiln, ball mill, and transportation.

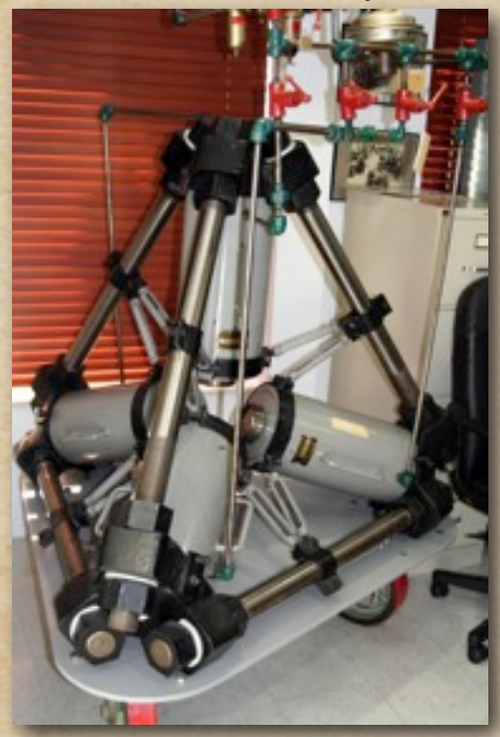
Example: Beryllium

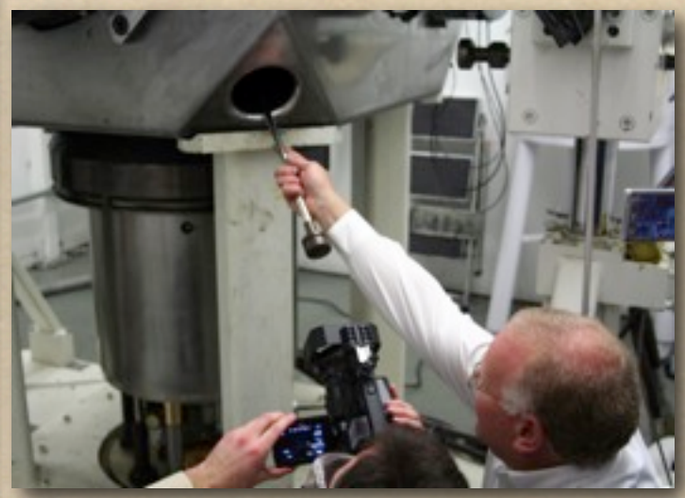
- Brush Engineered Materials beryllium concentration plant near Delta, Utah.
- The Spor Mt. deposit is the only commercial source of bertrandite ore in the U.S.
- Subject Expert: Phil Sabey, Manager of Technology and Quality.

Example: Glass Blowing

- Holdman Studios, Thanksgiving Point, Utah.
- Subject Experts: GayWyn Quance, chemist and glass blowing instructor; Trevor Holdman.
- History, process, art, science, and hazards of blown glass.
- Demonstrated how to make glass platters.

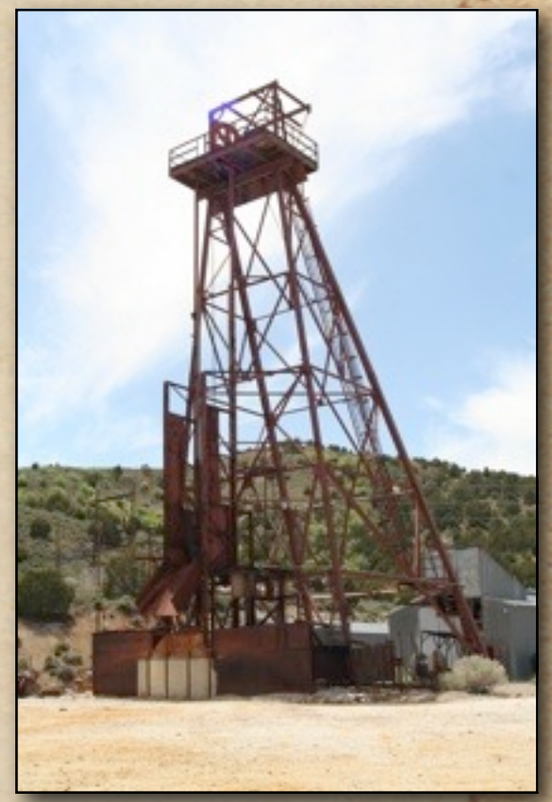
Example: Novatek (Synthetic Diamonds)





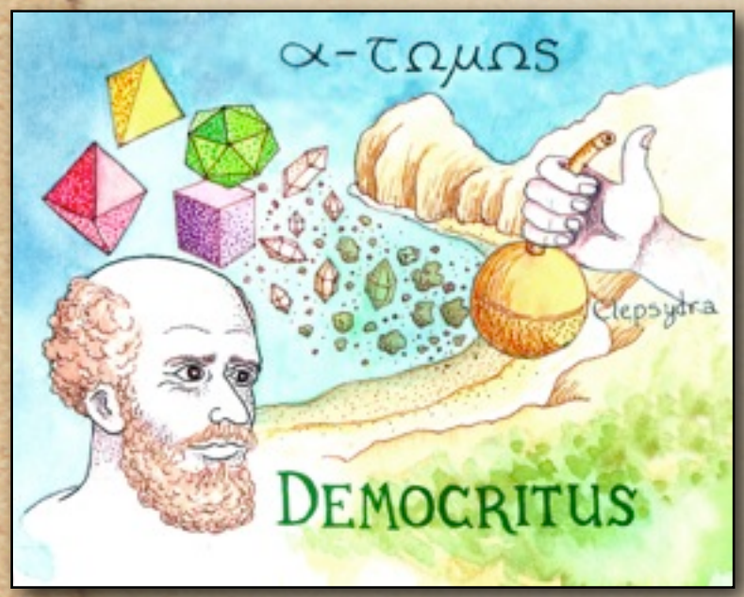
- Owned by David Hall, son of inventor H. Tracy Hall.
- Subject Expert: Francis Leany, Project Manager.
- Museum of original equipment, photographs, news reports, awards.
- History of discovery, new inventions, current processes and uses.

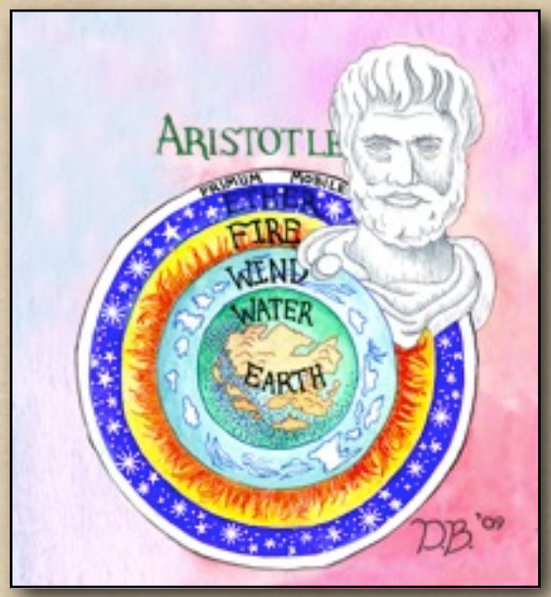
Example: Tintic Mining District (Silver)



- Tours of town and mine sites; extensive photos and video; in-depth document research.
- Tour of Tintic Mining Museum with Subject Expert June McNulty, a local historian.
- EPA Super Fund Site: clean-up is endangering the town's history.

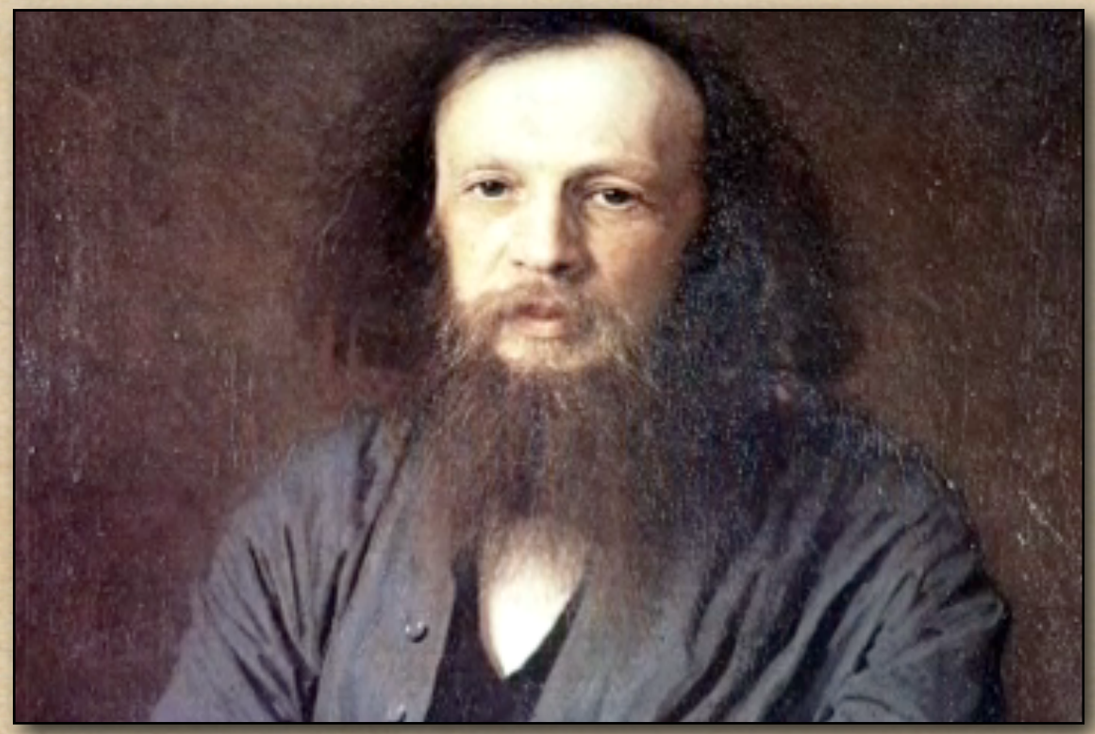
Example: Greek Matter Theories

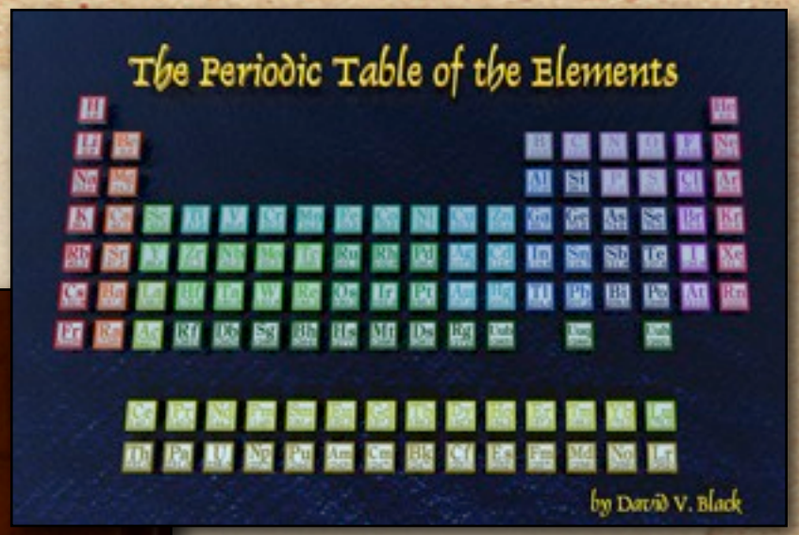




- Original illustrations, 3D animations, book photos (such as Diogenes Laertius).
- Based on recent scholarship (Lawrence Principe, Christopher Lüthy, etc.); researched at CHF.
- In three parts: (1) Thales to Empedocles, (2) Atomic Theorists, and (3) Aristotle and Beyond.

Example: Periodic Table History

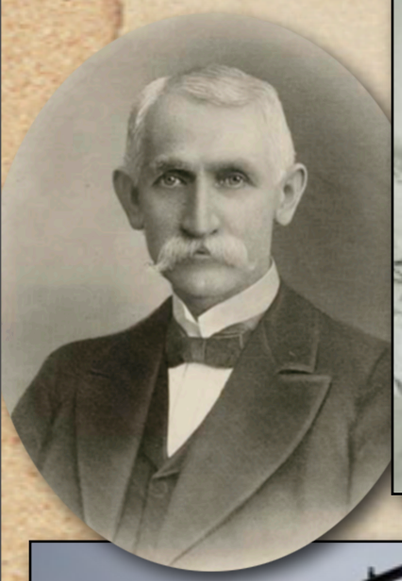




- Interviewed Dr. Eric Scerri of UCLA
- Photographed notes of Edward Mazurs
- Created illustrations and 3D animations
- Two episodes: "Before Mendeleev" and "Mendeleev and Beyond" now on YouTube

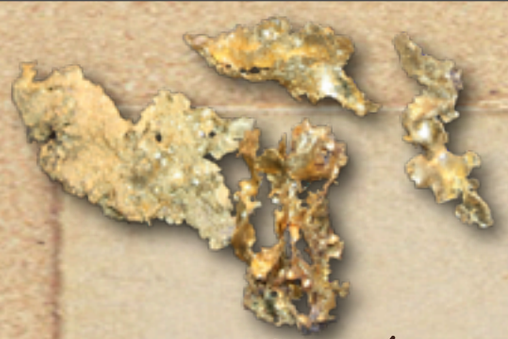
Cripple Creek

- Near Pike's Peak west of Colorado Springs.
- Gold discovered in 1891; last big gold strike in the continental U.S.
- Toured the Mollie Kathleen Gold Mine at 1000 ft. depth.
- Narrow gauge train ride.
- Visited nearby Victor, CO.



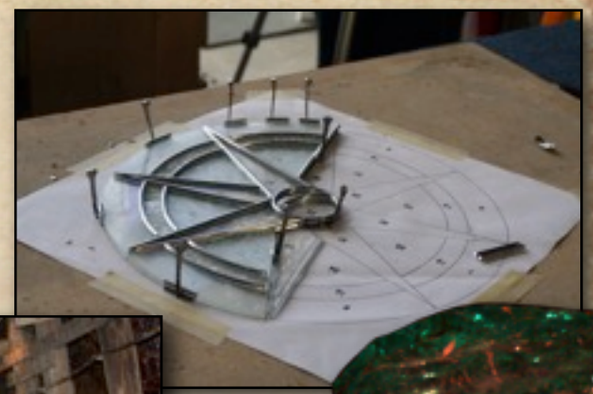
Reed Nixon: The Nuclear Navy

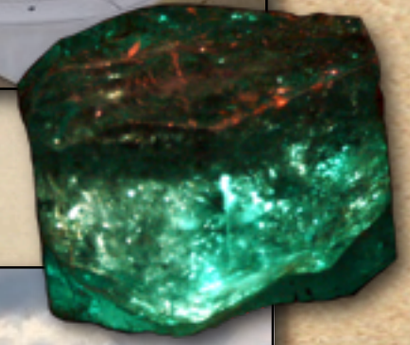
- Received Electrical Engineering degree at Caltech; Linus Pauling was his chemistry professor.
- Worked for Telluride Power Co., then at Idaho National Lab.
- Trained in Nuclear Engineering at Oak Ridge, TN.
- With Adm. Hyman Rickover's staff; oversaw the building of the reactors for the U.S.S. Nautilus and Seawolf.

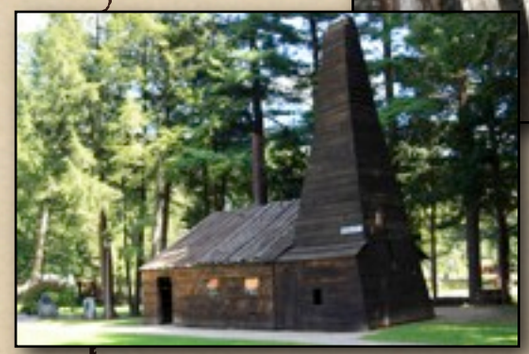


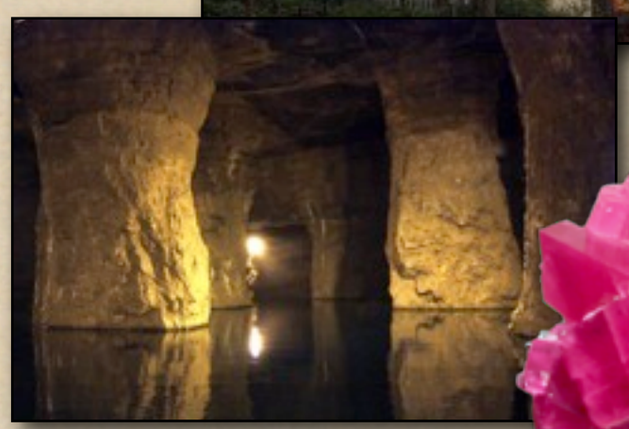
Other Examples

- Stained Glass: Holdman Studios, UT
- Lackawanna Coal Mine, PA
- Sterling Hill Zinc Mine, NJ
- Centralia, PA
- Drake Oil Well, PA
- Element Collecting: Theo Gray, IL
- Bonne Terre Lead Mine, MO
- Kansas State Oil Museum, KS
- Kansas Underground Salt Museum, KS
- Minerals: Museum of Natural History, Missouri State Lead Mining Museum, etc.









Video Process Steps:

I.) Research and Planning
- A - Choose topic (local angle)
- B - Research and write Wiki notes
- C - Collaborate with Subject Expert
- D - Develop preliminary script & questions

II.) Site Visit
- A - Prepare and learn equipment (checklist)
- B - Travel to site, set up
- C - Interview expert using prepared questions
- D - Videotape site tour

Process & Outcomes, Continued

III.) Post-Production

A - Footage capture, naming, and transcription

B - Final script, with Subject Expert approval

C - Content list and content creation

D - Narration recording and de-noising

E - A-roll edit: Prime footage and narration

F - B-roll edit: Animations, titles, photos, etc.

IV.) Evaluation

A - Alpha testing (in-house: technical quality

B - Beta testing (final audience) & editing: content quality, with Subject Expert approval

C - Final exporting, compression, metadata, and uploading

V.) Feedback

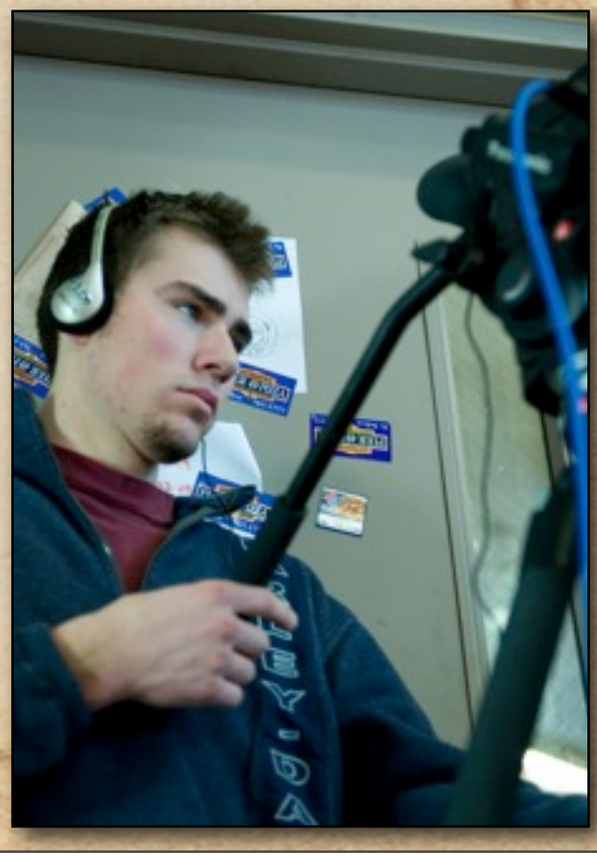
A - Comments, e-mail, questionnaires, etc

B - Revisiting the work (continual improvement)

C - "It's Elemental" contest at Chemical Heritage Foundation

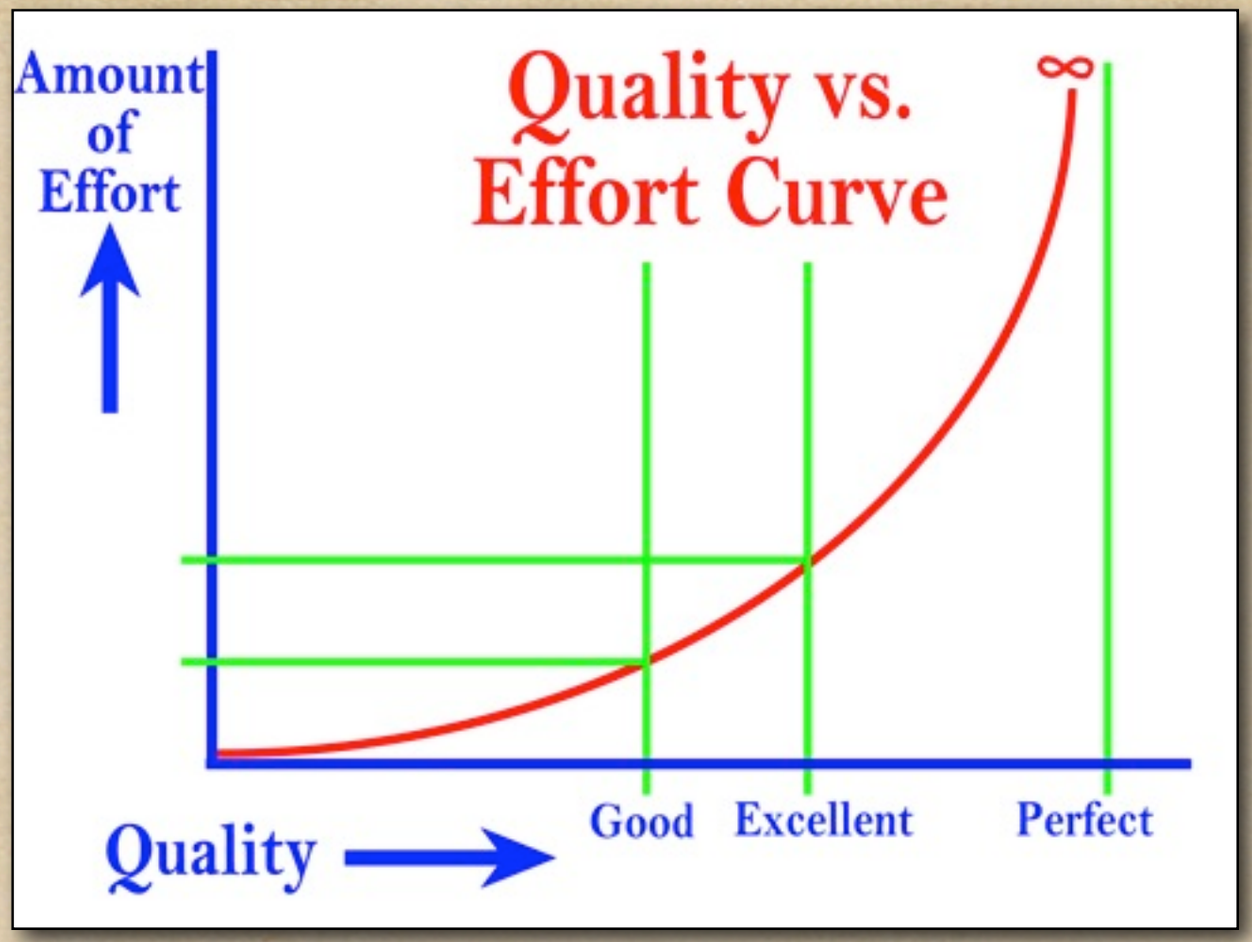
What We've Learned

- Preparation: Set high standards for factual accuracy and video quality. Collaboration between students and SE ensures depth, accuracy, and eliminates plagiarism. Keep detailed sources (become credits).
- Filming: Know equipment well, including lighting and microphones. Practice before! Use a checklist for preparation, packing, and take down. Use dual system filming and sound. Use tripods!



What We've Learned, Cont.

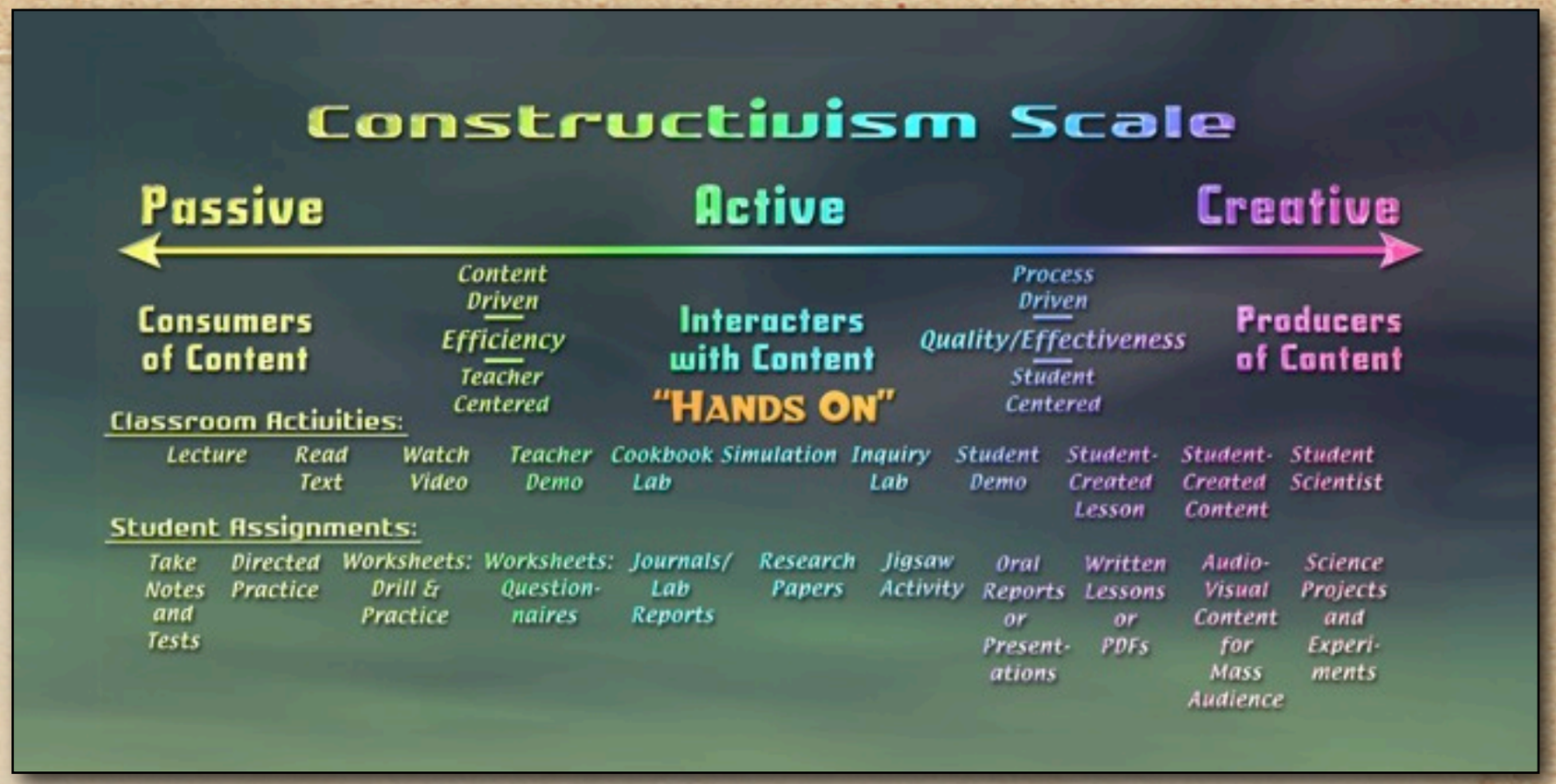
- Post-production: Use actual footage as much as possible; narration minimized, only as "glue." Easy naming system for files. Develop content list and make specific assignments. Follow the script, using only the best of everything. Cut out unessentials.
- Evaluation: Teams evaluate each other (best critics). Constructive comments only - how to fix as well as what. Bring in other students for beta test (don't know project or process). Get SE approval. Keep under 15 minutes total (YouTube).
- Uploading: Use best quality compression, standard for both platforms (QuickTime). Metadata: say what you need in first two lines. Feedback mechanism.



Quality vs. Effort

- Getting from the start to good quality takes 50% of the time allotted. Getting from good to excellent takes the remaining 50%. Leave enough time to get it right!
- Perfection takes infinite time; it's not possible or desirable.

Summary: Project Core Philosophies



- Student-Created Content (Citizen Historians)
- Beyond Hands-On: Students as Teachers, Authentic Learning
- Integration of science, technology, history, art, and writing
- Collaboration with Subject Experts (exposure to STEM careers)
- One-Stop Shop for detailed, balanced, free information on chemicals, materials, and the elements
- Preservation of local science history: Community-based projects involving local museums

How to Get Involved

Four Levels of Collaboration:

1. Use completed videos in class curriculum and send feedback as a teacher/class.
2. Be Beta Testers: Help with detailed evaluation of scripts and videos created by other teams.
3. Partial Team: Create part of a video (planning, some training, and filming but not editing) or help develop ancillary materials.
4. Complete Project Team: Full involvement (pre-test, planning, research, scripting, training, filming, content creation, editing, uploading, and post-test).

Any Questions?

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