Collaborative Methods for Digital Library Design

Overview
mimi recker

ia.usu.edu
dlconnect.usu.edu

Utah State University

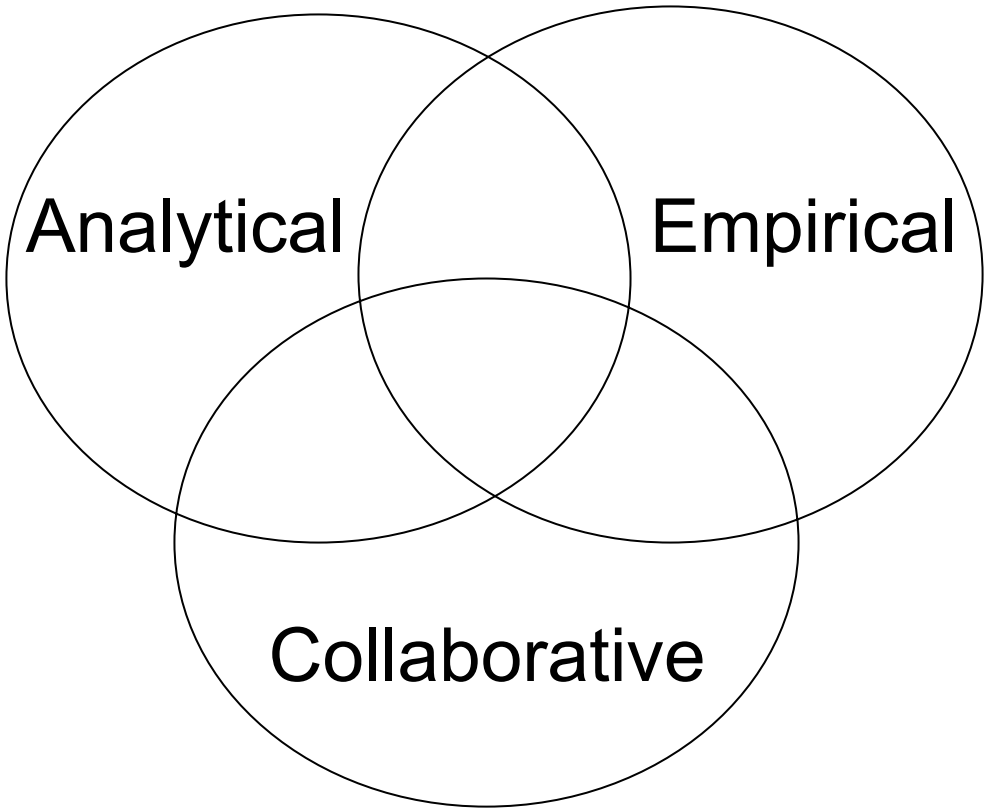
DUE-0434892/0333818

UtahState UNIVERSITY

NSDL THE NATIONAL SCIENCE DIGITAL LIBRARY

NSF

Design Approaches



User-centered design

- Users (not artifacts) at center
- Early focus on users to formulate briefs and prototypes
- Early, and continual user testing
- Iterative design
- Integrated design

Norman, D. (1986). User Centered System Design, New Perspectives on Human-Computer Interaction.

Design-based research/experiments

- Philosophy of ed. research
- Design, use, and perform research on educational tools in ‘real’ settings
- Pursue development and implementation in close collaboration with teachers
- Can promote adoption (through ownership)
- Can advance theory

http://www.designbasedresearch.org

Career Resources Network, Sarita Nair
Students using NSDL, Joanne Silverstein
Digital IdeaKeeper, Chris Quintana
G.R.O.W., Yan Han
Instructional Architect/DLConnect, Mimi Recker
Summing up, Joanne Silverstein
Q&A

Teacher Involvement in Design: Tools, Curriculum, & Instruments

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The Instructional Architect

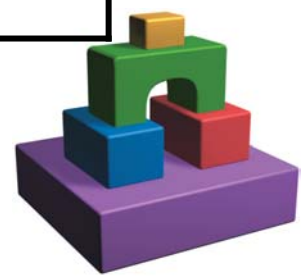
- Find, assemble, and annotate digital library resources into learning modules
- Audience: K-12 educators
- http://ia.usu.edu

DLConnect Mission

- NSDL dissemination within school settings through development workshops
- Employ an iterative program of workshop development and deployment
- Target middle school math and science teachers, pre-service teachers and media specialists
- Through a well-developed scheme for dissemination and sustainability, indirectly impact schools nationwide

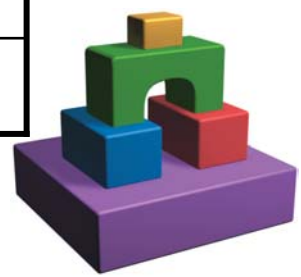
http://dlconnect.usu.edu

Design goals	Methods
Usability testing	Group interviews
Teacher development curriculum	Key informant interviews
Standardized, valid, reliable instruments	Participant observations
Model of teacher as change agent	Web-based surveys
Resource quality rubric	Webmetrics: artifacts and usage



User involvement

Teacher Participants	N
Grad student volunteers (Spring 2002)	15
Pre-service @ USU (Fall 2002)	18
In-service, math & Science (Fall 2002)	8
Pre-service @ USU (Spring 2003)	26
Pre-service @ USU (Fall 2003)	34
Pre-service @ USU (Spring 2004)	14
School Library Media Specialist @ USU (Summer 2004)	13
In-service, math & science (Fall 2004)	35



What worked

- Just do it!
- Rapid cycles of development and evaluation
- Webmetric analyses
- Interview protocols
- Wikis for recording observations
- Participatory evaluation

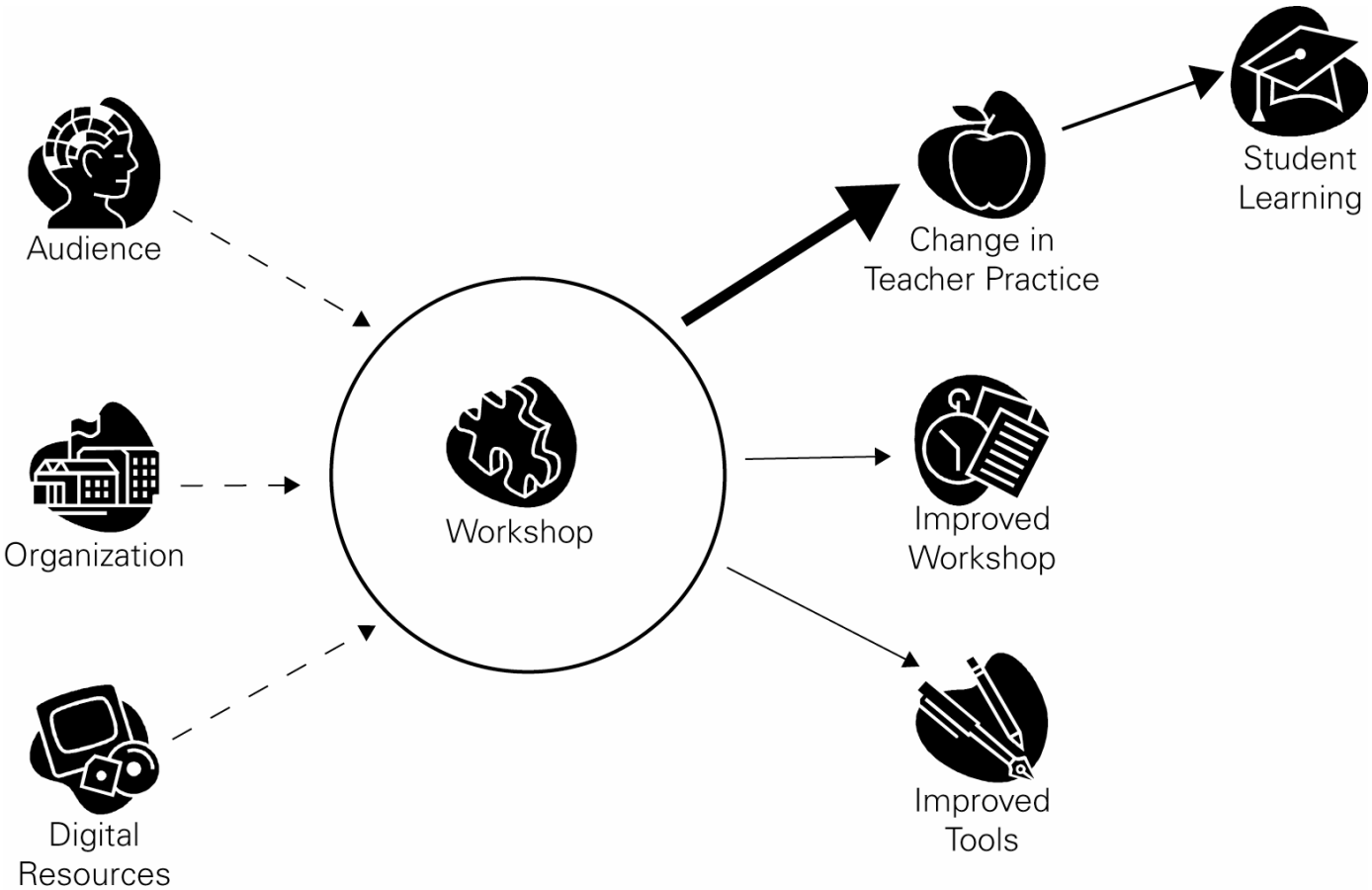
Difficulties

- Halo effect
- Heterogeneity of teacher and school contexts
- Webmetric analyses: missing data
- Differences between paper and digital versions of instruments

USU Personnel

- Mimi Recker, PI
- Jim Dorward, Co-PI
- Deonne Dawson
- Sam Halioris
- Ye Liu
- Xin Mao
- Bart Palmer
- Jaeyang Park

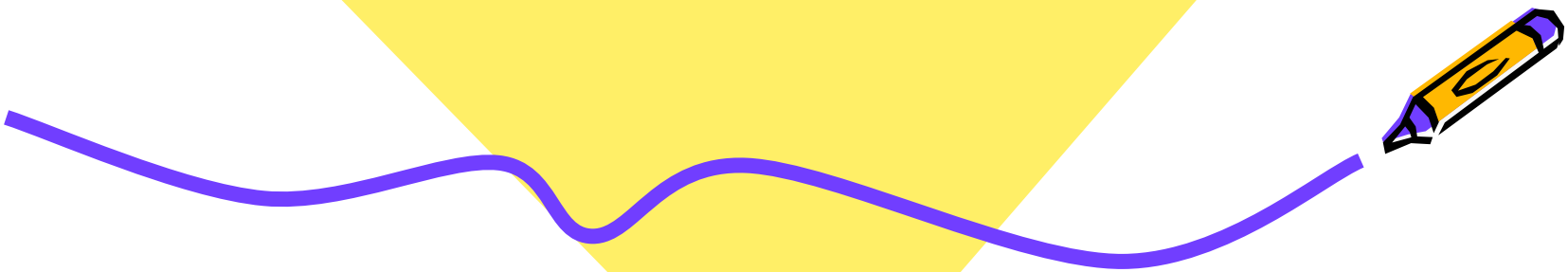
Theoretical Framework



Career Resources Network

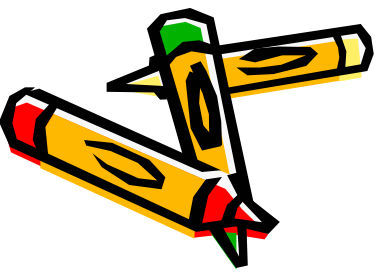
An exploration of STEM careers

Sarita Nair
Education Development Center Inc.



Project Overview

- Comprehensive STEM career development DL for youth ages 11-15, grades 6-9
- Engaging interface to capture their attention
- Begin with points of interest in their lives
- Provide a path from interests -> role of STEM -> possible careers ->‘experiencing’ the work



THE CHALLENGE … creating a fun, engaging and interactive site, that helps young students connect their interests to possible STEM careers!

Methodology

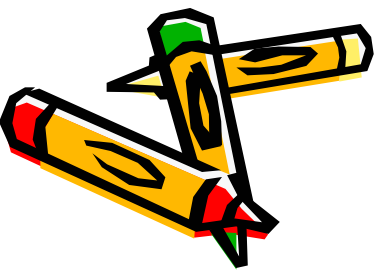
- Literature review
  - Career perceptions
  - Web design preferences
- We talked to young people…
  - Focus groups
  - Surveys
  - Youth Design Team

The Design Team

- Community center in an urban area
- 4 boys & 4 girls, mixed ethnicities
- Varying levels of technology skills and career awareness
- Work ethic & commitment – a real job!
  - Business cards, timesheets, paychecks
- 2 meetings a month, 4-6 months

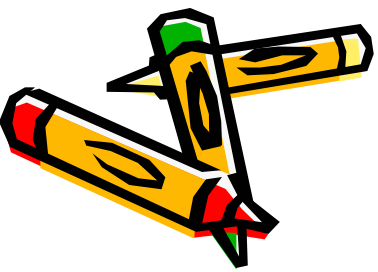
Types of Activities

- Team building activities
- Website reviews & surveys
- Brain storming sessions
- Paper-based mock-ups
- Online design activities
- Interviews w/ peers, adults, use of video



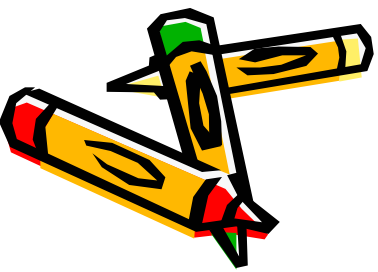
Lessons Learned

- Assembling the team
  - Diversity of perspectives
  - Ratio of adults to youth
  - Teamwork takes time
- Structure
  - Clear expectations, involve youth in defining
  - Build in bonding activities
  - Peer vs. 'power' relationships – behavior & ground rules



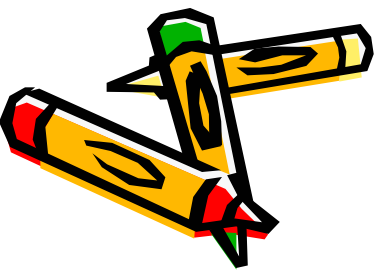
Lessons Learned

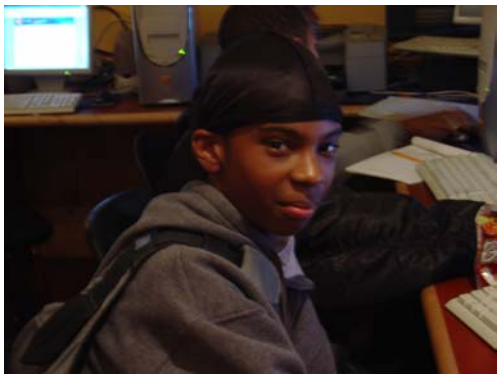
- Process & Activities
  - Give youth multiple ways to express their ideas, with and w/o technology
  - Respond to their ideas in concrete ways
  - Interactive activities
  - Start documenting activity early on (gather comparative data)
  - User involvement is an iterative process

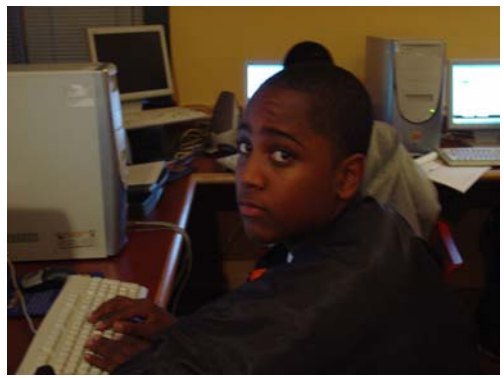


Contact Information

Sarita Nair, Project Director
Career Resources Network Project
Gender, Diversities & Technology Institute
snair@edc.org
http://www.edc.org/GDI







Students Using NSDL (SUN)

Funder

NSF/NSDL

Status

Half way through a two-year grant

Joanne Silverstein (jlsilver@syr.edu)

Goals

- **Foster science information literacy in target audience**

- **Engage young students in NSDL collections**

Objectives

- Case study to guide future integration of services into the NSDL core
- Prototype to inform the creation of a children's portal for NSDL, and
- Report feasibility/usefulness of incorporating students participants

Methodology

Instrument: Mixed-method protocol

- ½ hour think-aloud protocol while sharing favorite Web sites
- ½ hour think-aloud protocol while surfing researchers' sites
- ½ hour small focus groups with "king/queen of the Web" question.

Methodology

Population:

- 6^{th}, 7^{th} and 8^{th} grade students
- 12 participants
- Evenly divided by gender and grade.
- Two minority students, one challenged

Methodology

Analysis and use of findings:

- HyperResearch & grounded theory
- Created a list for the software engineers
  - functional specifications for software
  - navigation devices and search features
  - design, look and feel, and functionality

Lessons Learned

- Practice interviews
- Seemingly excessive communication
- School computer labs filter out games
- We sought diversity, but…
- IRB, IRB, IRB

Design Observations from the Digital IdeaKeeper Project

(in 10 minutes or less)

Chris Quintana
University of Michigan

Project background

- *Digital IdeaKeeper* project to support middle school students using the NSDL for online inquiry
- *Use context:* Looking at software use situated in a classroom context
- *Audience:* Consider students and teachers as users
  - Students are primary users
  - Teachers can be considered as secondary users
- *Design approach:* Learner-centered design approach where we collaborate with students and teachers with an eye towards the classroom context

Defining the work activity and needs for support

Consult the literature from education and content area

- Theoretical background for target work activity
- Describes obstacles and types of support that learners need

Discussions with teachers

- Their perspective on the target activity in their classrooms
- Observations from practical experience about their students

- Articulated the details of the online inquiry process
- Articulated some areas where students would need support to successfully do online inquiry

Informing the software design

Consult the literature	Discussions with teachers	Discussions with students
Describes typical usability and software scaffolding approaches	Informs design decisions and judges their potential effectiveness	Provides input to help decide on potential designs that students understand

- Develop conceptual design and corresponding software implementation from two perspectives
  - Design from a usability perspective
  - Design from a scaffolding perspective

A brief example

IdeaKeeper sidebar displays the online inquiry phases and holds the student artifacts

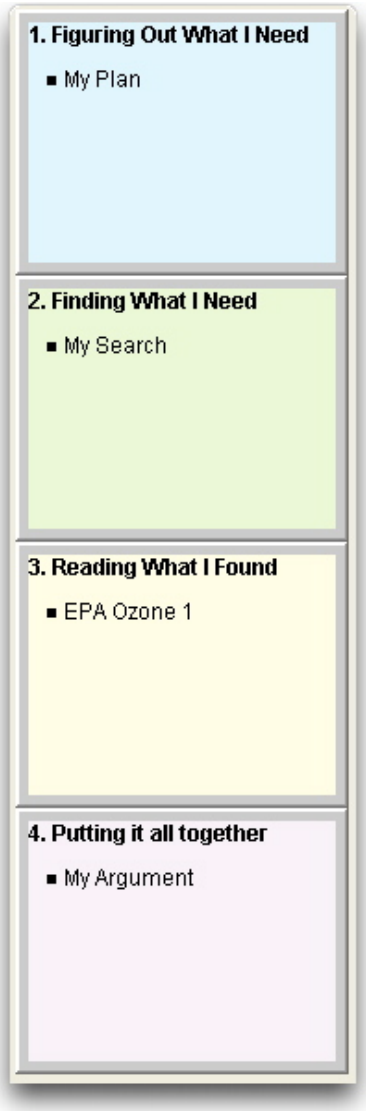
- Defined the activities involved in the online inquiry process with teachers
- Met with students to get ideas about how those activities would be described in the software interface

Planning

Searching

Analysis

Synthesis



Software assessment

- Assessment from both a usability and a scaffolding perspective
- Assessing the "effects with" the software
  - Interviews and videotaped observations of how the students work with the software to consider the effectiveness of the scaffolding
  - Assess whether students did their work in an easy, accurate, and mindful manner
- Assessing the "effects of" the software
  - Pre and post testing
  - Artifact analysis
  - Assess what students learned

Lessons learned

- Early and consistent communication with teachers helps inform our design and helps teachers consider possible uses of software in classroom
- Early interviews with student focus groups help us develop a software design that makes sense to them
- A variety of assessment methods are useful for getting a more detailed picture of software impact
- Videotaped sessions are useful in not only seeing how students used software, but how that use changes over time

Lessons learned

- Videotaping can be complex and disruptive, especially in a classroom situation. Also, some things are difficult to discern on videotape.
- Getting a varied cross section of students for focus groups and testing can be difficult--might wind up constraining the design
- Classroom environment is malleable and teacher's change in plans can be challenging for both the software design and assessment

Thank you!

- Greenhills School and Slauson Middle School
- The DLESE team!
- Lee Zia and our friends at NSF and NSDL
- http://hice.org/ideakeeper

Partnering with Users

Geotechnical, Rock, and Water Resources Library (GROW)

Yan Han

University of Arizona

hany@u.library.arizona.edu

Table of Contents

What is Civil Engineering?

A better world by creative,economical design and construction

The water that you drink

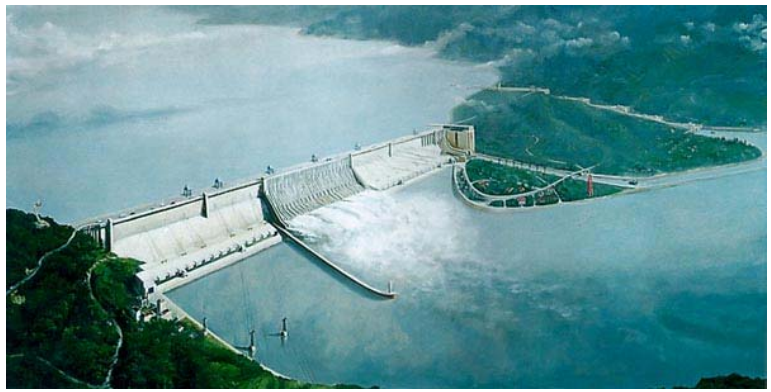
The roads that you drive

The bridges that you cross

The parks where you play

Civil Engineering Projects

Gateway Arch, St. Louis, MO



Three Gorges Dam, Yangtze River, China

Petronas Towers
Kuala Lumpur, Malaysia

Building new structures while keeping existing (transportation) systems in use –
Light (mono) rail system in Seattle, Washington

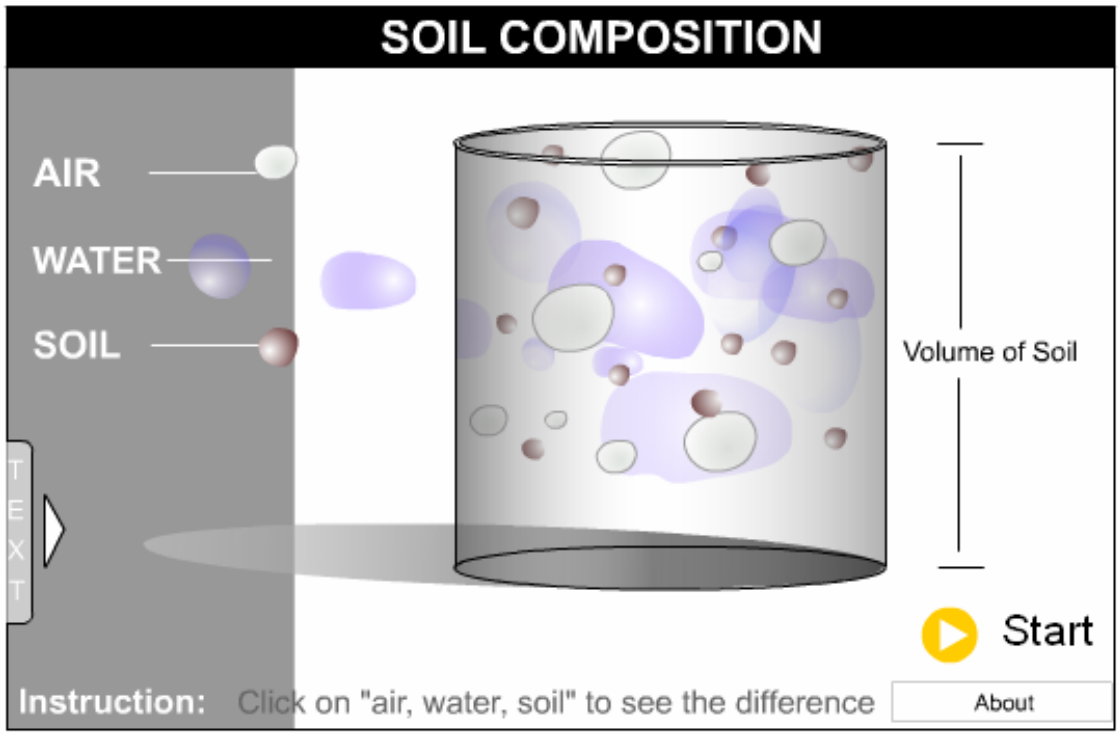
National Civil Engineering Resources Library

Phase I:

Geotechnical, Rock, and Water Resources Digital Library (GROW)

Soil Composition

Geotechnical
Geotechnical
Earth Science & Environment
Fundamental Science - Geotechnical Engineering
People & Structures
Research
K-12 Resources
General Resources
Rock
Water



Who is involved

- **Muniram Budhu**, Project Director - Professor, Department of Civil Engineering
- **John Kemeny**, Professor, Department of Mining and Geological Engineering
- **William Rasmussen**, Professor, Department of Agric. & Biosystems Engineering
- **Maliaca Oxnam**, Engineering Librarian, University of Arizona Library
- **Yan Han**, Systems Librarian, University of Arizona Library
- **Wayne Brent**, Instructional Applications Manager, CCIT
- **Janice Lodato**, Project Manager, Department of Civil Engineering
- **Elena Berman**, Assessment Specialist, Assessment & Enrolment Research
- **Anita Coleman**, Professor, School of Information Resources & Library Science

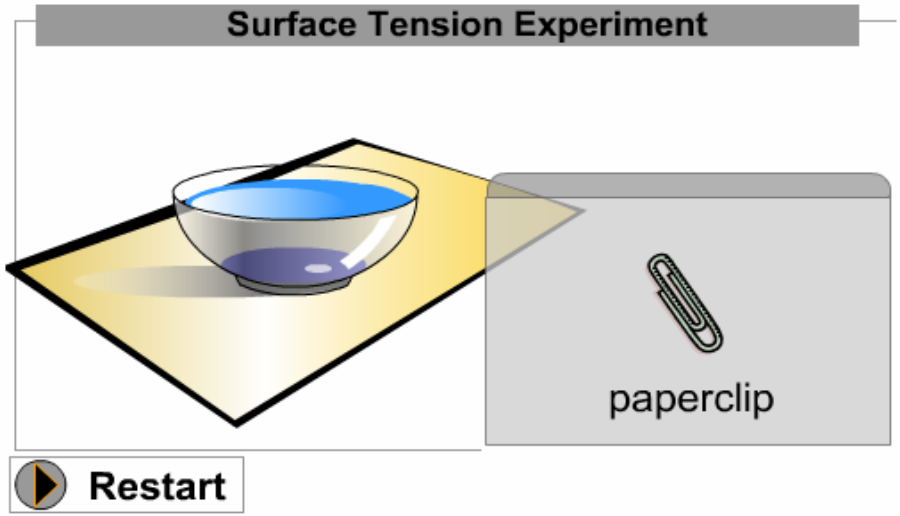
Why is GROW unique?

- GROW is both collecting and creating quality content
  - Most DLs are collecting quality content in specific areas
- Unusual focus on highly interactive digital learning objects
  - They can be used either for independent learning or as part of a course

Additional Features

- A tested model that can be used as a template for other (engineering) disciplines.
- Comprehensive, peer-reviewed, user-ranked, high quality educational materials for Civil Engineering.
- Customization (user can build his/her own digital library resources)
- Open standards-based architecture that allows for interoperability and integration.

Surface Skin



Question 1: Will a paperclip (made of steel) float on water?

Pick up the paperclip and gently place it on the surface of water in the container.

Finding: The paperclip will float on the water.

Reason: The water molecules in the liquid are attracted to each other by the slight difference in the locations of positive and negative charge centers on each molecule. This attraction (positive attracted to negative) results in an apparent "film" on the water. This film will support small objects such as paper clips, needles and water skippers. The remarkable part is that the density of steel in the paperclip is nearly eight times that of water. Yet, it still floats. A small wire bar placed on the water will sink as the strength of the "film" is very small relative to the weight of the bar.

Question 2: What will happen if one drop of detergent is added to the water?

Select a toothpick, dip it in the detergent cup and then dip the toothpick with detergent into the water where the paperclip is floating.

GROW Library

Geotechnical Engineering (Soil)
Earth Science & Environment
Fundamental Science Geotechnical
People & Structures
K-12 Resources
General Resources

Rock Engineering
Earth Science & Environment
Fundamental Science Rock Engineering
People & Structures
K-12 Resources
General Resources

Water Resources & Engineering
Earth Science & Environment
Fundamental Science Water Science
People & Water

Point Load Test

Point Load Test

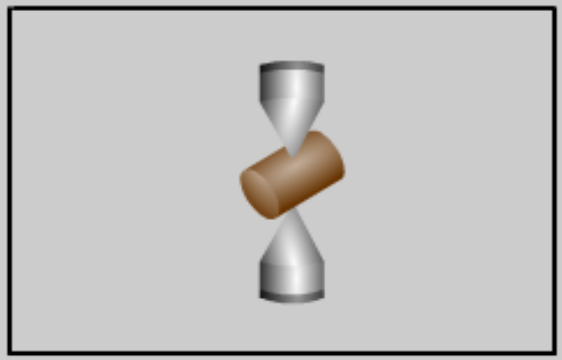
About
Help

GROW

Introduction | Procedure | Prep Video | Test Video | Simulator | Analysis | Report

Please select a rock type from the menu below and click on the "Test Sample" button on the bottom right hand side. Perform the test for 10 times. All the values from the test are stored and displayed in the analysis section.

Granite



Depth Range: 500 ft - 1000 ft

Core Diameter: 2.5 inches

Failure Load: 5089.9 Pounds

Test Sample 3 View Test

1 of 1

Review this Resource

Partnerships

- Commercial Partners
  - Macromedia
  - John Wiley & Sons
- Professional Organizations
  - Geo-Institute (ASCE)
  - American Rock Mechanics Association (ARMA)

Partnerships

- Schools
  - Corbett Elementary School
  - Catalina High School
- University Departments
  - Sustainability of Semi-Arid Hydrology and Riparian Areas (SAHRA)

Involving Users

- Users
  - K-12 / teachers
  - Undergraduate
  - Graduate
  - Faculty
  - Engineers

Involving Users

- User contributions
  - Understanding users' needs
  - Usability
    - User interface design
    - Objects
    - Searching / navigation
    - vocabulary
  - Resources recommendation / creation
  - Peer-reviewed resources
  - Workshop with high schools

Methods

- Internship
  - 4 high school interns
  - Some undergraduate students
- Online site surveys
- Usability testing
  - One-to-one videotaped session (think-out-loud protocol)
  - Questionnaire
  - Card sorting
  - Usage tracking (web analysis tools)

Benefits

- Qualitative and quantitative data for DL design
  - Video, focus group, workshop
  - Log files
- Establishing a community for high quality peer-reviewed resources.
- Establishing partnership

Challenges

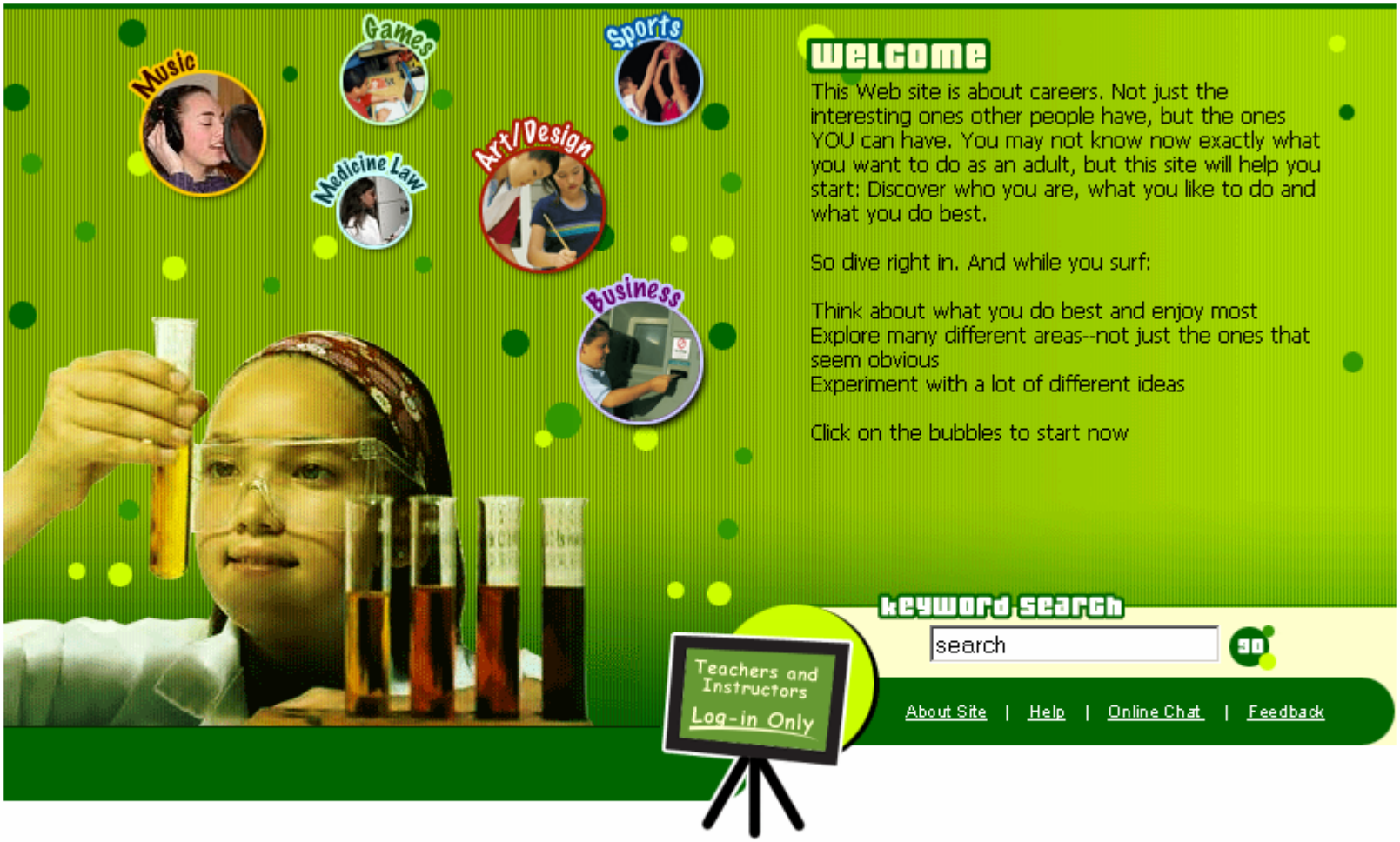
- Building relationship with various organizations (e.g. Schools, professional societies, companies)
- Compromises among different users needs.

Summary

- Phase I of a National Civil Engineering Digital Library – Geotechnical, Rock & Water Resources (GROW)
- Provides searchable collection of expert-reviewed, interactive teaching and learning objects
- Allows for continued contribution and review of additional learning objects

Edit View Favorites Tools Help

career resources network



welcome

This Web site is about careers. Not just the interesting ones other people have, but the ones YOU can have. You may not know now exactly what you want to do as an adult, but this site will help you start: Discover who you are, what you like to do and what you do best.

So dive right in. And while you surf:

Think about what you do best and enjoy most
Explore many different areas--not just the ones that seem obvious
Experiment with a lot of different ideas

Click on the bubbles to start now

keyword search

search

go

About Site | Help | Online Chat | Feedback

career resources network

sports

You Got Game?

You like sports but what does sports have to do with math or science? Well, did you ever wonder why Kobe Bryant stays in the air for so long on a slam dunk or why Venus Williams seems to know exactly where the sweet spot on her racket is?

It's physics...

And a lot of practice...

Studying the way a ball moves or the benefits of a shoe as it moves you is a branch of science called physics.

- How Science Relates
- Careers Options
- Links

Cool Facts

Teachers and Instructors Click Here

keyword search

go

career resources network

sports

Cool Facts

A sweet spot – that place on your racket that feels so solid when a ball hits it, it makes a "thwonk"! A physicist can tell you that most really good tennis players, like Venus Williams, actually have 2 sweet spots.

First, there's a spot where your racket doesn't shake in your hand when you hit the ball. So what? It means that more of your energy goes into hitting the ball than in your steadying the racket. Physicists call this the "center of percussion."

Second, there's a spot on the racket that is bounciest. It sends your ball off!

- How Science Relates
- Careers Options
- Links

Teachers and Instructors Click Here

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sports
Careers Options

With my interest in sports, what kind of job could I do?

Ok. Not everyone can be a rock star or a professional ball player. But you can still be involved. There's just as much going on behind the scenes and off-court as there is in front of the cameras and mikes: acquisitions, legal affairs, production, publicity, talent marketing. Here are just a few ideas:

- Sports Medicine
- Trainer
- Sports/Entertainment law
- Physical Therapist
- Industrial Design/Clothing design specialist

- How Science Relates
- Careers Options
- Links

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sports
Sports Medicine

What's Sports Medicine?

If you like to play a sport, you know you can get all kinds of injuries. Because sports injuries can create special problems for your body, there's a special branch of medicine to deal with them. But sports medicine isn't any one thing. You can study a lot of things that combine medical science with exercise. In general, think of it as the scientific study of physiological and biomechanical principals related to the adaptation of the human body to movement and physical activity. Research is one of the main aspects of sports medicine.

What Skills Do I Need?

Curiosity
Interest in math and science
Good grades
Good communications skills

Who does Sports Medicine, *click here to find out...*

- How Science Relates
- Careers Options
- Links

Teachers and Instructors Click Here

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sports
Sports Medicine

Who does Sports Medicine?

Meet Dr. Dave P. Richards. He practices in Arizona at the The Institute for Bone and Joint Disorders. Growing up, he played a lot of sports but basketball was his first love. In high school Dr. Richards was named to various all-star teams and was recruited to some NCAA division I schools.

Dr. Jessica Ellsworth - has varied background. Before becoming a doctor, she was a fashion model and full-time mom. Now she is one of six doctors at LifeScape Medical Associates in Arizona.

Dr. David Hughes of Pure Sports Medicine in London, England. He says one of the most exciting aspects of his job is that he gets to work with motivated people. Whether professional or amateur, Hughes finds that people who exercise are exciting to be around.

I like this job. *Find out what you can do in the meantime*

- How Science Relates
- Careers Options
- Links

Teachers and Instructors Click Here

keyword search go

David P. Richards, MD, FRCS(C)

Dr. Richards was born in Calgary, Alberta, Canada. Other than a short period of time he spent in Utah as a young child, he was raised and educated in Calgary. Dr. Richards participated in many sports while growing up, but he excelled at basketball. In high school he was named to various all-star teams including the all-provincial team in 12th grade. He was recruited by numerous colleges, including some NCAA division I schools. He decided to stay in his hometown and play at the University of Calgary. His college basketball career ended as a result of an athletic injury during his sophomore year.

After two years of college, Dr. Richards spent two years in Brazil as a volunteer for his church. Upon his return, Dr. Richards enrolled at Brigham Young University in Provo, Utah. There he majored in Exercise Physiology and graduated in 1991. He then was accepted at Queen's University in Kingston, Ontario, one of the top two medical schools in Canada. It was during this time that his interest peaked in Orthopedics and he became involved in research. Dr. Richards received his Doctor of Medicine (MD) in 1996. He then began his five-year residency in orthopedic surgery at the University of Ottawa in Canada's capital city. During his residency Dr. Richards continued to be involved in research. Dr. Richards completed his residency in 2001.

Upon completion of residency, Dr. Richards received two additional years of subspecialty training. His first fellowship year was spent in Plano, Texas with Drs. F. A. Barber, and A. I. Glogau. During this year he received expert training in the field of Arthroscopy and Arthroscopic reconstructive surgery from both an internationally reknowned shoulder and knee surgeon as well as a nationally respected arthroscopist. The year consisted of an outstanding clinical and surgical experience that provided him with outstanding arthroscopic skills. His second fellowship year was spent with Dr. S. S. Burkhart in San Antonio, Texas. Dr. Burkhart is one of the

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sports
Sports Medicine

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sports
Sports Medicine

In the Meantime....

Though there are plenty of jobs, there's plenty of competition for them. But if you get started now, you'll have a leg up.

Take lots of math and science
Keep your grades up
Interview a doctor

And check this Web site:

Learn more about sports medicine

And try some of these:

Try your hand at knee surgery
Bone up on body basics

- How Science Relates
- Careers Options
- Links

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Edheads
Activate Your Mind!

Choose an Activity!
-[Activity Choices]-

Virtual Knee Surgery

Developed in conjunction with COSI

Virtual Knee Surgery :

Take on the role of the Surgeon throughout a total knee replacement surgery.

Teacher Guide

Before using this project in class, check out the Teacher Guide. Click Here.

If you have a problem loading the activity Click Here.

Other Resources:

- Knee Surgery Glossary
- Interesting People (Knee Surgery)
- My Story (Video)

Edheads +COSI

Virtual Knee Surgery Sponsored by SBC

Career Resources Network

Sports Careers Options

With my interest in sports, what kind of job could I do?

Ok. Not everyone can be a rock star or a professional ball player. But you can still be involved. There's just as much going on behind the scenes and off-court as there is in front of the cameras and mikes: acquisitions, legal affairs, production, publicity, talent marketing. Here are just a few ideas:

- Sports Medicine
- Trainer
- Sports/Entertainment law
- Physical Therapist
- Industrial Design/Clothing design specialist

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Industrial Design

What's Industrial Design?

Cell phones, tennis shoes, even toasters have a person behind them, at least when it comes to their design. An Industrial Designer uses principles of art, psychology, and technology to create products that are convenient, cheap, and easy to use.

There are all kinds of designers from shoes to golf courses.

What Skills Do I Need?

Creativity
Ability to see the big picture
Good communication skills– both in writing and talking so you can convey your ideas to others (and perhaps even persuade them you are right!)
Math skills to help you put your ideas and words on paper
Computer skills

Who does Industrial Design, *click here to find out...*

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Industrial Design

Who does Industrial Design?

Meet Stephaine Michaud . An athelete herself, (she competed in the 1999 Nike Women's Trialthon in Vancouver Washington), Ms. Michaud has a Master's degree in Science. She concentrated on learning about the human body, studying prosthesis and orthotics.

See some student work at the Industrial Design Society of America Web site, where you can see an "unbathroom," a special backpack and reuseable garbage bags.

I like this job. *Find out what you can do in the meantime*

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Design Engineer [Nike]

[504]B: Competitive Edge

Stephanie Michaud is a design engineer at Nike's Biomechanics Lab in Beaverton, Oregon. There she researches how the body responds to physical stress. Join reporter Luqman "Luq" Shaw as he learns how infrared imagery, slow-motion photography and impact displacement all affect how athletic shoes are designed.

ACTION TIPS

- Log onto "Biomechanics Magazine" on-line at www.biomech.com
- Visit the American Society of Biomechanics at http://asb-biomech.org/
- Learn more about Nike biomechanics at http://www.nikebiz.com/
- Check out www.shoeinfonet.com to get more info on shoe design from history to manufacturing.

BOOK TIP

The Sneaker Book: Anatomy of an Industry and an Icon
By Tom Vanderbilt
ISBN: 1565844068

The Sneaker Book is an entertaining, informative look at this fascinating, $2-billion-a-year industry. How (and by whom) are sneakers made? Where does your money go when you buy a pair? Who are the companies behind the logos? Why is Nike heralded by economists and lampooned by Doonesbury? Jammed Full of facts, figures, cartoons by Garry Trudeau and Mark Alan Stamaty, and literary excerpts about sneakers from Tom Wolfe, Paul Beatty, Leslie Savan, Spike Lee, Ray Bradbury, and many more, The Sneaker

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Industrial Design

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Industrial Design

In the Meantime....

Take lots of math and science
Keep your grades up
Take a computer aided design (CAD) class. If your school doesn't offer any, look to your community center or your town's continuing education programs.

And check this Web site:

Read Slam Dunk Science

Check out your local library and read about the shoe industry in the Sneaker Book

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Slam Dunk Science

A Sport Research Lab in the Science Classroom

Introduction

Lab Tools

Shoe Design

Activities

Glossary

References