Collaborative Methods for Digital Library Design
Overview
mimi recker

Utah State University
DUE-0434892/0333818

ia.usu.edu
dlconnect.usu.edu
Design Approaches

Analytical

Collaborative

Empirical
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

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

mimi recker
Utah State University

ia.usu.edu
dlconnect.usu.edu

DUE-0434892/0333818

Utah State University
NSDL
NSF
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
<table>
<thead>
<tr>
<th>Design goals</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usability testing</td>
<td>Group interviews</td>
</tr>
<tr>
<td>Teacher development curriculum</td>
<td>Key informant interviews</td>
</tr>
<tr>
<td>Standardized, valid, reliable instruments</td>
<td>Participant observations</td>
</tr>
<tr>
<td>Model of teacher as change agent</td>
<td>Web-based surveys</td>
</tr>
<tr>
<td>Resource quality rubric</td>
<td>Webmetrics: artifacts and usage</td>
</tr>
</tbody>
</table>
# User involvement

<table>
<thead>
<tr>
<th>Teacher Participants</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grad student volunteers (Spring 2002)</td>
<td>15</td>
</tr>
<tr>
<td>Pre-service @ USU (Fall 2002)</td>
<td>18</td>
</tr>
<tr>
<td>In-service, math &amp; Science (Fall 2002)</td>
<td>8</td>
</tr>
<tr>
<td>Pre-service @ USU (Spring 2003)</td>
<td>26</td>
</tr>
<tr>
<td>Pre-service @ USU (Fall 2003)</td>
<td>34</td>
</tr>
<tr>
<td>Pre-service @ USU (Spring 2004)</td>
<td>14</td>
</tr>
<tr>
<td>School Library Media Specialist @ USU (Summer 2004)</td>
<td>13</td>
</tr>
<tr>
<td>In-service, math &amp; science (Fall 2004)</td>
<td>35</td>
</tr>
</tbody>
</table>
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

- Audience
- Organization
- Digital Resources

Workshop

- Change in Teacher Practice
- Improved Workshop
- Improved Tools

Student Learning
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
  Describes typical usability and software scaffolding approaches
- Discussions with teachers
  Informs design decisions and judges their potential effectiveness
- Discussions with students
  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
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
What is Civil Engineering?

A better world by creative, economical design and construction

The bridges that you cross

The roads that you drive

The water that you drink

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

Instruction: Click on "air, water, soil" to see the difference
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**

**Surface Tension Experiment**

![Diagram of a paperclip floating on water](image)

**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 paperclips, 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.
Point Load Test

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

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
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.
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 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.

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
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
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...](#)
Who does Sports Medicine?

Meet Dr. Dave P. Richards. He practices in Arizona at 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.
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 renowned 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. Burkhard in San Antonio, Texas. Dr. Burkhard is one of the
Who does Sports Medicine?

Meet **Dr. Dave P. Richards**. He practices in Arizona at 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 a 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](#)
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
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)

Virtual Knee Surgery
Sponsored by SBC

Knee Home  Project Credits  Thanks To...  Awards and Mentions

Home  FAQ  About  Privacy  Terms of Use  Partners  Sponsors  Contact  Site Map

All Content © Edheads 2004
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 mikesh: 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
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...](#)
Who does Industrial Design?

Meet Stephanie Michaud, an athlete herself, (she competed in the 1999 Nike Women’s Triathlon in Vancouver Washington). Ms. Michaud has a Master’s degree in Science. She concentrated on learning about the human body, studying prosthetics 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 reusable garbage bags.

I like this job. Find out what you can do in the meantime.
Design Engineer [Nike]

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-bioechn.org/
• Learn more about Nike biomechanics at http://www.nikebiz.com/
• Check out www.shoeinfo.net.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
Who does Industrial Design?

Meet Stephanie Michaud. An athlete herself, (she competed in the 1999 Nike Women's Triathlon 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 reusable garbage bags.

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