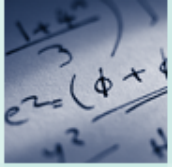

NSDL

THE NATIONAL SCIENCE DIGITAL LIBRARY

Understanding Impact: Results from a District-Wide Field Trial of the NSDL Curriculum Customization Service

Holly Devaul and Tamara Sumner

Digital Learning Sciences

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Program Goals

Increase achievement for all students through customized instruction

- Develop a model for customizing instruction using digital libraries
- Embed model in mainstream classroom practice
- Measure impact on teaching and learning
- Scale-up across districts and curricula

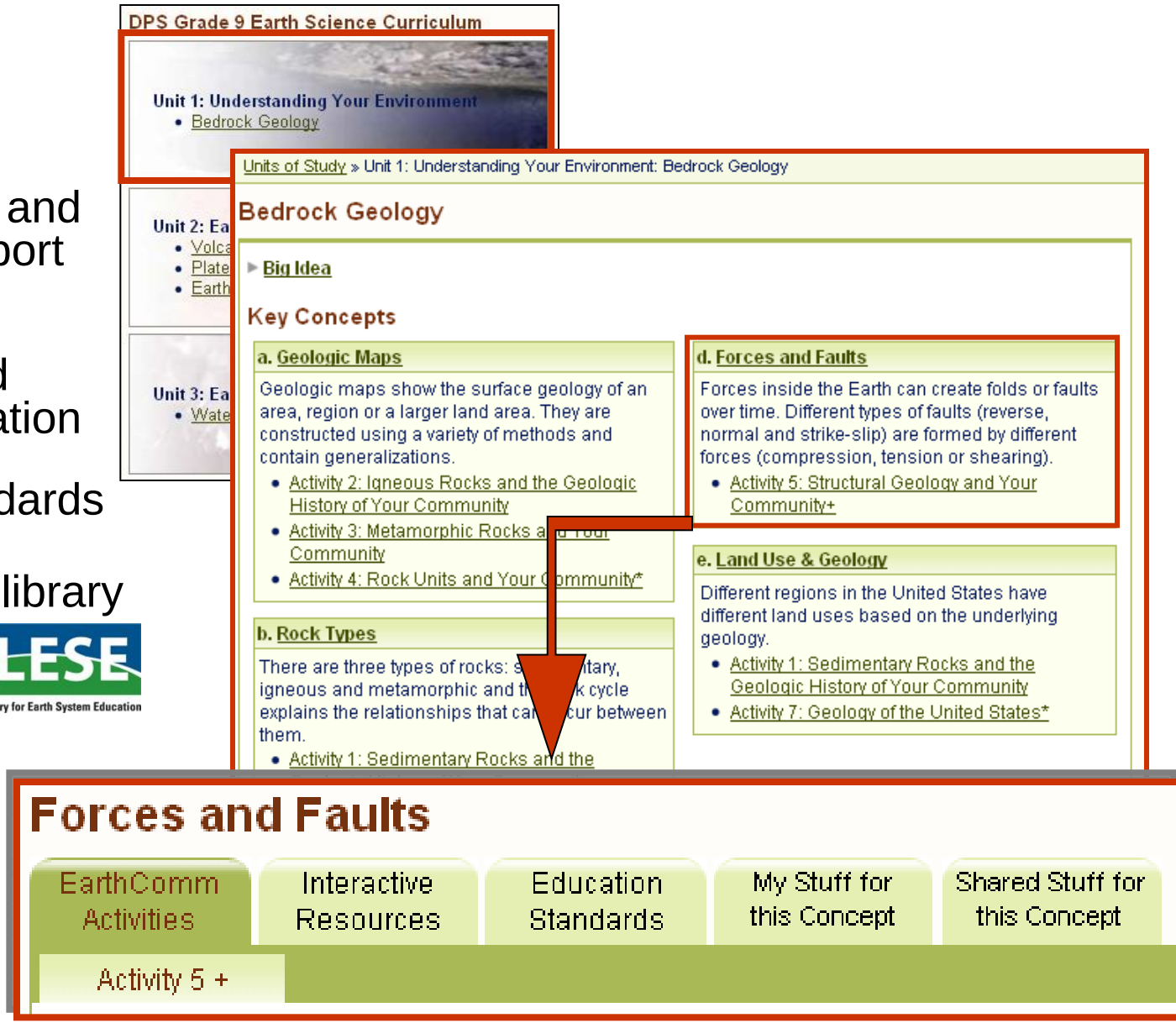
Curriculum Customization Service

- Supports teachers to mix and match materials
  - Customize instruction for diverse learners
  - Engage digital learners
  - Meet district and state learning goals
- Provide integrated access to materials teachers need and use
- Support professional development and collegiality through sharing of materials, pedagogy, practice

Curriculum Customization Service

Transforms print materials into interactive, self-directed curriculum guides

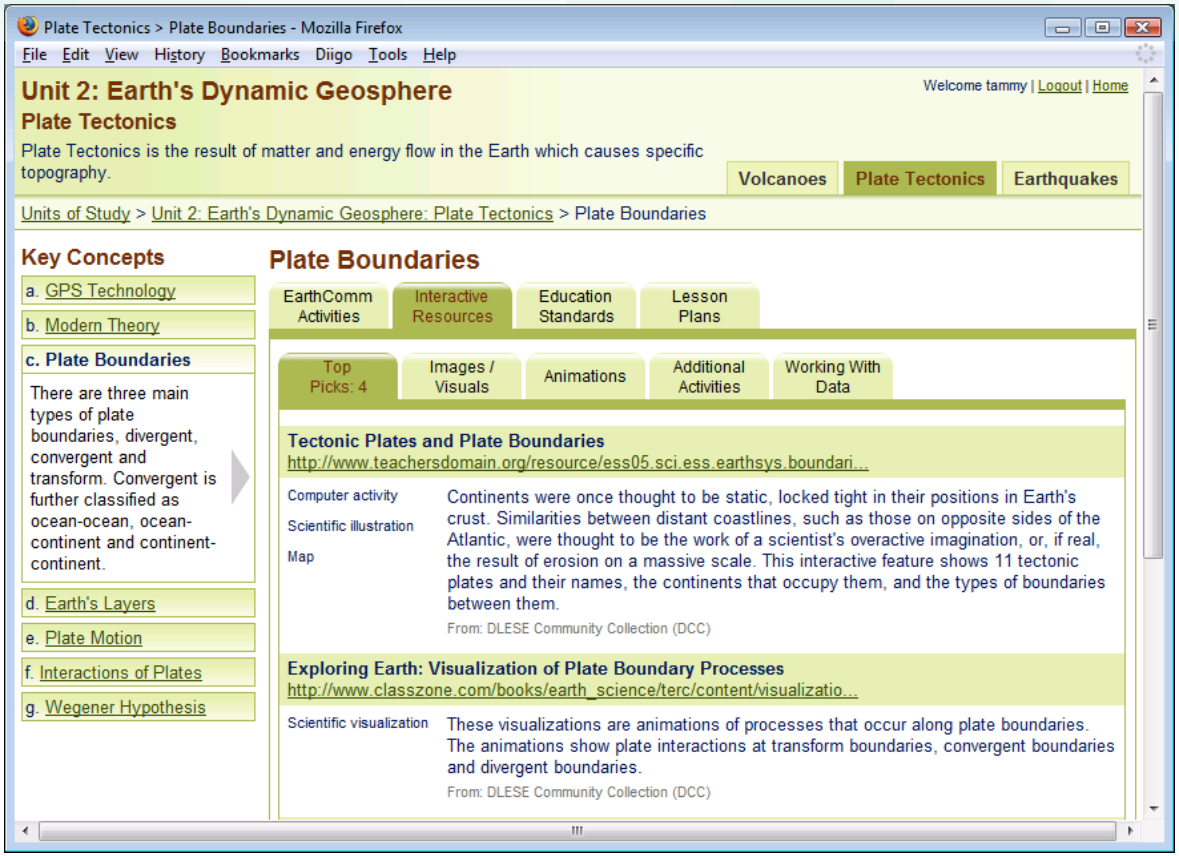
- Concept-focused
- Student Activities and Instructional Support Materials
- District scope and sequence information
- Educational Standards
- Interactive digital library resources for differentiation
- Collections of "My Stuff" and "Shared Stuff"



Program History

- Partners: NSF, Denver Public Schools, It's About Time Publishing, National Science Digital Library
- Developed CCS model through participatory design process with DPS teachers
- Demonstrate feasibility for middle and high school Earth science: Pilot Study in Fall 2008 –10 teachers,10 weeks
- Measured impact in District-wide Field Trial in 2009/2010 – 124 teachers, academic year
- Now – scaling up to new districts and curriculum
  - Douglas County (CO), St. Vrain (CO), Mapleton (CO), Davis (Utah)
  - Middle school physical science, comPADRE

Curriculum Customization Service: Demo



http://ccs-dev.dls.ucar.edu/home

Concept-focused planning tool

Unit 1: Understanding Your Environment

Lynne Davis (lynne) | Logout | My profile | Find people | Units of Stud

Bedrock Geology

The geologic history of the Earth is determined by Earth Science principles such as differing rocks and sediments in different locations, forces inside the Earth and basic geologic principles.

Bedrock Geology

Units of Study » Unit 1: Understanding Your Environment: Bedrock Geology » Forces and Faults

View All Stuff

Key Concepts

- a. Geologic Maps
- b. Rock Types
- c. Interpretation Principles
- **d. Forces and Faults**

  Forces inside the Earth can create folds or faults over time. Different types of faults (reverse, normal and strike-slip) are formed by different forces (compression, tension or shearing).
- e. Land Use & Geology

Forces and Faults

EarthComm Activities | Interactive Resources | Education Standards | My Stuff for this Concept | Shared Stuff for this Concept

Activity 5 +

Bedrock Geology: Activity 5: Structural Geology and Your Community

http://ccs.dls.ucar.edu/dps/protected/iat/bedrock_geology/ch...

Opens full text

Classroom activity

Students use craft clay to model how a real fold looks in map view and in cross-section view. Students use foam blocks to model faults and determine the direction of forces needed to cause normal faults, reverse faults, and strike-slip faults. Students interpret a simple map and cross section that contains folds and faults.

Keywords from Denver Public Schools: fault, fold, compression, tension, shear

+ essential learning: must grade

From: It's About Time

- My Stuff for this Activity
- Shared Stuff for this Activity
- Key Concepts for this Activity (1)
- Instructional Support Materials (5)
- Teaching Tips (7)
- Student Conceptions (1)
- Embedded Assessments (5)

Activity 5 Structural Geol

Goals

In this activity you will:

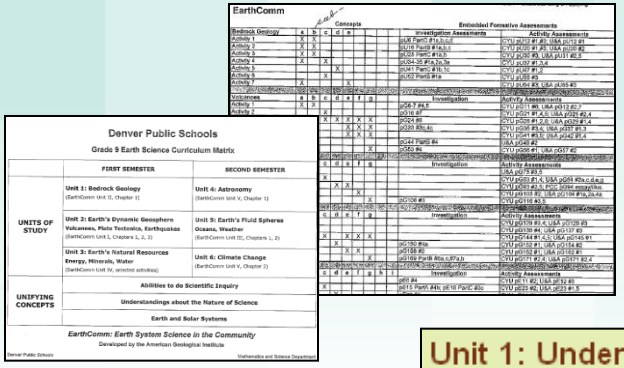
- Describe the relationship between fault movement and the forces that cause this motion.

Think about It

Marble is metamorphos... nearly horizontal layers...

- What would happen i...

DPS Implementation Guide - online



- Key concepts and standards
- Keywords from DPS
- Page number from student text
- Pacing guidance
- Essential learning indicator
  - + Must grade
  - * May skip

Colorado > Science > Grades 9 - 12

Standard 4: Earth and Space Science: Students kn
Earth's systems and the structure and dynamics of
Meteorology, Astronomy, Oceanography)

4.1. the Earth's interior has a composition and st

4.6. evidence is used (for example: fossils, rock l
Earth has changed or remained constant over sh
Helen's' eruption, Pangaea, and geologic time)

Unit 1: Understanding Your Environment

Bedrock Geology

The geologic history of the Earth is determined by Earth Science principles
different locations, forces inside the Earth and basic geologic principles.

its of Study

Geology

Units of Study » Unit 1: Understanding Your Environment: Bedrock Geology » Forces and Faults

View All Stuff

Key Concepts

a. Geologic Maps

b. Rock Types

c. Interpretation Principles

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e. Land Use & Geology

Forces and Faults

EarthComm Activities | Interactive Resources | Education Standards | My Stuff for this Concept | Shared Stuff for this Concept

Activity 5 +

Bedrock Geology: Activity 5: Structural Geology and Your Community

http://ccs.dls.ucar.edu/dps/protected/iat/bedrock_geology/chap01/ec_u2...

Page: U 39
Number of periods: 2

Classroom activity

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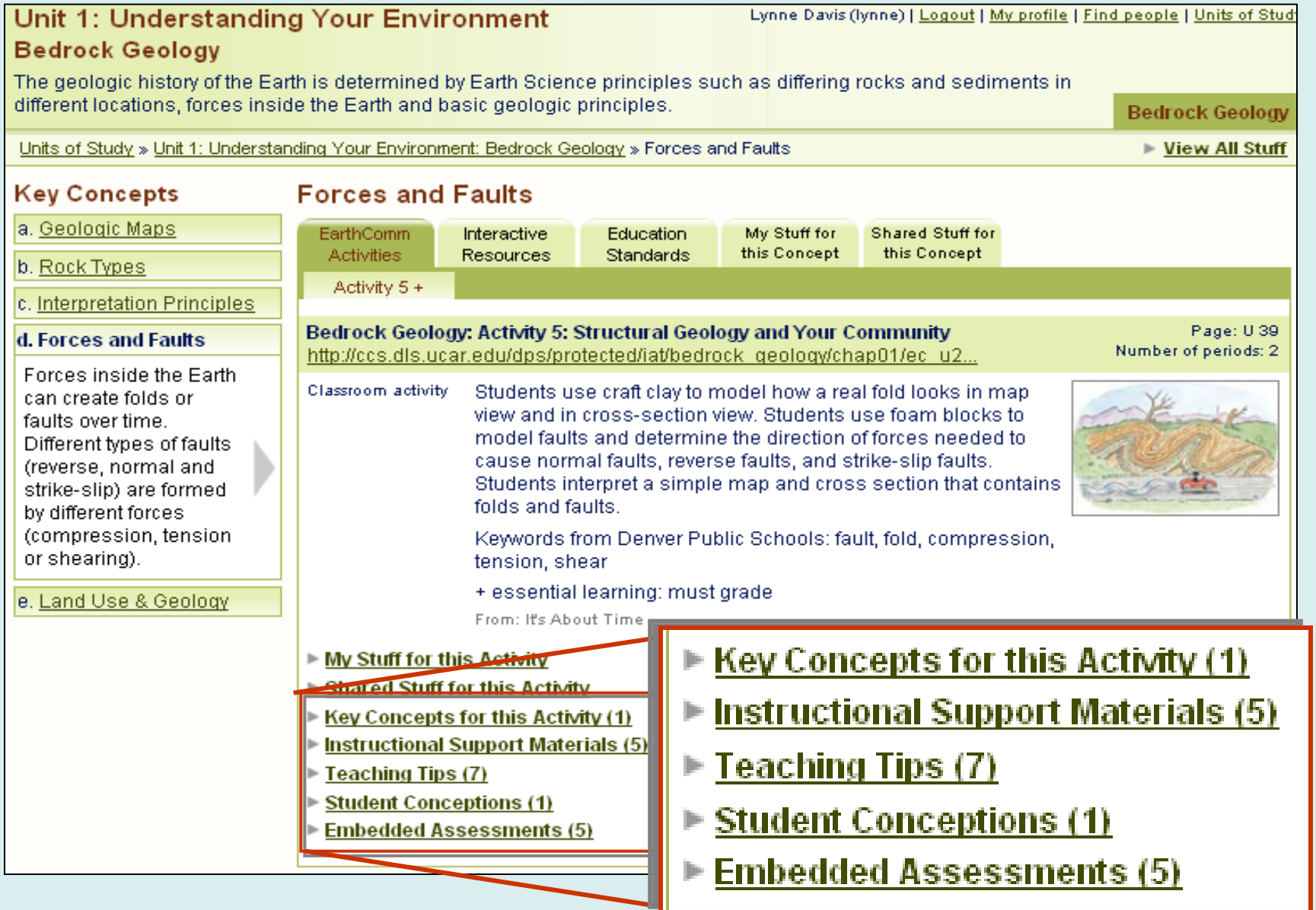
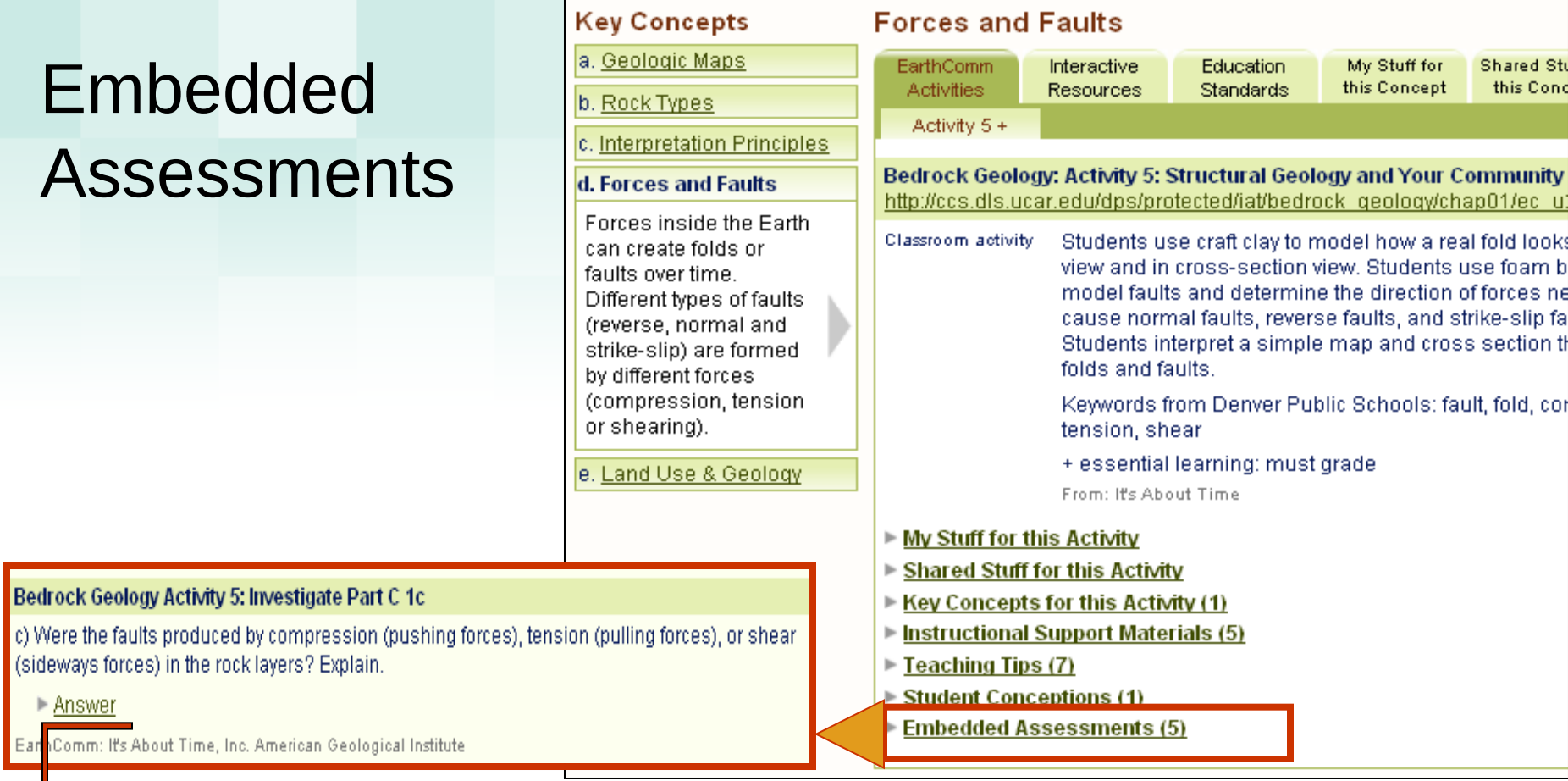
- Teaching Tips (7)
- Student Conceptions (1)
- Embedded Assessments (5)

Teacher's Guide is built-in



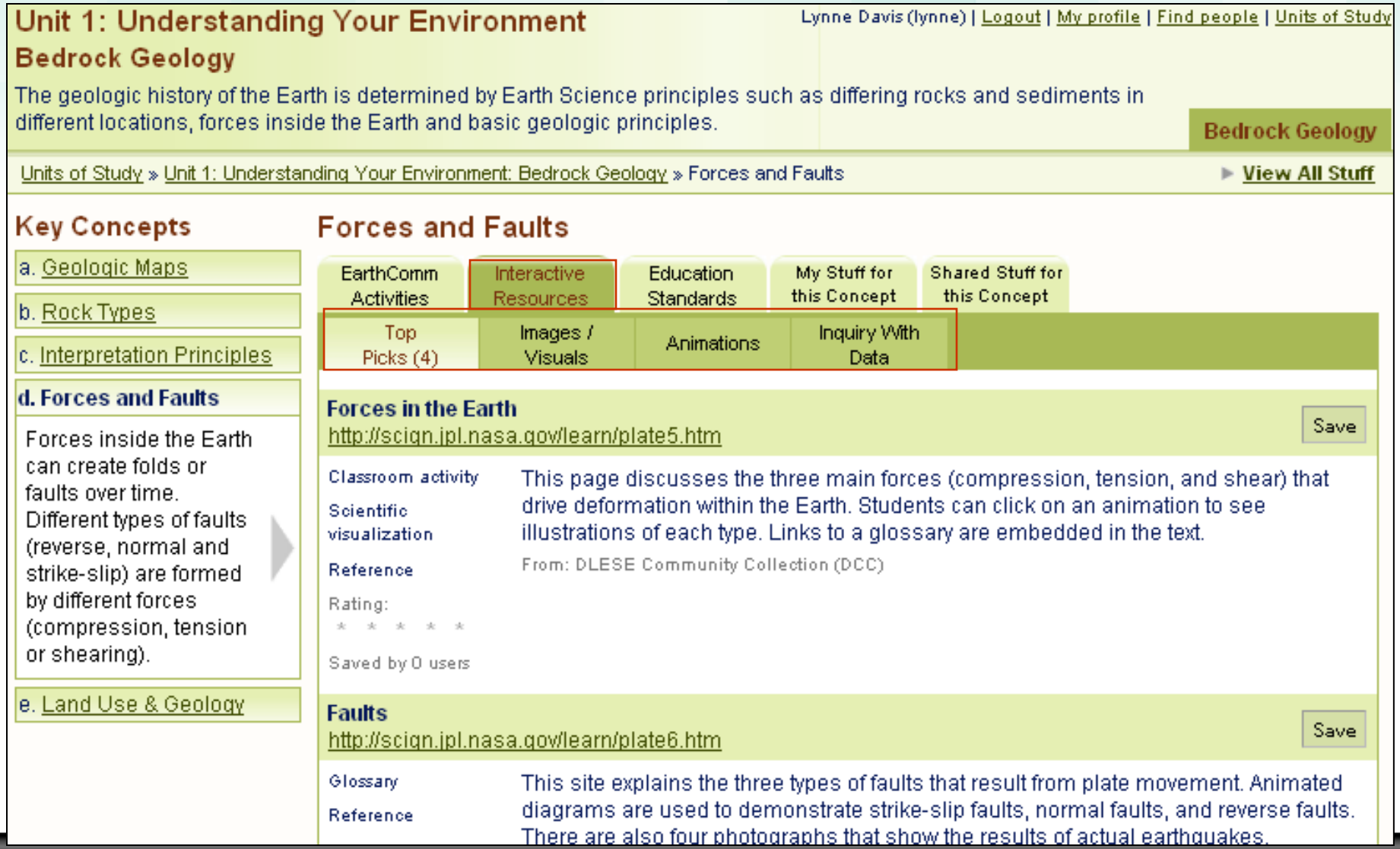
Embedded Assessments



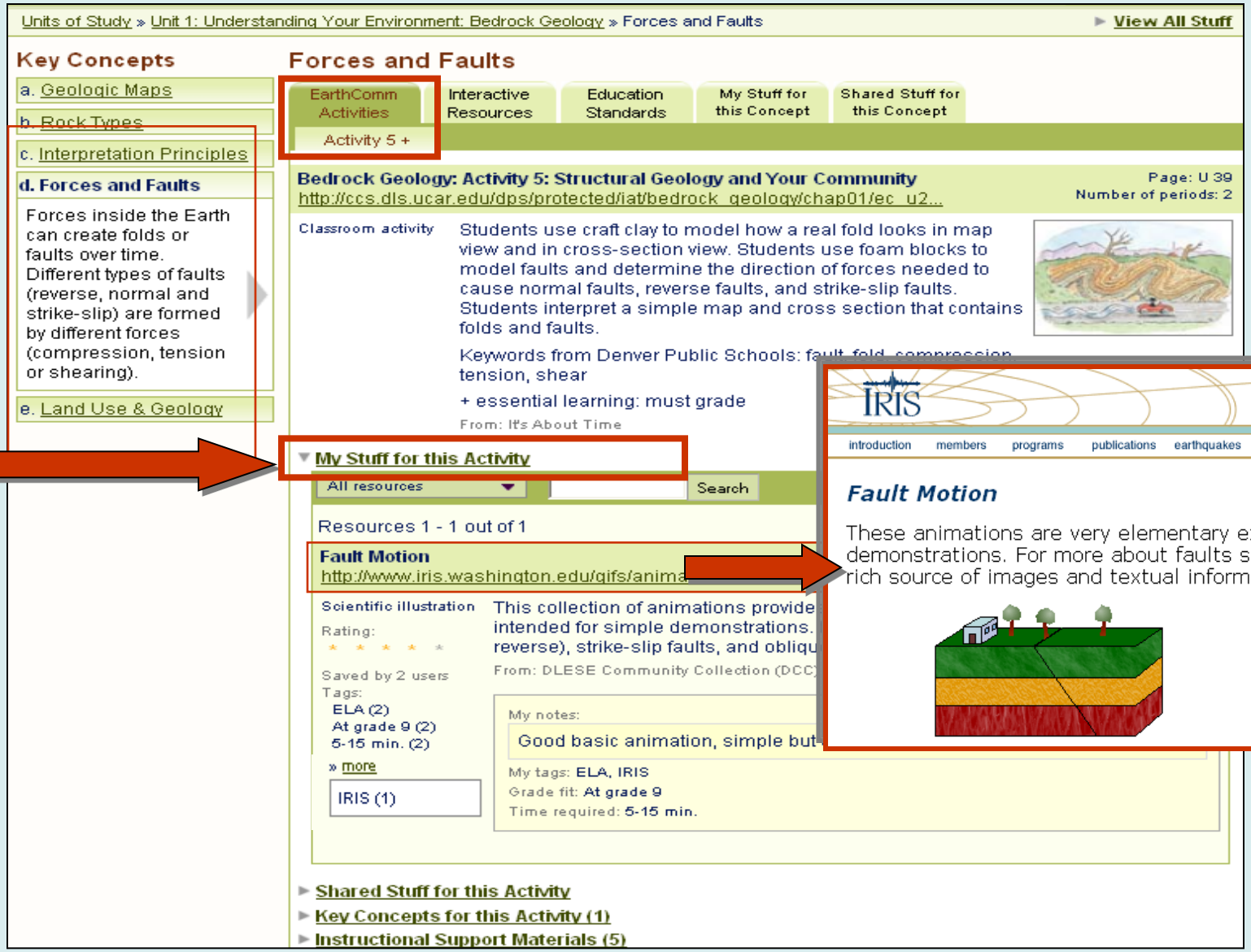
Answer

There are two faults. The fault on the left was produced by pulling forces. It is a normal fault and cannot be created by compression. The fault on the right was formed by pushing forces. It is a reverse fault and cannot be created by tension or pulling.

Interactive Resources to enhance instruction and support differentiation



My Stuff and Shared Stuff: Ability to Save, Upload, and Share



Technical underpinnings

- NSDL EduPak tools
  - NSDL Collection System (NCS)
  - Digital Discovery System (DDS)
- NSDL learning resources
- Service Oriented Architecture
  - Web services used to implement the CCS

Curriculum Customization Logic Model

Nat'l Need and Prior Research	Inputs	CCS Intervention	Anticipated Outcomes	Impacts
Effective instruction builds on learners' current knowledge and background	High quality DL resources aligned to learning goals and curriculum	Learning Goals integrate: • Core curriculum • DL resources • Assessments • Common student conceptions • User-contributed content	Teachers customize instruction to meet learner needs and to improve learner engagement	Increases in student learning
Classrooms are becoming increasingly diverse	DL technologies enabling scalable access, use, and sharing	CCS supports instructional planning, customization, and professional learning	Teachers integrate DL resources into their instruction with greater confidence and frequency	Customization is widespread and instruction is improved
Large differences in teachers' abilities to tailor instruction to learner needs	School Districts: • Curriculum Guides • Teacher PD processes and incentives • Technical infrastructure	District PD incentives encourage CCS use and customization, and recognize contributions / sharing	Teachers share customizations and other contributions online	Use of the CCS for ongoing professional learning is widespread
Extensive and purposeful planning is a hallmark of effective teaching			Teachers use the CCS to support their own professional learning in informal and formal settings	Teachers develop improved skills and knowledge for making pedagogically sound customizations
			Customizations support curricular coherence and use high quality DL resources	

2009/2010 Denver Field Trial

- All middle and high school Earth science teachers (n = 124)
- Initial training session (101 teachers)
- Incentives: projector, standard district hourly compensation for initial training session and evaluation activities
- Research team contact: bi-weekly community updates and support email

Mixed Methods Research Design

Teacher Usage, Attitudes, and Behaviors

- Demographic data
- Usage instrumentation*
- Series of three surveys*
- Adoption interviews*
- Classroom Observations
- Artifact Analysis

Teacher Learning

- Cognitive interviews

Student Learning

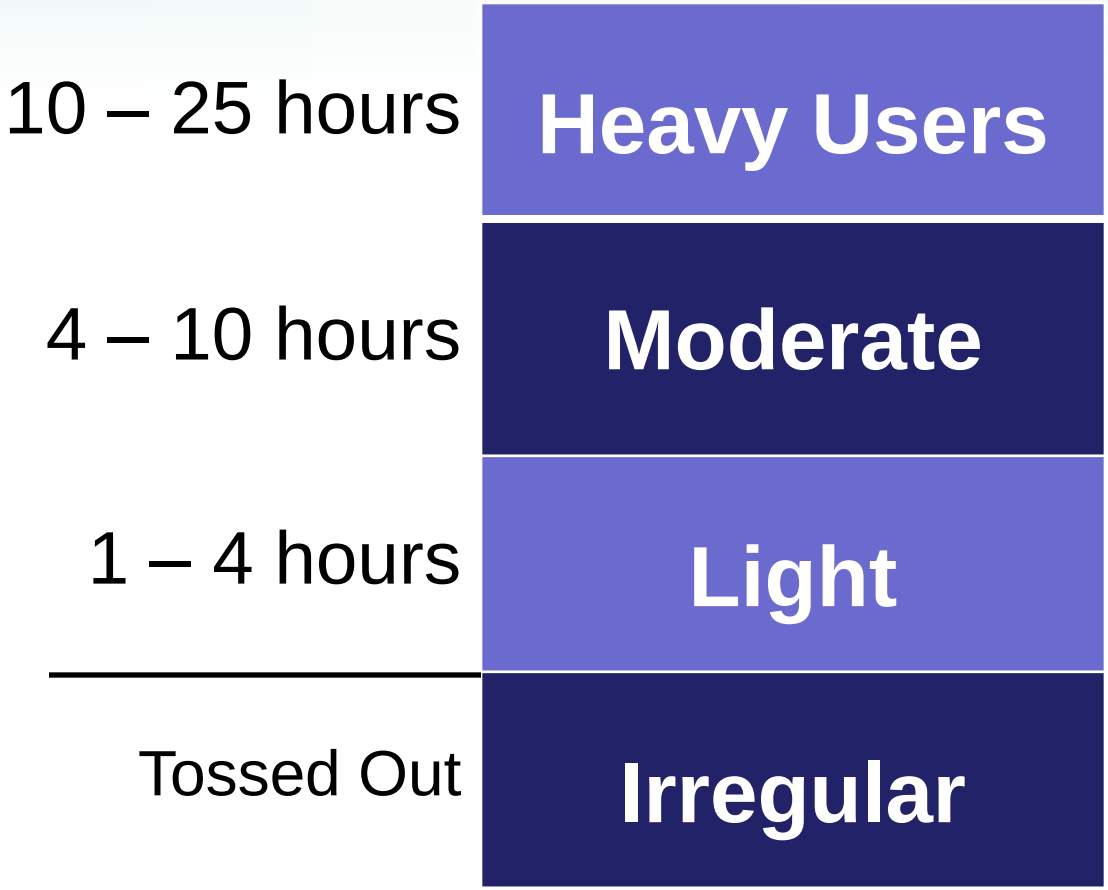
- District-wide, student assessments administered by DPS

Three On-line Surveys

- September, December, May
- 80-84 respondents each time (overlap n= 50)
- Multiple choice and free text
- Attitudes and beliefs regarding educational technology in general, use of CCS, customizing instruction
- Longitudinal analysis in progress – final survey reused 24 items

Adoption Rate – Fall 2009

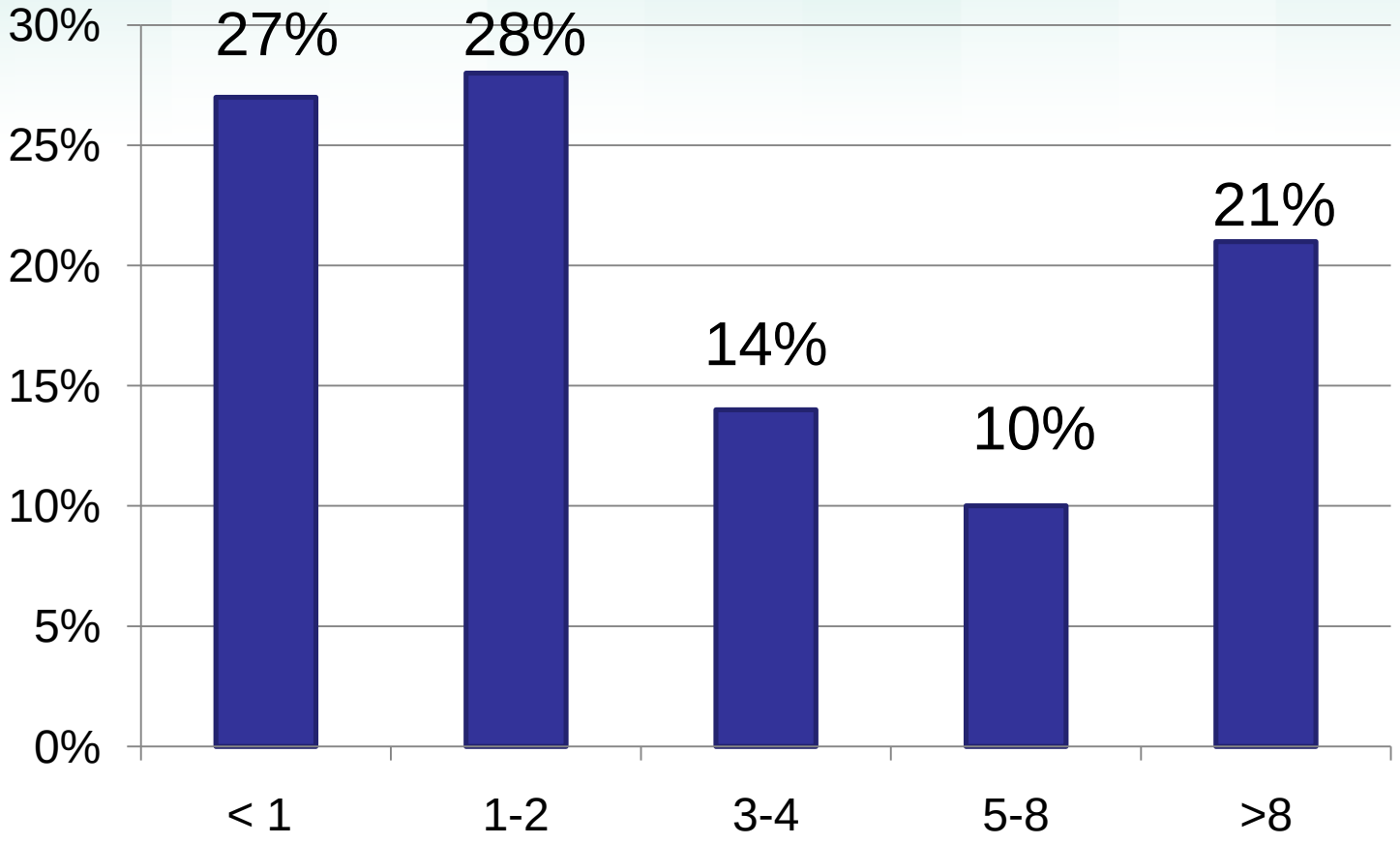
84 out of 124 logged in



Web logs:
51% Adoption rate
(63 out of 124)

Surveys:
57% Rely on CCS
69% Use it frequently

Usage and Adoption: Sept – June
sessions per month



Qualitative data: interviews and classroom observations

Teachers report 2 main uses of the CCS:

- supplement or customize curriculum

"It [the CCS] is a space for me to save my materials on that won't be erased…it's a centralized location where I can find that extra material that I know is going to be, nine times out of ten, useful for me. It actually has cut down on [my] random searching on the Internet. "

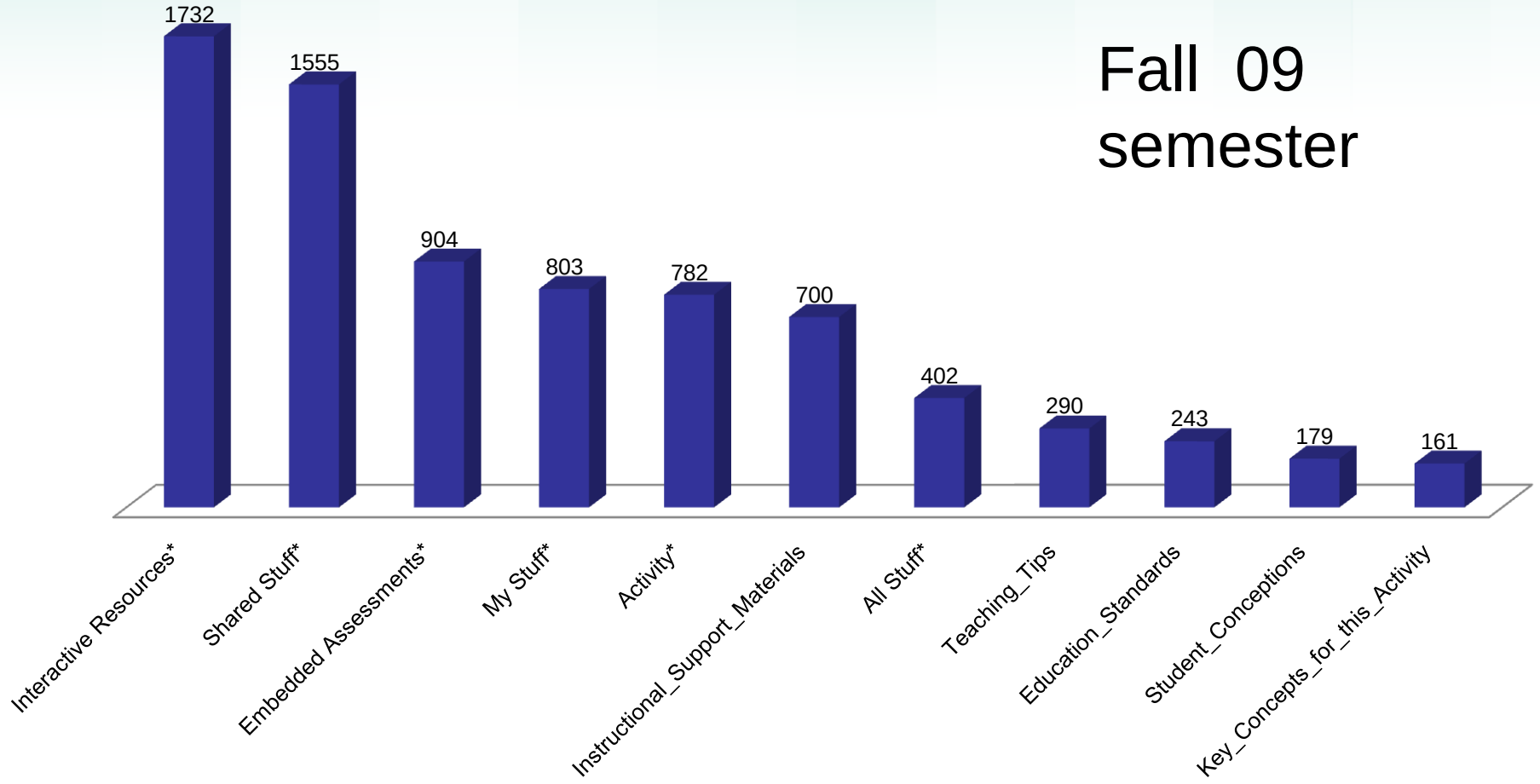
"Looking at the Shared Stuff uploaded by other users gives me ideas about how I can present particular concepts in my classroom".

Customizing Instruction

- CCS has made it easier to use formative assessments **(84%)**
- The CCS has helped me integrate interactive digital resources, such as videos and animations, into my instruction with greater confidence and frequency (**84% of respondents agreed**)
- The CCS has helped me to include more alternate representations of science phenomena into my teaching (**88% of respondents agreed)**

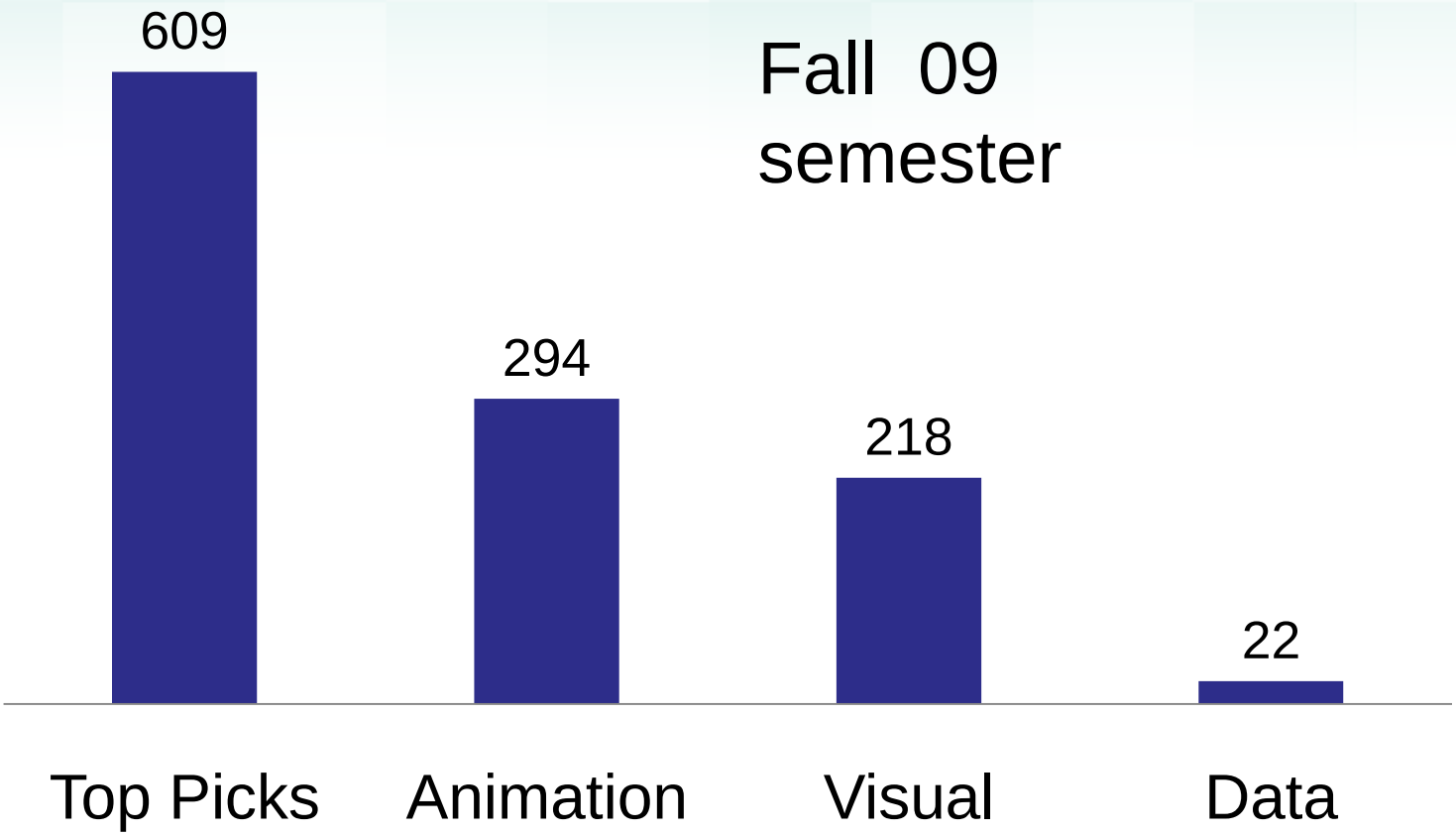
Overall CCS Feature Usage

23995 total click actions logged

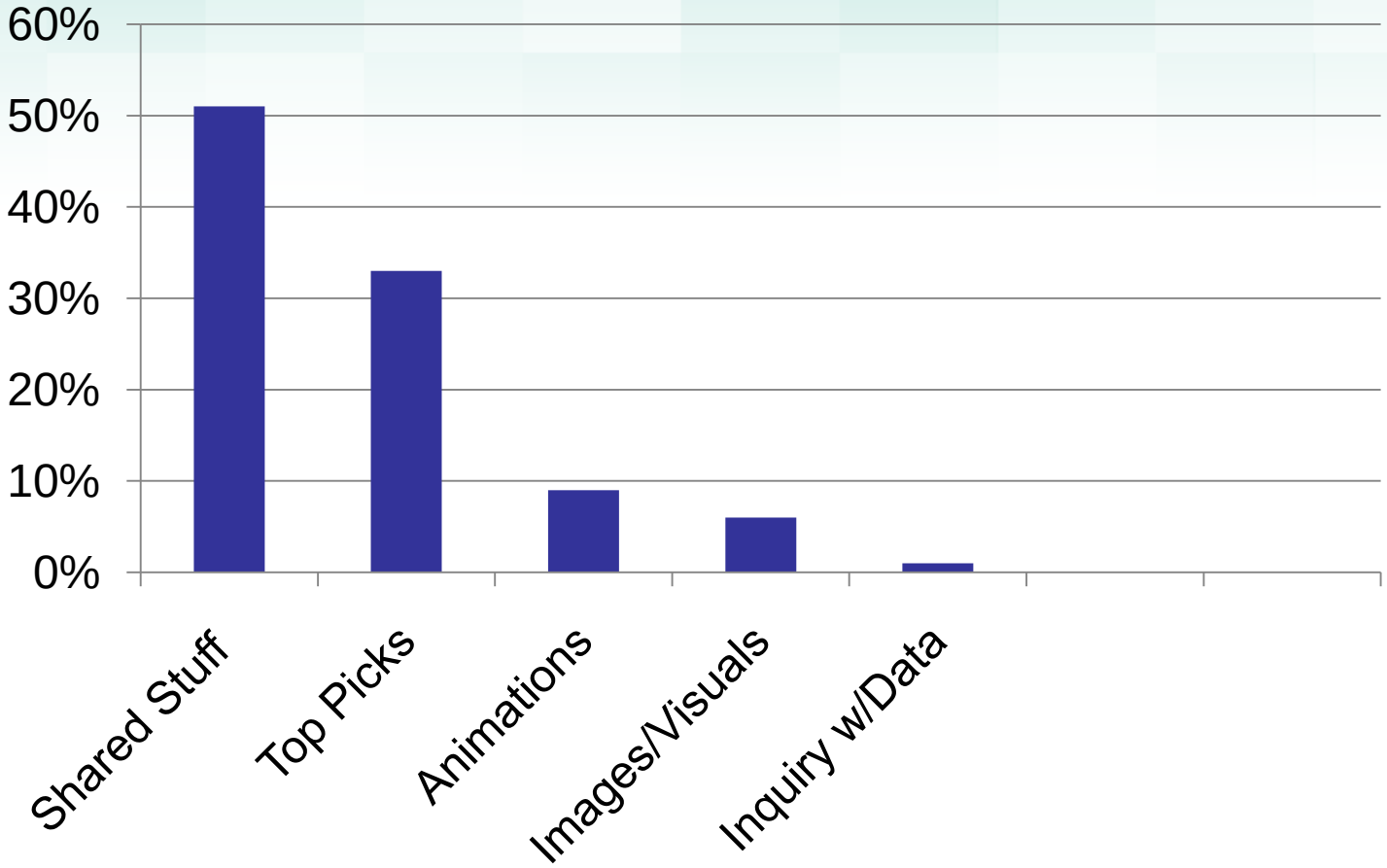


Fall 09 semester

Interactive Resources



What is being "saved" to My Stuff? From where?



Sharing Contributions Online

SharedStuff – very highly used area (usage logs)

- I look at SharedStuff for new ideas (96%)
- Ability to upload and share is very useful (84%)
- The CCS has resulted in DPS teachers sharing resources with one another more than ever before (48%)

I've learned that there are a variety of perspectives that you can approach these [Earth science] *concepts with, and that my idea of how to teach* [is] *only one of many. It's challenged me to see my learners from different perspectives and respond accordingly.*

Support for Professional Learning

- The CCS has supported my own professional learning about Earth science and how to teach it (80%)
- The CCS has increased my awareness of other teachers' practices. (59%)
- The CCS has helped me become a more active member of the DPS professional learning community (50%)
- DPS, on their own, integrated the CCS into their ongoing professional development (“New Users Workshop”)

Curricular Coherence

- CCS has made it easier for me to find interactive resources that support the DPS key concepts [for the Earth science curriculum] **(90%)**
- CCS has helped me teach EarthComm/Investigating Earth Systems more effectively. **(78%)**
- Artifact analysis will provide more specific information on this

Cognitive Interviews

- Focused on teachers approaches to and knowledge of pedagogical strategies in science instruction, differentiation and customization, and science concepts.
- Two interviews, 11 high school teachers, early and late in the school year
- Analysis in progress
  - change over time with respect to shallow vs. deep knowledge
  - correlations to CCS use

Teacher Knowledge: Preliminary Results

- All teachers engage in more “deep” talk overall:
  - pedagogical strategies ($p < .01$)
  - science knowledge ($p < .07$)
- However, teachers tend to increase their talk about deep science knowledge by interview 2 ($p < .09$).
  - Teachers do not increase the depth with which they talk about pedagogical strategies from interview 1 to 2 ($p > .10$)

Barriers

- Adoption – Lack of Time and Technology Support
- Use – Still a lot of information to process, sift through and organize – we need improved ways to manage MyStuff and SharedStuff

Reflections

- Partnerships with districts, NSDL and publishers key to supporting such a comprehensive evaluation effort
- The CCS model is one model to put NSDL resources in the hands of teachers during the course of their daily work- it has to be “freakishly easy”
- An example of utilizing “learning app ready” collections
- Is it replicable?

Many thanks to the CCS team !

- Kirsten Butcher
- Lynne Davis
- Katy Ginger
- Loretta Melhado
- Jonathan Ostwald
- John Weatherley
- Mike Wright
- DPS Advisory Board
- James Foster
- Keith Maull
- MG Saldivar
- Natalie Harris
- Kimberly Myers
- Ashley Crockett Mazal
- Adriana Lopez