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

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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
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.

Key Concepts
- Geologic Maps
- Rock Types
- Interpretation Principles
- Forcse and Faults
- Land Use & Geology

Forces and Faults

EarthComm Activities
- Activity 5 +

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).

Bedrock Geology: Activity 5: Structural Geology and Your Community
http://csc.dls.ucar.edu/dps/protected/iat/bedrock_geology/ch

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
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

**Unit 1: Understanding Your Environment**

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**Forces and Faults**

**EarthComm Activities**

**Interactive Resources**

**Education Standards**

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+ essential learning: must grade
Teacher’s Guide is built-in

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

Forces and Faults

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

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http://cgs.dls.ucar.edu/dps/protected/iat/bfbedrock_geology/chap01/ec_u2...

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From: It's About Time
Bedrock Geology Activity 5: Investigate Part C.1c

c) Were the faults produced by compression (pushing forces), tension (pulling forces), or shear (sideways forces) in the rock layers? Explain.

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

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Forces and Faults

Forces in the Earth
http://sciglax.jpl.nasa.gov/learn/plate5.htm

Classroom activity
Scientific visualization
Reference

This page discusses the three main forces (compression, tension, and shear) that drive deformation within the Earth. Students can click on an animation to see illustrations of each type. Links to a glossary are embedded in the text.

Rating:

Saved by 0 users

Faults
http://sciglax.jpl.nasa.gov/learn/plate6.htm

Glossary
Reference

This site explains the three types of faults that result from plate movement. Animated diagrams are used to demonstrate strike-slip faults, normal faults, and reverse faults. There are also four photographs that show the results of actual earthquakes.
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

<table>
<thead>
<tr>
<th>Nat’l Need and Prior Research</th>
<th>Inputs</th>
<th>CCS Intervention</th>
<th>Anticipated Outcomes</th>
<th>Impacts</th>
</tr>
</thead>
</table>
| 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

The National Science Digital Library (NSDL)
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

10 – 25 hours  Heavy Users
4 – 10 hours  Moderate
1 – 4 hours  Light
Tossed Out  Irregular

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

- < 1: 27%
- 1-2: 28%
- 3-4: 14%
- 5-8: 10%
- >8: 21%
Qualitative data: interviews and classroom observations

Teachers report 2 main uses of the CCS:

• supplement or customize curriculum
• below grade level reading and ELL
• provide alternative visual representations of science phenomena
• leverage peer knowledge and experience
• as an archive/repository for digital resources

“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

Fall 09 semester

- Top Picks: 609
- Animation: 294
- Visual: 218
- Data: 22
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!

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