Teachers' Curriculum Planning Behavior: Preliminary Research Results and an NSDL Perspective

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Outline

- Leveraging technology to help teachers
  - Purposeful planning
  - Differentiated instruction
  - Curriculum Customization Service
- Research questions
- Denver field trial
- Usage analytics
- Discussion
- Conclusion and Next Steps

Purposeful planning is a tool.

Research shows it is effective.

But what exactly should teachers build with this tool?

Differentiated instruction.

Differentiated Instruction

- Student populations are growing more diverse
- Accountability movement is growing more pervasive
- Constructivist learning approaches are prevailing

→Teachers must ‘narrowcast’ to students

Example: Denver, CO

- 78,352 students (2009-2010)
  - 1.1% American Indian
  - 3.5% Asian
  - 16.2% Black
  - 54.1% Hispanic
  - 25.2% White
- 70.45% of students receive free/reduced lunch
- 11.75% of students are gifted/talented
- 24,519 (31%) of student are native English speakers
- Top five languages spoken by students:
  - Spanish (29,525 - 40% - includes ELL)
  - Vietnamese, Arabic, Karen, Burmese and Somali

Diverse student populations call for differentiated instruction.

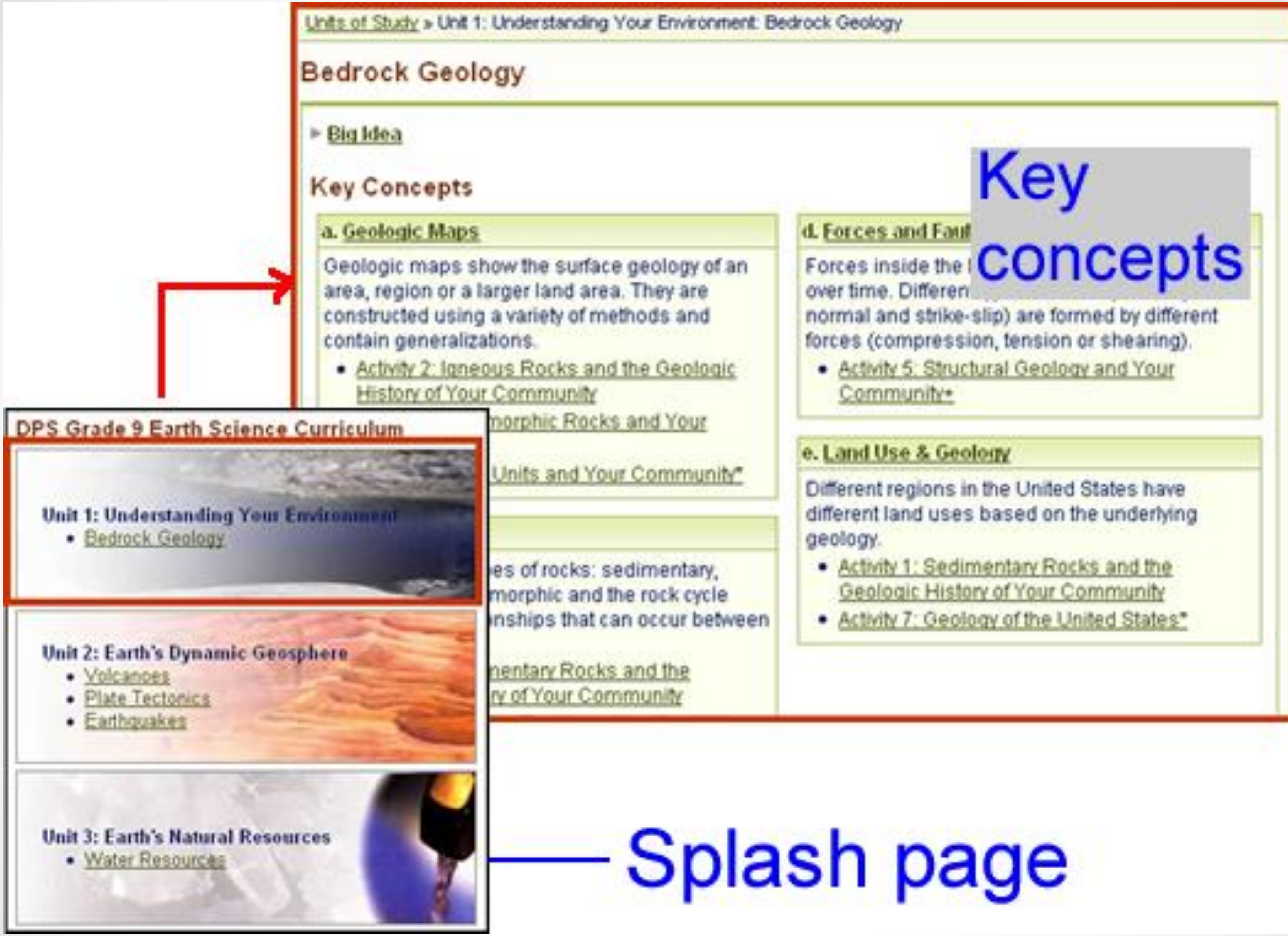
However, this differentiation must occur within the context of curriculum and standards.

A tool was developed to make this possible:

Curriculum Customization Service

Curriculum Customization Service

- Web-based curriculum planning tool
- Teachers' 'one stop shop' for:
  - Digital versions of curricular materials
  - Digital resources from DLESE/NSDL
  - Educational standards
  - Web 2.0 functionality
    - Sharing
    - Saving
    - Rating
    - Tagging


Units of Study » Unit 1: Understanding Your Environment: Bedrock Geology
Bedrock Geology
Big Idea
Key Concepts
a. Geologic Maps
Geologic maps show the surface geology of an area, region or a larger land area. They are constructed using a variety of methods and contain generalizations.
Activity 2: Igneous Rocks and the Geologic History of Your Community
morphic Rocks and Your
Units and Your Community*
es of rocks: sedimentary,
morphic and the rock cycle
nships that can occur between
nentary Rocks and the
ry of Your Community
d. Forces and Fault
Forces inside the
over time. Differen
normal and strike-slip) are formed by different forces (compression, tension or shearing).
Activity 5: Structural Geology and Your Community*
e. Land Use & Geology
Different regions in the United States have different land uses based on the underlying geology.
Activity 1: Sedimentary Rocks and the Geologic History of Your Community
Activity 7: Geology of the United States*
Key concepts
DPS Grade 9 Earth Science Curriculum
Unit 1: Understanding Your Environment
Bedrock Geology
Unit 2: Earth's Dynamic Geosphere
Volcanoes
Plate Tectonics
Earthquakes
Unit 3: Earth's Natural Resources
Water Resources
Splash page

Unit 1: Understanding Your Environment
Bedrock Geology

Curricular unit

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

Units of Study » Unit 1: Understanding Your Environment: Bedrock Geology » Geologic Maps

Key Concepts

a. Geologic Maps

Geologic maps show the surface geology of an area, region or a larger area. They are constructed using a variety of methods and contain generalizations.

b. Rock Types

c. Interpretation Principles

d. Forces and Faults

e. Land Use & Geology

Key concepts for Unit 1

Geologic Maps

Key concept

CO state education standards

Teacher 'file cabinet'

EarthComm Activities | Interactive Resources | Education Standards | My Stuff (0)

Resources from DLESE

Activity 2 | Activity 3 | Activity 4 *

Bedrock Geology: Activity 2: Igneous Rocks and the Geologic History of Your Community

Page: U 14
Number of periods: 2.0

http://ccs.dls.ucar.edu/protected/iat/bedrock_geology/chap01/ec_u2ch1a...

Classroom activity

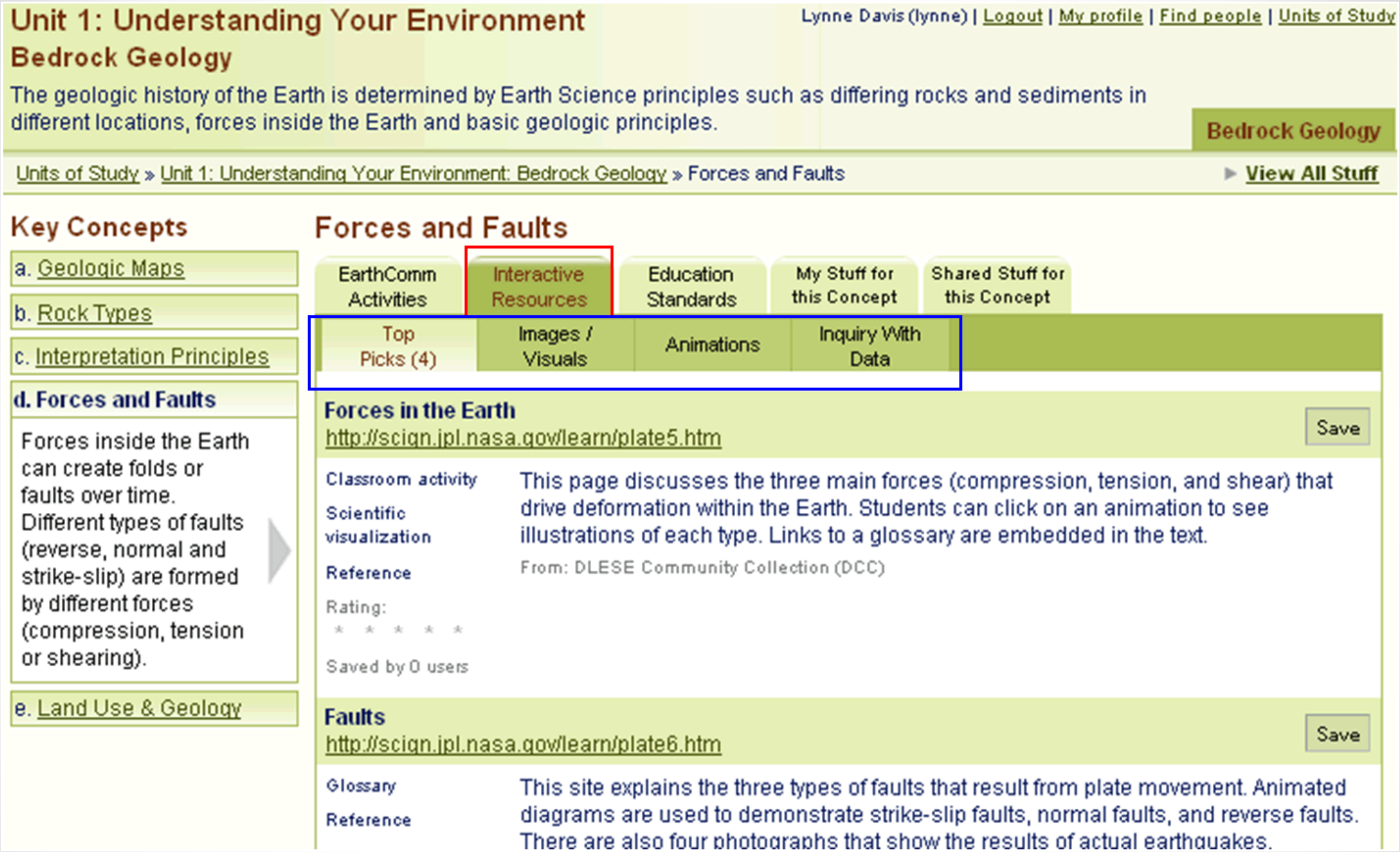
Activities (from curriculum)

Students develop their own scheme for classifying igneous rocks by closely examining igneous rocks. Students identify igneous rocks using a traditional igneous classification scheme and then compare this classification system to their own. Students learn how igneous rocks form and that rates of magma cooling determine grain size in igneous rocks. Students then examine the geologic map of their area to determine if any igneous rocks are present.

Keywords from Denver Public Schools: igneous rock, magma, lava, intrusive, extrusive

DPS guideline: Focus on Digger Deeper

From: EarthComm Activities


Unit 1: Understanding Your Environment
Bedrock Geology
Lynne Davis (lynne) | Logout | My profile | Find people | Units of Study
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
Top Picks (4)
Images / Visuals
Animations
Inquiry With Data
Forces in the Earth
http://scign.jpl.nasa.gov/learn/plate5.htm
Save
Classroom activity
Scientific visualization
Reference
Rating:
Saved by 0 users
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.
From: DLESE Community Collection (DCC)
Faults
http://scign.jpl.nasa.gov/learn/plate6.htm
Save
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.

2009-2010 Denver Field Trial

- CCS available to all middle and high school Earth science teachers (n = 124)
- 98 teachers logged into the system at least once
- 49% user were regular users (3+ sessions per month)
- Qualitative data from surveys, interviews, and classroom observations
- Quantitative data from surveys and CCS Web logs

Learn More About the CCS

- Kirsten Butcher (U. of Utah)
  - Tuesday, 11:35a, Hampton Ballroom
  - A cognitive interview protocol for assessing changes in teacher knowledge
- Holly Devaul (UCAR & Digital Learning Sciences)
  - Wednesday, 9:15a, Hampton Ballroom
  - Understanding impact: Results from a district-wide field trial of the NSDL Curriculum Customization Service

Major Research Questions

Keith → Usage Analytics

- What behaviors did teachers exhibit when using the CCS?
- How do these behaviors map onto teaching practices observed ‘in the wild?’

M. G. → Technology adoption

- How did the CCS impact teachers’ differentiation of instruction?
- How and why did teachers decide to use the CCS?

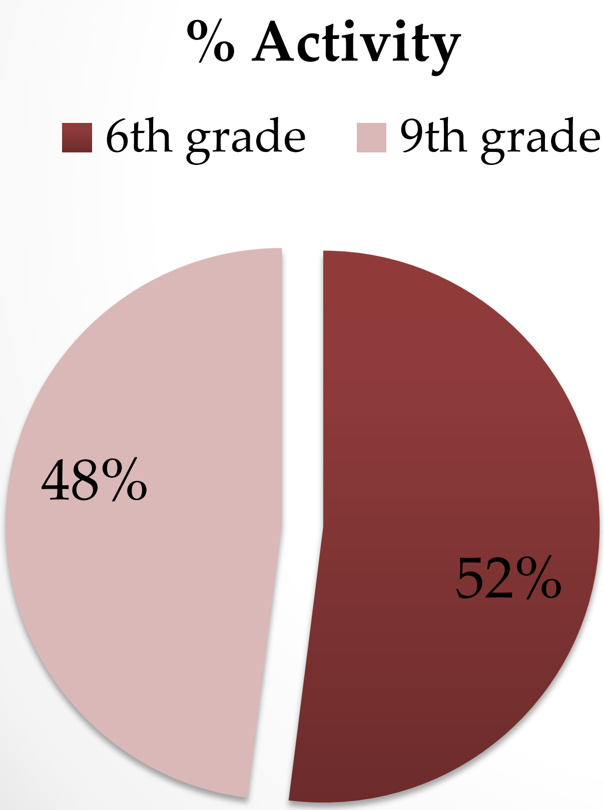
Usage Analytics

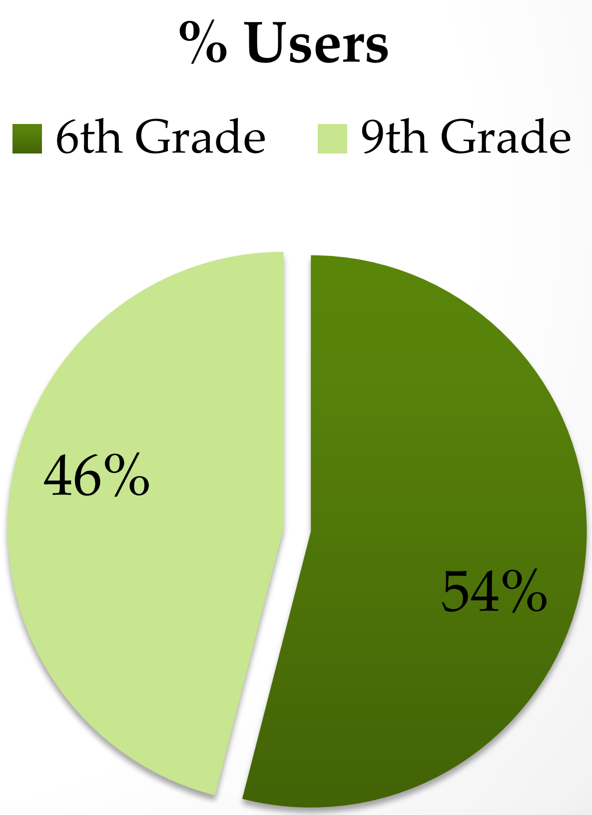
Overall System Use

- 9 months (Aug 31-July 1)
- Aggregate Usage
  - ~1400 hours of total usage
  - ~3700 unique sessions
  - 98 distinct user IDs
- Average Usage
  - 22.7 minutes/session
  - 1.6 hours/month
  - 4.1 sessions/month

Who Used The System?

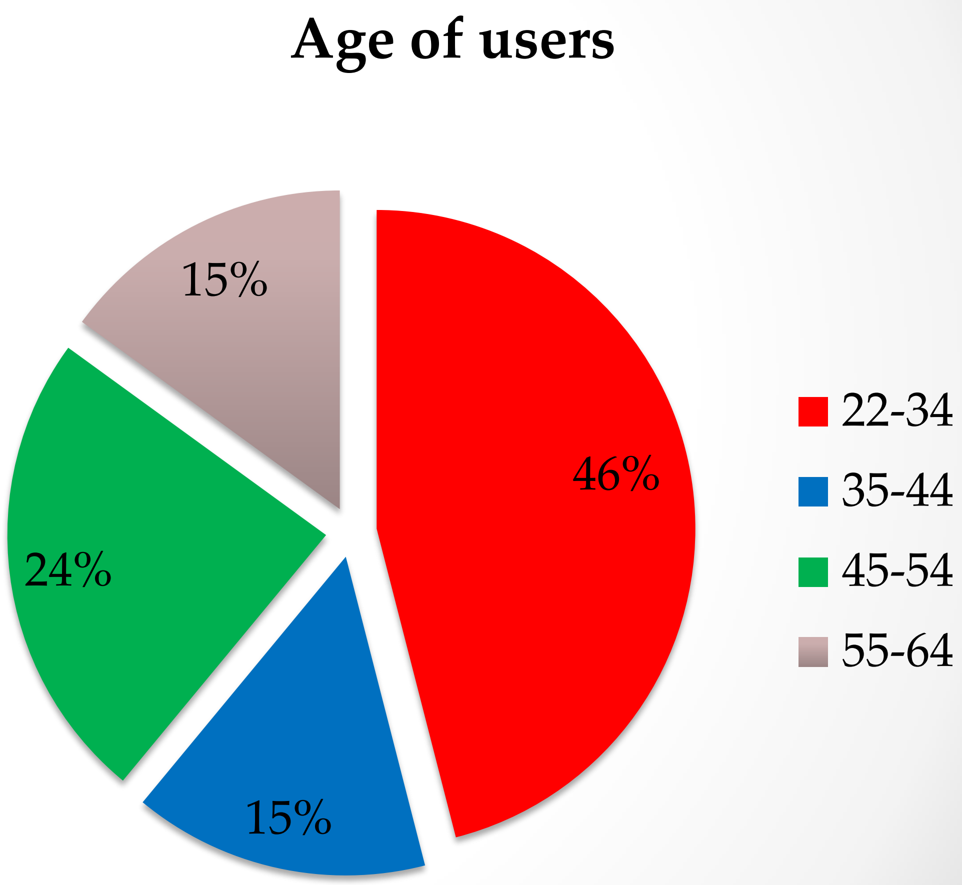
- 6^{th} and 9^{th} grade Earth Science Teachers



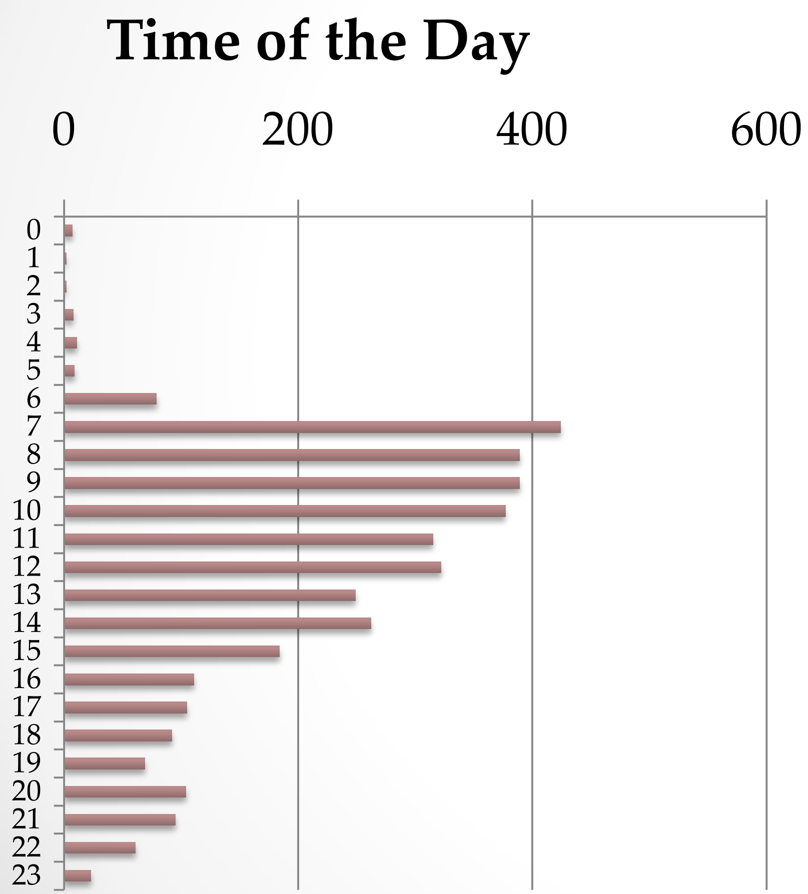


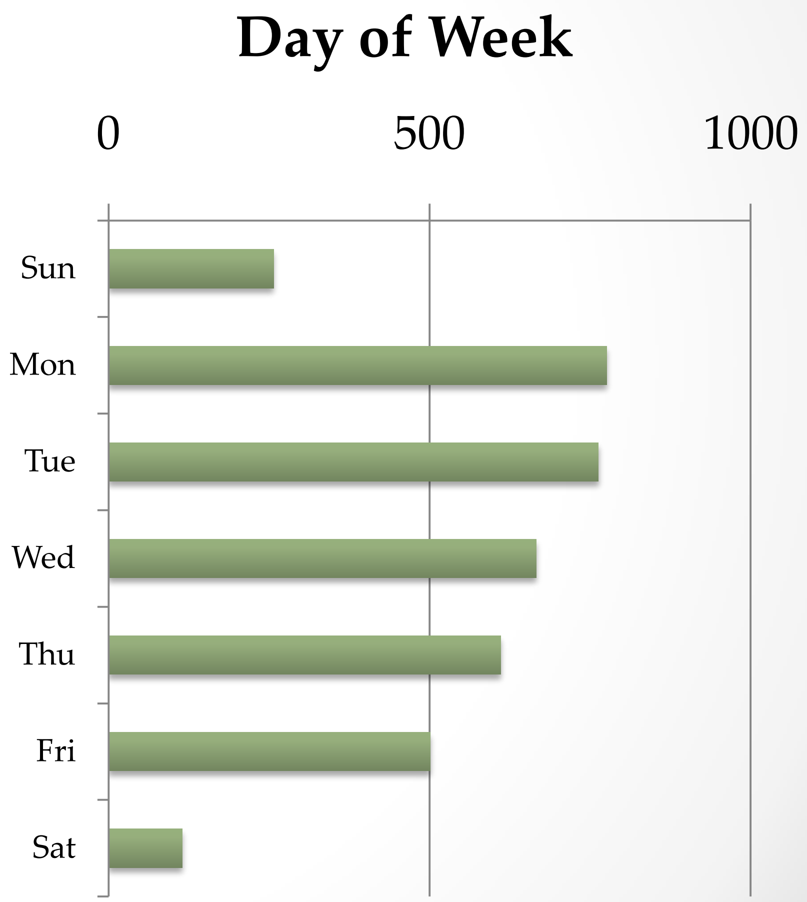
Demographic Information

- Years Teaching
  - 10 years (n=64)
  - > 70% female

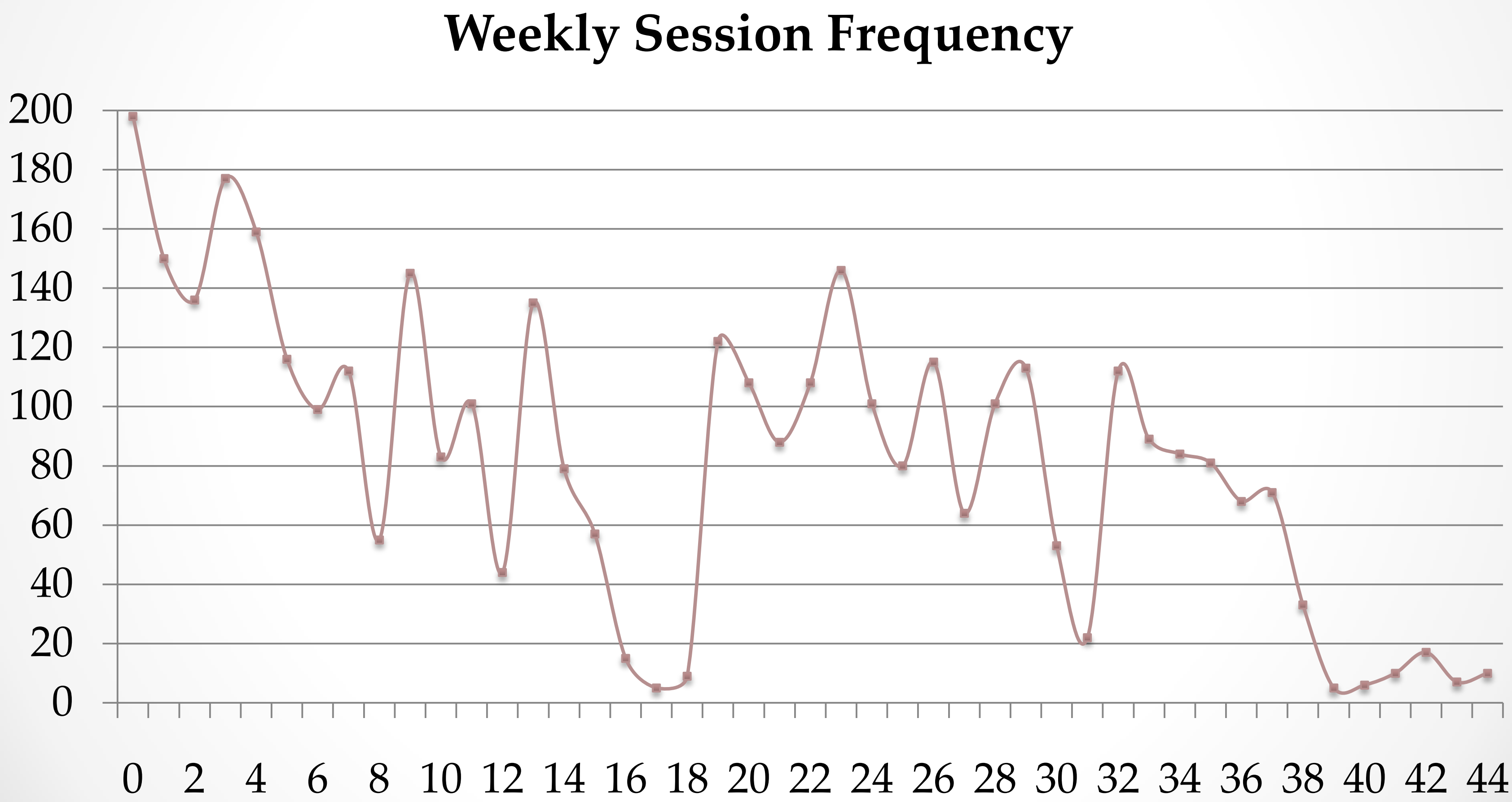


System Usage Overview

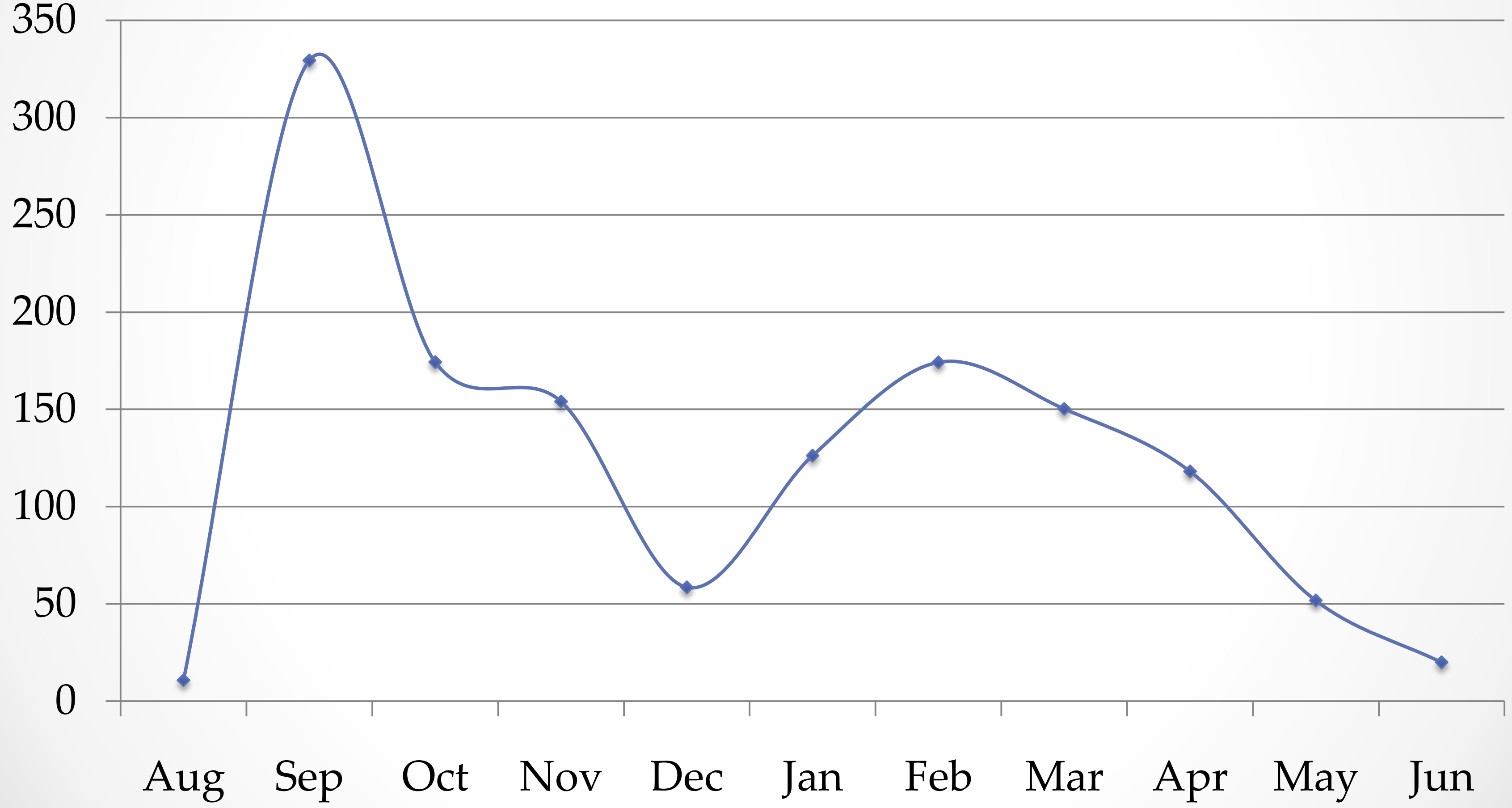




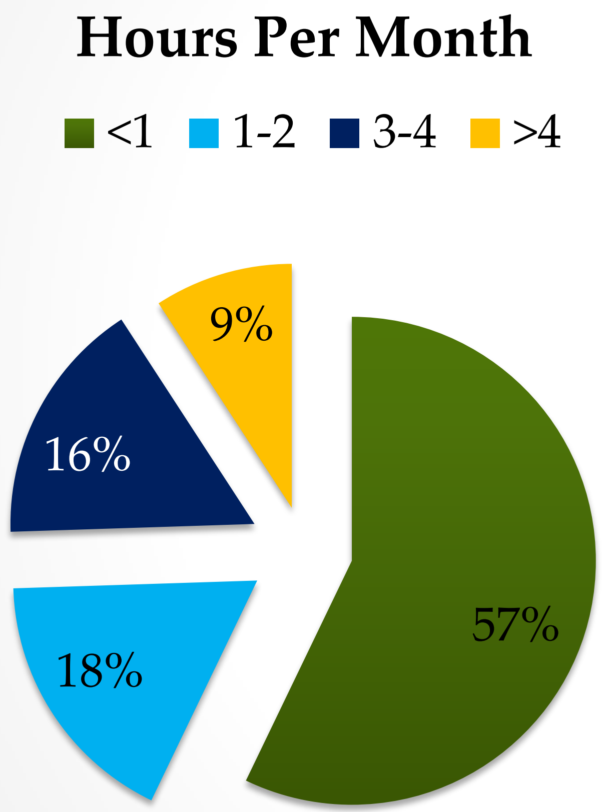
System Usage : Weekly Usage

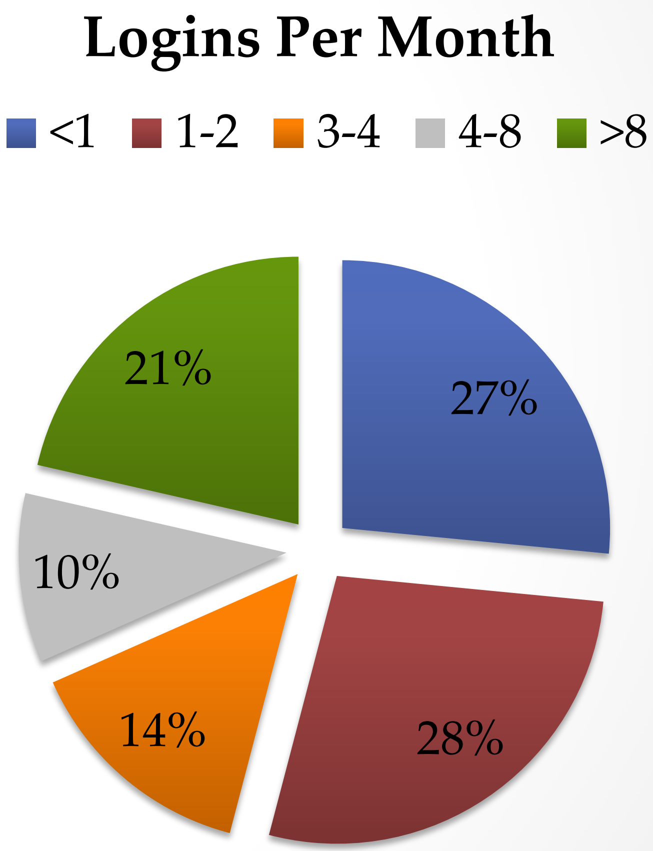


System Usage : Total Monthly Hours

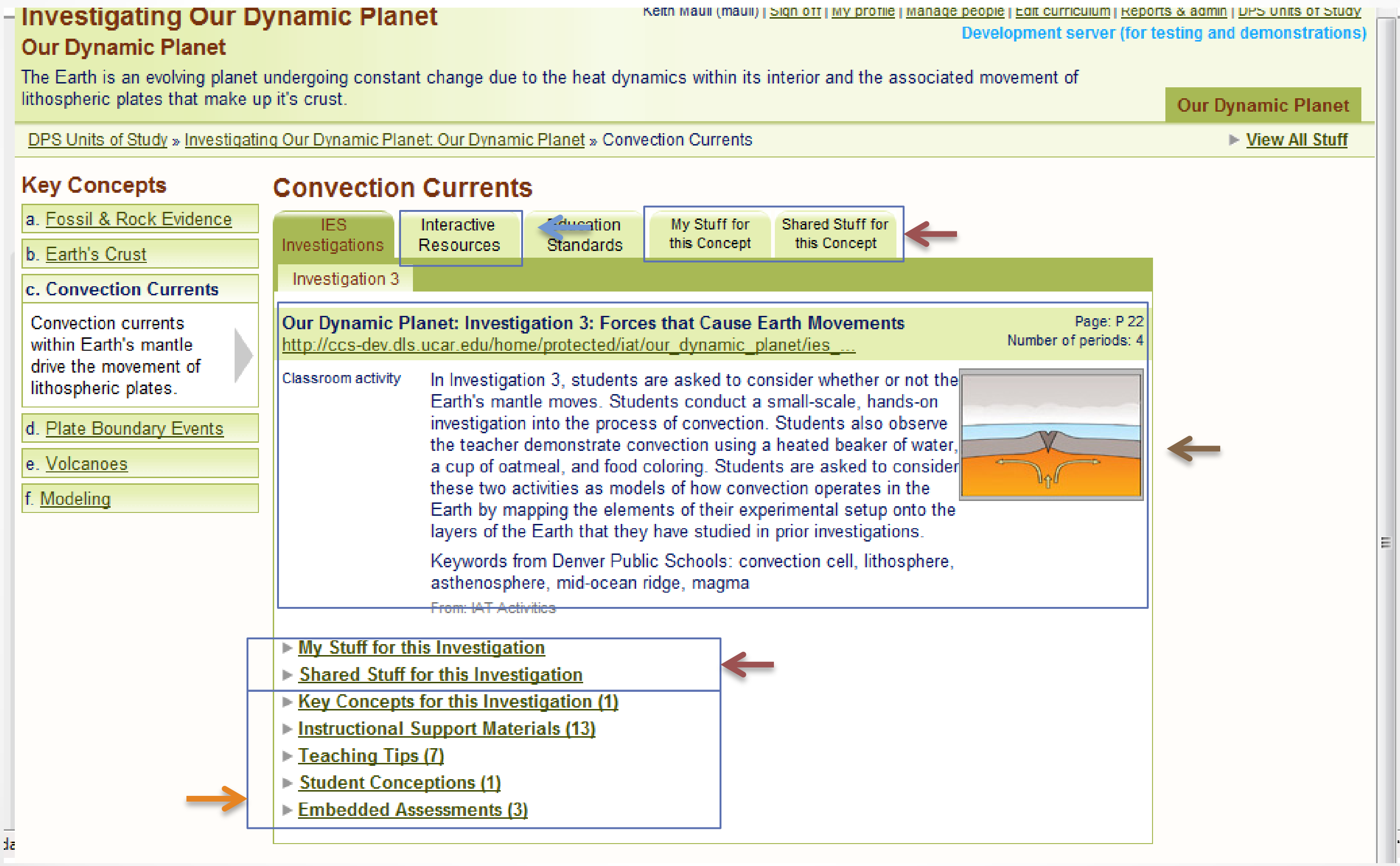


System Usage : Frequencies

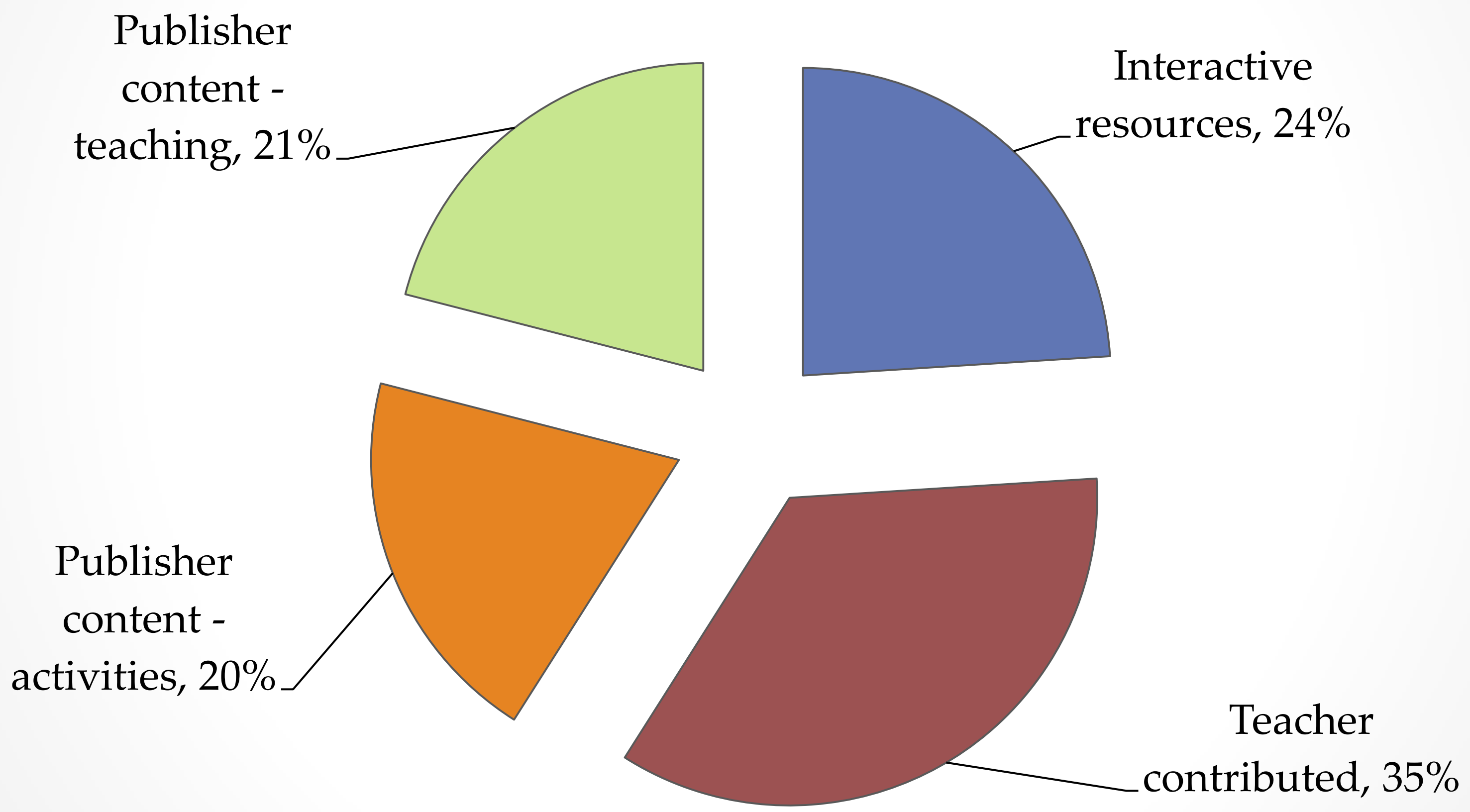




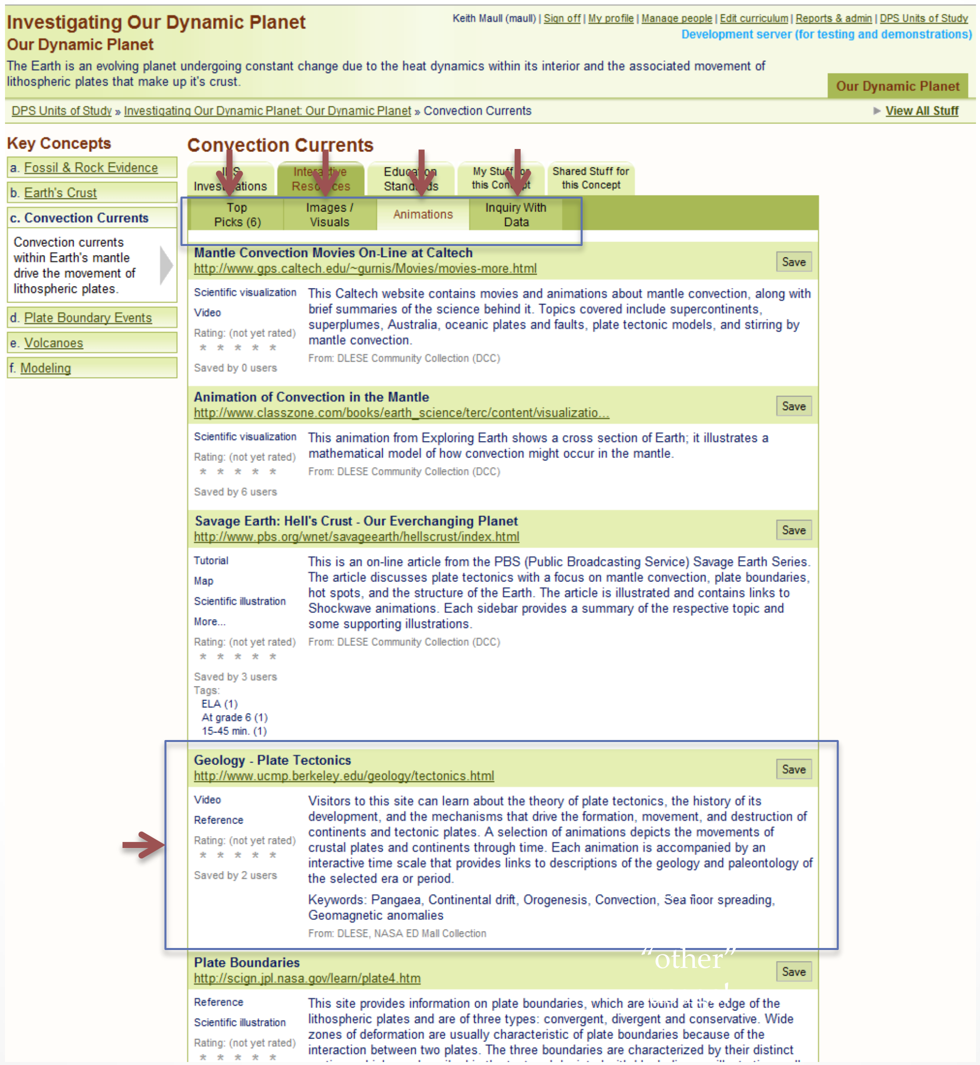
System Usage : System UI Areas



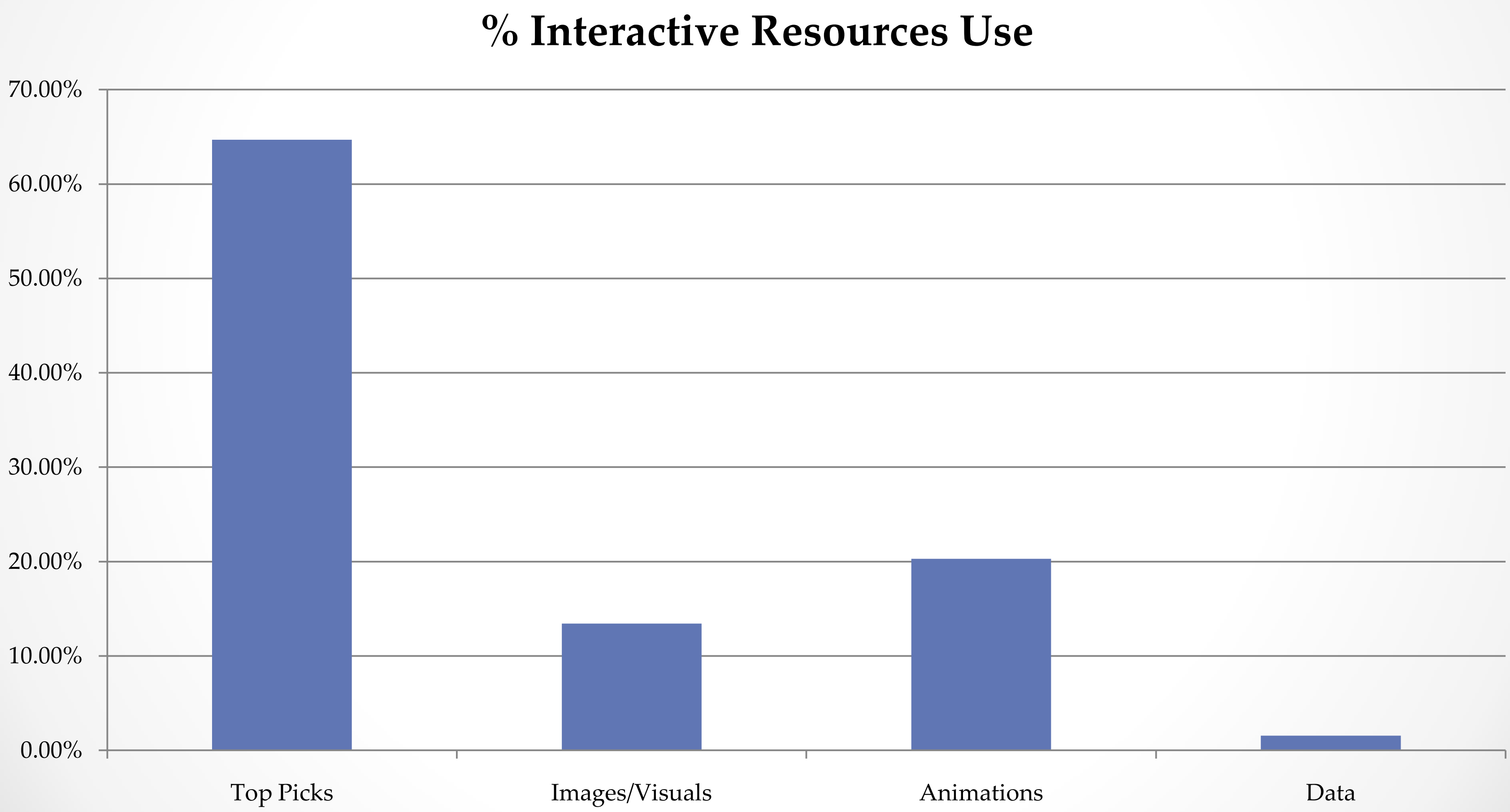
System Usage : System UI Areas



System Usage : NSDL Resources



System Usage : NSDL Resources



Discussion:
Triangulating Usage Analytics with Other Data Sources

Major Research Questions

Keith → Usage Analytics

- What behaviors did teachers exhibit when using the CCS?
- How do these behaviors map onto teaching practices observed 'in the wild?'

Teachers' Use of CCS

NSDL resources were deeply contextualized vis-à-vis DPS learning goals

Evaluation survey results (n=84):

- CCS has made it easier for me to find interactive resources that support the DPS key concepts [for the Earth science curriculum] (90% agreed/strongly agreed)
- CCS has helped me teach EarthComm/Investigating Earth Systems more effectively. (78% agreed/strongly agreed)

Teachers' Use of CCS

The CCS made it easier for teachers to integrate resources into their planning practices.

- 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)

Teachers' Use of CCS

Access to each others' materials helped teachers institutionalize and apply pedagogical knowledge and techniques.

- Ability to upload and share is very useful (84%)
- I look at *Shared Stuff* for new ideas (96%)
- The CCS has increased my awareness of other teachers' practices. (59%)
- The CCS has resulted in DPS teachers sharing resources with one another more than ever before (48%)

Major Research Questions

M. G. → Technology adoption

- How did the CCS impact teachers' differentiation of instruction?
- How and why did teachers decide to use the CCS?

CCS and Differentiation

Interactive digital resources already are valued by teachers because they aid differentiation.

- Using interactive resources in the classroom enables me to better meet the learning needs of students in my classroom. (90%)

CCS and Differentiation

The CCS helped strengthen and enlarge the digital resource → differentiation 'pipeline.'

- Overall, the CCS has helped me to differentiate instruction with greater CONFIDENCE than I had previously. (75%)
- Overall, the CCS has helped me to differentiate instruction with greater FREQUENCY than I had previously. (64%)

CCS and Differentiation

Differentiation is a means to an end (constructivist instruction). The CCS helped achieve this goal.

- The CCS has helped me use inquiry-based instruction more effectively in my classroom. (57%)
- The CCS has had a positive impact on my students' learning. (86%)

Conclusion and Next Steps

- The CCS has been adopted by a significant number (>50%) of DPS Earth science teachers
- Usage is robust, diverse, and appears to achieve project goals of more differentiated instruction
- Usage analytics map onto real world behaviors

Conclusion and Next Steps

Keith's next steps:

- Data mining to streamline analysis of teacher behaviors
- Quantifying *use diffusion*

M. G.'s next steps:

- Qualitative case studies describing *How?* and *Why?* of CCS adoption
- Exploring teachers' notions about differentiation
- Graduating
- Employment

Further Reading

Maull, K. E., Saldivar, M.G. & Sumner, T. R. (Under review). Using data mining to evaluate the instructional planning behaviors of science teachers. *Journal of Educational Data Mining*.

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Saldivar, M. G., Maull, K. E., Kirshner, B. R. & Sumner, T. R. (In press). A two- dimensional framework for evaluating teachers' technology adoption. In M. Orey, et. al. (Eds.), *Educational Media and Technology Yearbook, Vol. 36. New York: Springer.*

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