NSDL Resource Center

Mission:
To support the NSDL community by coordinating resources, tools, information, and relationships that can enhance the quality, utility, and educational impact of NSDL projects, and ensure the long-term relevance and sustainability of the NSDL enterprise.

Baseline Activities:
Community coordination, annual PIs meeting, outreach, communications, professional development, presentations and workshops, brokering partnerships and opportunities, trends monitoring, stakeholder engagement
### Resource Center Team

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Title</th>
<th>FTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director</td>
<td>Kaye Howe</td>
<td>0.8</td>
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</tr>
<tr>
<td>Deputy Director</td>
<td>Susan Van Gundy</td>
<td>1.0</td>
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<tr>
<td>Evaluation Director</td>
<td>Mary Marlino</td>
<td>0.08</td>
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<tr>
<td>Office Manager</td>
<td>Donna Cummings</td>
<td>1.0</td>
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<tr>
<td>Communications Manager</td>
<td>Eileen McIlvain</td>
<td>1.0</td>
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<tr>
<td>Evaluation Support</td>
<td>Digital Learning Sciences</td>
<td>0.60</td>
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<tr>
<td>Professional Devel Manager</td>
<td>Laura Moin</td>
<td>1.0</td>
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<tr>
<td>Educational Technology Consultants</td>
<td>Project Tomorrow</td>
<td>1.0</td>
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May 17 Start Date

[Website: www.tomorrow.org]
Relevant Trends

The increasingly networked and mobile learner
e.g., Speak Up 2009 data (tomorrow.org)

Large federal initiatives: Common Core Standards, Race to the Top, National Educational Technology Plan, Federal Broadband Plan

Increasing interest in district and state-level resource portals: threats and opportunities

Digital textbooks including Beyond Textbooks (beyondtextbooks.org)
Shared Strategies with TNS

• Maintain and operate the technical infrastructure
• Mobilize the community
• Improve the NSDL.org user experience
• Support educational exemplars
• Extend strategic partnerships
• Evaluation and Analysis
NewNSDL Community Website (NSDLnetwork.org)

Discussions, information sharing, project profiles, community networking

Launched in November 2009 as annual meeting website

New information site for prospective grantees and other contributors
NSDL Accessioning Board

reviews and approves accessioning and deaccessioning

responsible for ensuring that collections meet the collections policy criteria

comprised of up to five representative members of the NSDL and STEM education community who do not have explicit conflict of interest in NSDL collection review activities

Richard Audet
STEM Education Consultant

Elizabeth Brown
Binghamton University Libraries

Marcia A. Mardis (Chair)
The Florida State University

Robert Payo
Denver Museum of Nature and Science

Lutishor Salisbury
University of Arkansas Libraries
May 2010 report recommends best practices for comprehensive project metrics collection and analysis in four broad areas:

- Web portal or web site
- Community building /social media
- Outreach and marketing
- Professional development and training

Challenging to apply a common set of metrics across the diversity of NSDL projects

Recommends the RC/TNS implement an automated method for projects to report minimal set of metrics on monthly basis.
National Workshops

Cyberlearning Tools for Climate Education: Community Needs Assessment Workshop (September 2009)

Planning for the Future of GeoCyberEducation (January 2010)

NSDL-NSTA Web Seminars
- ChemEdDL -- Chemistry Comes Alive IV: Oxidation/Reduction
- Dragonfly TV -- Knowing Nano: New Video, Web, and Print
- Middle School Portal -- Timely Teachings: Seasons and the Cycles of Night and Day
- ActionBioscience -- Thinking Like a Scientist: Teaching and Learning Through Current Science Issues
- Teachers’ Domain -- Teaching Biotechnology: New Tools and Resources for the STEM Career Pipeline
- Project BudBurst -- Involving Students in Climate Research

NSDL Virtual Brown Bags
- Lecture Tools Demonstration
- Project Tomorrow – Speak Up 2008 Report
- CLEAN Pathway Overview
- MathPath Overview
- New Projects/People Orientation
- Marcia Mardis -- School Librarians: An NSDL Trends Report
- SERC -- Pedagogy in Action and the NSDL Pedagogical Service – Helping Users Teach with Your Materials
Community – Content – Context – Capacity for Teaching and Learning in a Networked World

Leveraging the existing network of NSDL partners to develop new strategic alliances with educational stakeholders

Redefining NSDL’s value as a content provider to practitioner networks and educational systems’ portals

Enabling both expert and user contextualization of resources based on practitioners’ on-the-ground needs

Developing users’ capacities to effectively integrate cyberlearning resources in the classroom.
Ongoing Challenges

Discoverability
Granularity
Relevance
Persistence
Intellectual Property
Sustainability
Evaluating Impact

Issues of metadata creation, scalability, quality, interoperability, stability, maintenance,

Scant knowledge of educators’ resources use outside of structured applications and interventions
Leveraging NSDL Science Literacy Maps as the basis for partnerships with state departments of education and other stakeholder groups.

2009-2010:
Working with Georgia State Department of Education to bring NSDL resources aligned to Georgia standards and AAAS Benchmarks into state portal

Discussions with Indiana put on hold awaiting information about Common Core standards
NSDL Common Core Collections

A new initiative developed in cooperation with the White House Office of Science and Technology Policy

Aligning subsets of NSDL collections to new Common Core educational standards for pK12

Developing new approaches for characterizing relationships of resources to standards

Initial Math Common Core collection targeted for Fall 2010, Science collection to follow

Math collection developed in partnership with Internet Scout, AAAS Project 2061, MathForum, MathPath
The STEM Exchange:
A Dissemination and Broader Impacts Initiative developed in cooperation with the White House Office of Science and Technology Policy

Broad Goals

• Enhancing the diffusion and access of NSDL resources to educational practitioner communities
• Aligning NSDL Resources to new Common Core standards
• Tapping practitioner knowledge and craft to add valuable context around cyberlearning resources
• Enhancing understanding about the adoption and impact of cyberlearning resources
• Developing models that will be of value to other federal agencies and other resource providers
• Embodying open source, open access, open resource practices

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Stakeholder Engagement

*Organizations participating in early discussions at varying levels include:*

<table>
<thead>
<tr>
<th>Organization</th>
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<tbody>
<tr>
<td>Advance Distributed Learning (DOD)</td>
<td>Microsoft Education</td>
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<tr>
<td>BetterLesson</td>
<td>IBM</td>
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<tr>
<td>Beyond Textbooks / Vail, AZ Unified School District</td>
<td>Intel</td>
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<tr>
<td>California Dept of Ed / Brokers of Expertise</td>
<td>International Association for K12 Online Learning</td>
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<tr>
<td>Concord Consortium</td>
<td>ISKME/ OERCommons</td>
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<tr>
<td>Corporation for Public Broadcasting</td>
<td>National Council of Teachers of Mathematics</td>
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<td>Curriki</td>
<td>National Geographic Society</td>
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<tr>
<td>Discovery Education</td>
<td>National Science Teachers Association</td>
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<td>Elluminate</td>
<td>NYSci</td>
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<tr>
<td>ePals</td>
<td>PALM Center at Florida State University</td>
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<tr>
<td>FCC</td>
<td>PBS</td>
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<tr>
<td>George Lucas Educational Foundation</td>
<td>Project Tomorrow</td>
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<tr>
<td>Georgia Department of Education</td>
<td>The Smithsonian</td>
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<tr>
<td>The Library of Congress</td>
<td>Southern Regional Education Board</td>
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</table>
NSDL Projects participating in Common Core and STEM Exchange

- AAAS
- AMSER
- comPADRE
- CLEAN
- MatDL
- MathForum
- MathPath
- MSP2
- SERC
- SMILE
- Teachers’ Domain
Why the STEM Exchange?
The Limitations of Metadata

- labor intensive, expensive
- metadata creation and exchange requires technical library expertise
- essential but not sufficient
Discover – Select – Use – Reuse – Remix – Contextualize

Search
Browse

Link
Download

Share
Embed
Reauthorize
Recommend
Favorite
Review
Tweet
Feed
Align
Adopt
Personalize
Customize
Bookmark
Mash Up
...

Educational Impact: We are missing much of the picture...
Why the STEM Exchange? The Evolving Power of Context

- scarcity of content is no longer the issue
- content alone does not transform
- content creation as a powerful learning process
- need to liberate the wisdom of teacher communities around content to achieve transformation
New Information Profile Around STEM Resources

focused, not on describing the resource itself, but on facilitating the diffusion of the resource into educational practice and explicating diffusion patterns as the resource is annotated, reviewed, downloaded, embedded, shared, accreted, modified, and updated.
STEM Exchange as system through which resource profiles can be collaboratively assembled and openly exchanged by leveraging existing social networking software to create a dynamic system with interconnected learning resources—instead of people—as the entities with rich information spaces of profiles, friends, groups, and status updates
“Paradata”

- a complement to metadata, not a replacement
- separate layer of information from metadata
- a means to automate information generation about resource use by using social networking tools
- a means to create an open source and open access data space around resources
- emphasizes dissemination rather than description
- accommodates expert and user-generated knowledge
- powers feedback loops
- explicates usage patterns and inferred utility of resources
**Resource ID:**
Short human-readable identifier unique to each resource profile

**Metadata:**
One or more descriptive records from one or more resource providers

**Direct Access to Content:**
Preview, download, or embed functionalities as appropriate to resource

**Data Feeds:**
Favoriting, curriculum alignments, usage notes, and other associations from user communities
DATA FLOW THROUGH THE STEM EXCHANGE

RESOURCES

- Metadata
- Content files (e.g., PDFs, Flash files, embed codes)
- Associations (e.g., relationships to other resources)

DATA EXCHANGE

RESOURCES

- Rich resource information
- Access (e.g., download, preview)
- IDs to reference profiles

COMMUNITY-GENERATED DATA

- Connections to lessons and curriculum, mappings to standards, and other user-defined associations

RESOURCE PROFILE DATA

- Paradata that captures how resource is being used
- Profile usage data including number of hits or downloads

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What We’ve Heard from Stakeholders

Interest in...

• social media style access to NSDL resources
• potential to enhance dissemination of resources
• adding practitioner context to resources
• rethinking impact metrics around how resources are being used (paradata)

• simple, flexible, customizable tool for capturing and analyzing resource paradata
• data formatting and data sharing standards for resource paradata
• cooperation and collaboration across stakeholder groups

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Technical Network Services - Overview

Carl Lagoze, Cornell University
Tamara Sumner, University of Colorado
Michael Wright, UCAR
Role of Technical Network Services

- Services for discovery and delivery of the library's collections through nsdl.org and other portals
- Tools to create and manage collections of digital objects
- Web-based applications that help teachers and learners to optimize their experiences with digital content
- Services to support collaborative conversations among scientists, teachers, and students
- Support, training and consultation for the adoption and use of TNS supported tools
NSDL circa 2002

Diagram showing the interactions between users, portals, metadata repository, collections, and services.
NSDL circa 201x

NSDL resources & services
NSDL Logic Model
Messages from 2009 Reverse Site Visit
From infrastructure development to deployment…
From general portals to embedded applications...

If we build it they will come

We will build it and bring it to them
What comes next

- Review of 2009 accomplishments
  - Tammy Sumner
- Plans for the year ahead
  - Mike Wright
### Strategies & Resource Alignments

<table>
<thead>
<tr>
<th>Project Management and Administration</th>
<th>1.5 FTEs</th>
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<tbody>
<tr>
<td>1) Maintain and operate the technical infrastructure</td>
<td>4.7 FTEs</td>
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<tr>
<td>2) Mobilize the community</td>
<td>3.5 FTEs</td>
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<tr>
<td>3) Support educational exemplars</td>
<td>2 FTEs</td>
</tr>
<tr>
<td>4) Improve NSDL.org user experience</td>
<td>0.5 FTE</td>
</tr>
<tr>
<td>5) Evaluation</td>
<td>0.3 FTE</td>
</tr>
<tr>
<td>6) Extend strategic partnerships</td>
<td>As needed</td>
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## Major Accomplishments of TNS in 2009

<table>
<thead>
<tr>
<th>Strategic Goals Being Met</th>
<th>Key Outcomes</th>
<th>Evidence of Efficacy and Impact</th>
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</table>
| Goal 1: Operate the NSDL technical infrastructure and streamline operations for long term sustainability | • Completed major collections streamlining  
• Continued HW/SW streamlining  
• Improved virtualization and hosting | • Significantly improved alignment between collections and audience  
  o Pre/Post collection content analyses  
  o NSDL.org user audience survey and improved web analytics  
• Seven fold increase in hosting services to grantees with no additional FTEs |
| Goal 4: Improve the NSDL.org user experience                                             |                                                                                                                                                   |                                                                                               |
| Goal 2: Mobilize the NSDL community to position NSDL as premier distributed cyberlearning platform | • Significantly ramped up platform technical support, services, and training  
  • New “reverse visit” model for mini-summits  
  • Semi-structured interviews with 16 grantees in 8 projects on TNS services  
  • Initiated Roadmap technical planning process  
  • Provided technical support to RC to develop NSDL Community Site  
  • Secured continued access to strategic service: Content Assignment Tool (CAT) | • Significant increase in platform adoption  
  o From 3 to 19 community groups  
  o From 125 to 311 EduPak downloads  
  o Trained approx 50 people from NSDL, CCLI, NASA, and AAAS  
  o Saves grantees effort and expense, strong levels of service and support  
• Major releases and key agreements  
  o TNS Roadmaps - Jan 2010  
  o NSDL Community Site - Oct 2009  
  o Syracuse University to support CAT |
| Goal 3: Support educational exemplars                                                   | • Validated “embedding” model for promoting mainstream K-12 use and NSDL Logic Model  
  • Extending school district deployment site network  
  • Improving platform support for exemplars: NDR API 2.0 and Science Literacy Collection | • Denver Public Schools Field Trial Results (124 teachers) and RAND Site Visit  
  • Districts on board: DPS, Douglas (CO), Davis (Utah), St. Vrain (CO) |
| Goal 5: Extend strategic partnerships                                                    |                                                                                                                                                   |                                                                                               |
G1 Infrastructure & G4 User Experience

- **Objective:** Streamline infrastructure to improve operations and hosting

- **Evidence:** Seven-fold increase in community hosting services without additional FTEs

- **Objective:** Streamline collections and align to audience

- **Evidence:** From 2 million to 133,000 items
  - Pre/Post Analysis
  - NSDL.org audience survey
Pre/Post Collection Analysis

Pathway resources more than doubled
Improved Alignment to Audience

Who uses NSDL.org?
- Educators (56%) and students (23%)

What grade levels?
- High, Undergrad, Middle

What are they doing?
- Looking for resource to teach (35%)
- Furthering own knowledge (17%)

Were they successful?
- Very - 42%, Somewhat - 42%, No - 5%
- Complexity, Student-facing content

519 responses; about 13%
**G2: Mobilize Community/Platform Support**

- **Objective:** Engage community in technical planning and co-development
  - **Evidence:**
    - Roadmaps released
    - Community contributions rolled back into platform

- **Objective:** Ramp up platform support services
  - **Evidence:** Significant increase in platform adoption (6 fold increase)
    - Grantee interviews on TNS services
Mean and Median

This applet allows students to investigate the mean, median, and box-and-whisker plot for a set of data that consists of 10 integers, each with a value from 10 to 120. The exploration questions challenge students to invent sets of data that satisfy given criteria.

From: Middle School Portal 2
Resource Type: Instructional Material, Activity, Simulation
Other Examples of Platform Adoption

- Engineering Pathway – helping them to rebuild from the ground up
  - A sign of things to come as projects prepare for sustainability?

- California County Educational Technology Consortium
  - 17 Counties; 1 million students
  - Use EduPak to develop repository and Curriculum Customization-like services
Perceptions of TNS Services

- Semi-structured interviews with 16 people from 8 groups
- What tools and services do they use and why? Do they help you meet your project goals?
- Issues and barriers with TNS tools and services?
- Priorities and interests in coming year?
Results – What do you use and why?

- Mostly collection development services
- Efficiency, may lack in-house technical support, make their dollars go farther

“I think the clear aspect was a savings in cost and time. And that was, you know, of course the primary motivation, so we can stretch our dollars further for actual stewardship of the community. And of course, we wanted to be part of the NSDL and be seen as an example of how a pathway can start relatively quickly without having to worry about the infrastructure so much. So we both wanted to be a test case for future pathways, and we wanted to make sure the development of X Pathway went smoothly and quickly, and that’s why we went – and of course, you know, it helps that TNS is around and is composed of such great people to offer technical support.”
Results – Issues and Barriers

- Have own tools; don’t want to be guinea pigs or test cases
- Lack of awareness of available tools and services
- Usability of NCS – need a more user friendly approach for casual catalogers
- Development cycles out of sync (they want it now)
Results – Help meet your project goals?

- YES! Saves them effort and expense and enables more investment in product
- Additional goals seeking support for:
  - More technical guidance and best practices on setting up their own services
  - Outreach and evaluation (not really expecting TNS support here, more RC)
- Better communication, difficult to find roadmaps, need more prompting
G3 Edu Examplars & G5 Partnerships

- **Objective:** Develop and validate model for embedding in mainstream K-12

- **Evidence:** Denver Public Schools field trial (n = 124) and RAND site visit

- **Objective:** Extend school district deployment site network

- **Evidence:** Four districts now on board: DPS, Douglas County (CO), Davis (Utah), St. Vrain (CO)
Unit 2: Earth’s Dynamic Geosphere
Plate Tectonics
Plate Tectonics is the result of matter and energy flow in the Earth which causes specific topography.

Key Concepts
- GPS Technology
- Modern Theory
- Plate Boundaries
- Earth’s Layers
- Plate Motion
- Interactions of Plates

Interactions of Plates
- EarthComm Activities
- Interactive Resources
- Education Standards
- My Stuff

Plate Tectonics: Activity 4: Effects of Plate Tectonics
This activity uses maps to discover the relationship among plate tectonics and earthquakes and volcanoes. Students will model: 1) the rise of magma through the Earth using honey and vegetable oil, 2) subduction and mountain building using clay and cheese, and 3) hypothesis about the formation of the Appalachian Mountains at plate boundaries.

Unit 2: Earth’s Dynamic Geosphere
Plate Tectonics
Plate Tectonics is the result of matter and energy flow in the Earth which causes specific topography.

Created with EduPak and the Strand Map Service
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, end-of-class student assessments administered by DPS
<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>
<tbody>
<tr>
<td>Effective instruction builds on learners’ current knowledge and background</td>
<td>High quality DL resources aligned to learning goals and curriculum</td>
<td>Learning Goals integrate: • Core curriculum • DL resources • Assessments • Common student conceptions • User-contributed content</td>
<td>Teachers customize instruction to meet learner needs and to improve learner engagement</td>
<td>Increases in student learning</td>
</tr>
<tr>
<td>Classrooms are becoming increasingly diverse</td>
<td>DL technologies enabling scalable access, use, and sharing</td>
<td>CCS supports instructional planning, customization, and professional learning</td>
<td>Teachers integrate DL resources into their instruction with greater confidence and frequency</td>
<td>Customization is widespread and instruction is improved</td>
</tr>
<tr>
<td>Large differences in teachers’ abilities to tailor instruction to learner needs</td>
<td>School Districts: • Curriculum Guides • Teacher PD processes and incentives • Technical infrastructure</td>
<td>District PD incentives encourage CCS use and customization, and recognize contributions / sharing</td>
<td>Customizations support curricular coherence and use high quality DL resources</td>
<td>Use of the CCS for ongoing professional learning is widespread</td>
</tr>
<tr>
<td>Extensive and purposeful planning is a hallmark of effective teaching</td>
<td>Teachers integrate DL resources into their instruction with greater confidence and frequency</td>
<td>Teachers share customizations and other contributions online</td>
<td>Teachers develop improved skills and knowledge for making pedagogically sound customizations</td>
<td></td>
</tr>
</tbody>
</table>

CCS supports informal and formal settings.
Teacher Publications about NSDL Learning Applications


- Miller, Jeffrey. “Customizing Curriculum with Digital Resources”; In preparation for submission to The Science Teacher, Special Issue on New Web Tools and Technology; NSTA Publications (May 1)

- Harrell, Karen. In preparation for submission to Science Scope, Special Issue on Models; NSTA Publications (June 1)
New Partners and Opportunities

- Expanded School District Network
  - Denver Public Schools, CO: 70,000 students, urban, very diverse, high needs learners
  - Douglas County, CO: 50,000 students
  - Davis County, Utah: 70,000 students
  - St. Vrain, CO: 26,000 students

- Expanding Inquiry Curriculum
  - Investigating Earth Systems and EarthComm; American Geological Institute/ It’s About Time
  - Biology: A Human Approach; Biological Sciences Curriculum Study/ Kendall Hunt
  - Project-Based Inquiry Science; Kolodner, Krajcik, Edelson, et al/ It’s About Time
Preserving and Enhancing NSF’s Investment in NSDL

1. Staging for sustainability through improved operational flexibility
2. Extending the reach of the NSDL cyberlearning platform
3. Demonstrating impact of embedded NSDL services across deployment sites and disciplines
1) Staging for Sustainability

Improved Operational Flexibility

- Ability to shift ops to new providers quickly and at low cost
- Leverage rapidly evolving cloud computing capabilities
- Complete transition to virtualized environment
- Conduct cloud services experiment with test set of grantees and partners
2) Extending Reach of NSDL Cyberlearning Platform

Increase breadth and depth of platform usage

- Realign developer staff to improve customer focus and technical support
- Support pathways and projects to transition to NSDL platform

*Home grown or proprietary vendor systems are difficult to maintain, end-of-life issues*

Engineering Pathway, Instructional Architect, GenderDL, Funworks
3) Demonstrating impact of embedded NSDL services

CCS has strong potential to be self-sustaining once we demonstrate replicability across sites and disciplines

- Strategically grow school district network
- Replicate Earth science-specific Curriculum Customization Service and related NSDL services across network
- Set the stage for other disciplines
- Seek external funding to conduct research on replicability and impact on student learning
Discussion