NSDL CORE INTEGRATION EVALUATION REPORT

EVALUATION SURVEY #1: RESOURCE CREATION AND REVIEW PROCESSES

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Contents

This document reports preliminary findings from an online survey conducted by NSDL Core Integration. The principle objective of the survey was to assess the progress that NSDL as a program has made towards creating and/or reviewing exemplary digital educational resources. The survey asked respondents (a) if their projects had been involved in the creation and/or review of library resources, (b) whether they had used guidelines/rubrics to help them in these tasks, (c) whether they could describe and/or supply copies of these guidelines, and (d) how they would rate the help that they received from NSDL in carrying out their tasks.

Respondents to the survey found the tasks of resource creation and review to be somewhat harder than expected, but not too hard. They also reported that they had also received support in carrying out these tasks from NSDL, with this help being rated 'adequate to good' rather than 'good to excellent.'

The most popular sources of help for projects were personal and face-to-face in nature, and included other contacts in NSDL, and NSDL Annual Meetings and workshops. Online sources of help provided by NSDL, including wikis and e-mail lists, were not highly rated, and several respondents requested that NSDL provide simple and easy to understand sets of online guidelines to support project activities.

The survey indicates that the NSDL program has a strong community, and that NSDL projects have sets of formal and informal practices in place for ensuring the overall quality of NSDL resources. This suggests in turn that NSDL resources are themselves of a certain quality. At the same time, however, there are no standardized, program-wide definitions of quality that NSDL developers and users can consult. Generating such a standardized set of resource creation guidelines and best practices would support both developers and users in their interactions with NSDL, and help assure the quality of future NSDL resources.

Introduction: The quality question

This document reports preliminary findings from an online survey conducted by NSDL Core Integration on the subject of resource creation and review practices and processes amongst NSDL projects. The findings will support further research aimed at evaluating resource quality in the NSDL program.

Evaluating the quality of the resources in NSDL is a complex task, for a number of reasons. First, there is no yardstick against which to measure resource quality in NSDL; and while NSDL has adopted an overall definition of a quality library resource as 'appropriate to the NSDL mission' and 'matching the subject scope of NSDL'[1], more precise definitions are lacking. Second (therefore), NSDL also does not provide standardized instruments with which to measure resource quality. Third, definitions of 'quality' can vary from context to context. For instance, a media-rich, high-bandwidth resource appropriate for teaching complex concepts in a computer lab, may not be considered a 'quality' resource for teachers working in classrooms with low bandwidth connections, for whom a collection of printable lesson activities might be more usable. These and other factors mean that the question of evaluating NSDL resource quality is currently an *under-determined* one with respect to the number of variables that have to be accounted for in order to isolate a measure of 'quality.'

This situation could be addressed in large-scale comparative studies between schools that had integrated NSDL resources into the curriculum and schools that had not. Here, variables could be controlled at the unit of analysis, the school. NSDL does not however have the resources to carry out such studies. An alternative strategy, implemented in a preliminary way in this survey, is to switch the focus of the inquiry from use to points upstream in the digital library resource delivery process, and in particular to the point of resource creation. The point of creation is a good place at which to evaluate resource quality, as it is here that resource quality should be guaranteed by resource creators.

Under current logistical constraints, therefore, a useful measure of *overall* resource quality in NSDL can be obtained from a strategic evaluation of the quality control processes which resource creators themselves apply at the point of resource creation. In other words, it is assumed that a guarantee of resource quality at the point of creation is a broadly useful indicator of resource quality at the moment of use, and therefore that it is useful to look at how individual projects create resources and monitor their quality, and document their quality control processes.[2]

In the case of this survey, this has entailed collecting descriptions of projects' resource creation and review processes, and copies of their guidelines, and inquiring into how well NSDL as an organization and a program has supported them to create such criteria.

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[1] According to NSDL collection policy, http://nsdl.org/about/index.php?pager=collection_policy:
  "Each [NSDL] collection has been selected based on the following criteria:
  - appropriate to fulfilling the mission of NSDL
  - matches the subject scope of NSDL
  Since almost all scientific materials have the potential to be used in some aspect of education, this scope is very broad."

[2] For further exploration of this strategy, see the NSDL Evaluation White Paper:
  http://eval.comm.nsdl.org/cgi-bin/wiki.pl?WhitePaper

1 Survey overview

The principle objective of the survey was to assess the progress that NSDL as a program has made towards creating and/or reviewing exemplary digital educational resources. As has just been described, this was achieved by focusing on projects' resource creation and review processes. The survey asked respondents (a) if their projects had been involved in the creation and/or review of library resources, (b) whether they had used guidelines/rubrics to help them in these tasks, (c) whether they could describe and/or supply copies of these guidelines, and (d) how they would rate the help that they received from NSDL in order to carry out their tasks.

A number of respondents suggested that the distinction made in the survey between resource creation and review was too fine, and that in practice, creation and review processes were integrated, and covered by the same practices, guidelines and documentation. In places, the following analysis therefore aggregates responses from separate survey questions dealing with creation and review, and in doing so, note that reported figures are often approximate averages of the responses to these separate questions.

Survey format
The survey was carried out online using a web survey provider, surveymonkey.com. The survey web page was accessed via a URL that was e-mailed to all members of two Core Integration e-mail lists, the NSDL project PIs list, and the NSDL Pathways PIs list. It was hoped that linking directly to the survey from an e-mail would make it easier for respondents to take part.

The first e-mail was sent out on January 17, 2006. By February 21, 54 responses had been received. NSDL has funded 212 projects,[3] and so approximately 25% of all NSDL projects responded to the survey. This response rate rises to a 49% for projects funded within the past two years, and to 67% for projects funded within the last year (chart 1). These different response rates were expected, as it was assumed that current NSDL PIs would be more engaged with their projects than past PIs. The response rate also indicated that the survey did a reasonable job of capturing opinions from more recent NSDL projects, opinions that are likely to be more relevant to Core Integration.

Most responses were received within 48 hours of the sending out of an e-mail reminder, and over 80% of all responses were received after the first two e-mails (chart 3), and it is therefore planned to reduce the next survey to one initial and two reminder e-mails.

Ease of use
Most respondents found the survey easy to complete. 84% of respondents completed the survey in less than half an hour (43% of respondents in 0-15 minutes, and 40.9% in 15-30 minutes; the remaining 15.9% completed the survey in 30-45 minutes). On a scale of 1 (easy) to 5 (hard), respondents ranked the survey as 1.96 (quite easy). The main problems with the survey were identified as:

- the repetitive and confusing nature of some of the questions
- a lack of relevance for particular projects
- ambiguity and lack of definition in key survey terms
- lack of a briefing page explaining the background to and rational for the survey

These issues will be addressed in the next survey.

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[3] For a full list of projects, see: http://nsdlib.org/about/index.php?pager=projects

2 Respondent profiles

Project status
73.5% (n=49) of respondents were members of current NSDL projects, and 26.5% were members of past NSDL projects. 72% (n=50) indicated that they were lead PIs, 16% that they were co-PIs, and 12% that they were involved with the project in some other capacity.

Project track
Reponses were received from all NSDL program tracks. In numerical terms (n=20), the most responses were received from the collections track. In proportional terms (92.3%) the program track with the highest response rate was Pathways (chart 2). The program track with the lowest response rate, numerically and proportionally, was Core Integration (1 response). Note that the subject of the survey may not have been relevant to all projects in all program tracks.

Project staff
Respondents indicated that each project supported an average of 2.8 PIs and 2 graduate students. With a number of reservations (including the imprecise nature of the data, and the changing structure of NSDL over time), this suggests that the NSDL program as a whole has supported *approximately* 600 PIs and 425 graduate students.

Target audiences
Respondents were asked to identify their most important target audience(s). Respondents could identify more than one audience. The most frequently identified target audience was higher education (46% of all responses), followed by K-12 (28%), and lifelong/other audiences (18%). Curriculum developers featured as a significant target audience (11%). Generally, the higher the educational level, the more important this audience was as an audience (chart 4).

Responses in the 'other' category of this question included:

- Education researchers
- Teachers/faculty
- Higher education faculty
- Scientists
- Afterschool audiences
- Content providers, teachers, catalogers
- STEM Faculty
- Museums, zoos, & aquaria; scientists; commercial companies; radio, TV, cinema producers; wildlife management teams; university faculty
- Specifically the audience is curriculum developers who wish to create educational modules that allow the learner to interact directly with remote scientific datasets (not pre-generated visualizations, but true interaction)
- Moving image archivists, collectors, the general public

Several respondents indicated that the survey questions did not distinguish sufficiently between students and faculty as audiences; this issue will be addressed in subsequent surveys.
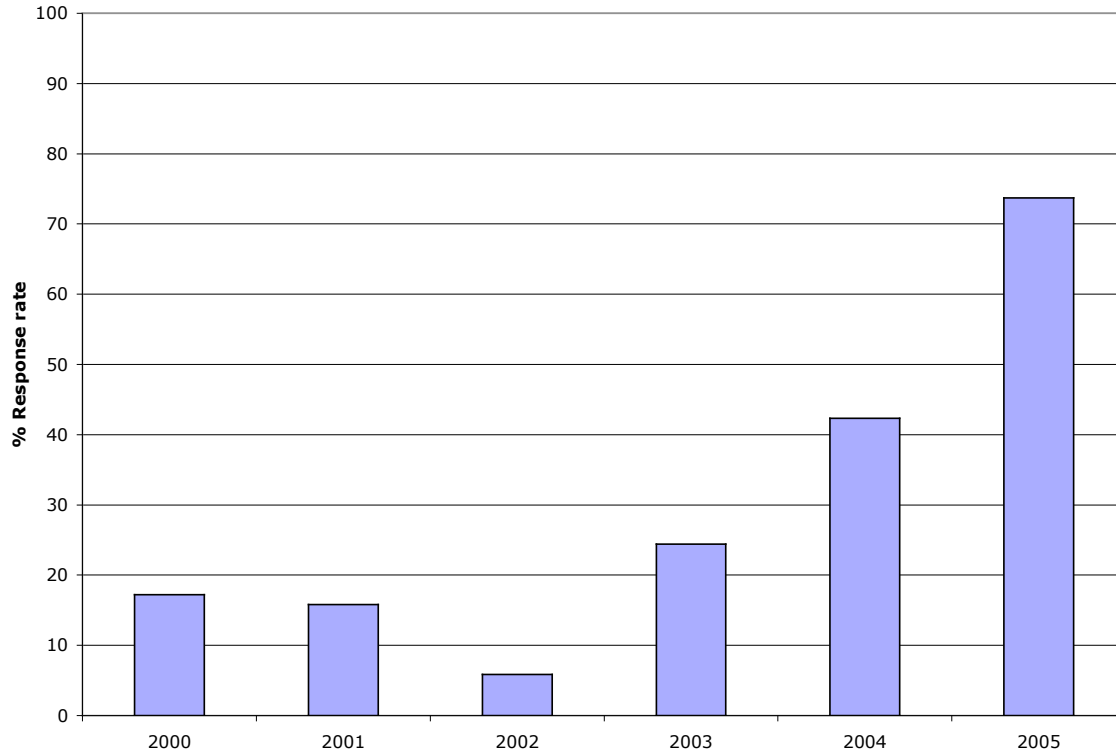
Chart 1: Survey responses by project start year

Start year	Awards (n)	Responses (n)	Response Rate (%)
2000	29	5	17.2
2001	38	6	15.8
2002	51	3	5.9
2003	41	10	24.4
2004	26	11	42.3
2005	19	14	73.7
Not sure	n/a	5	n/a
All NSDL	**204**	**54**	**26.5**
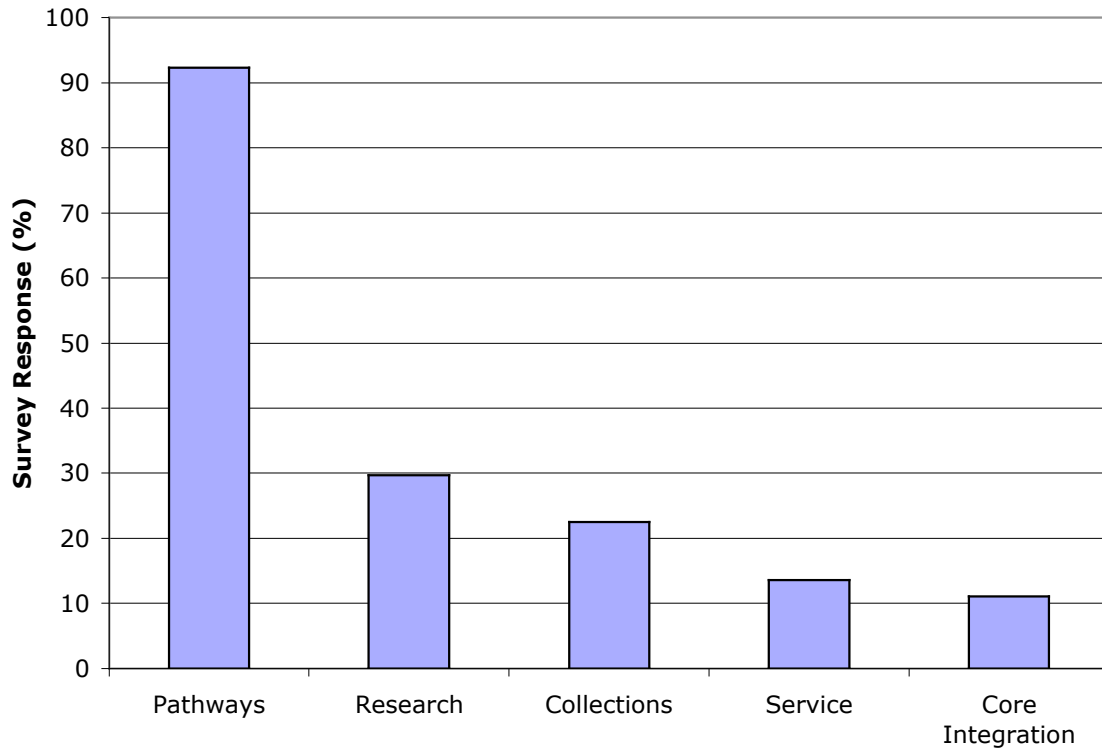
Chart 2: Survey responses by project track

Project track	Awards (n)	Responses (n)	Response Rate (%)
Collection	89	20	22.5
Pathway	13	12	92.3
Service	66	9	13.6
Research	27	8	29.6
Core Integration	9	1	11.1
None-NSDL	n/a	1	n/a
Not sure	n/a	1	n/a
All NSDL	**204**	**54**	**26.5**

Chart 3: Survey responses over time
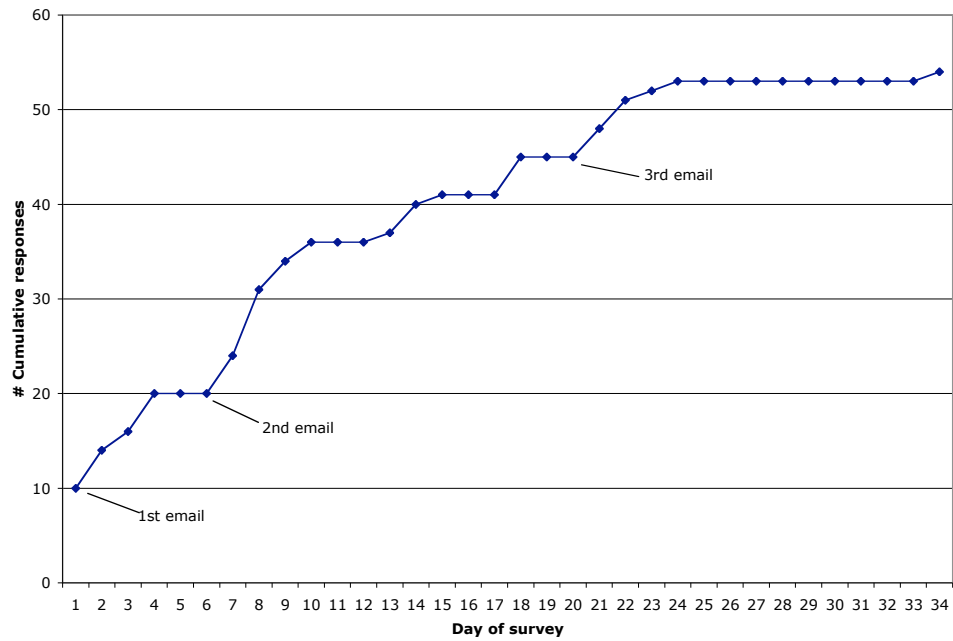
Chart 4: Target audiences
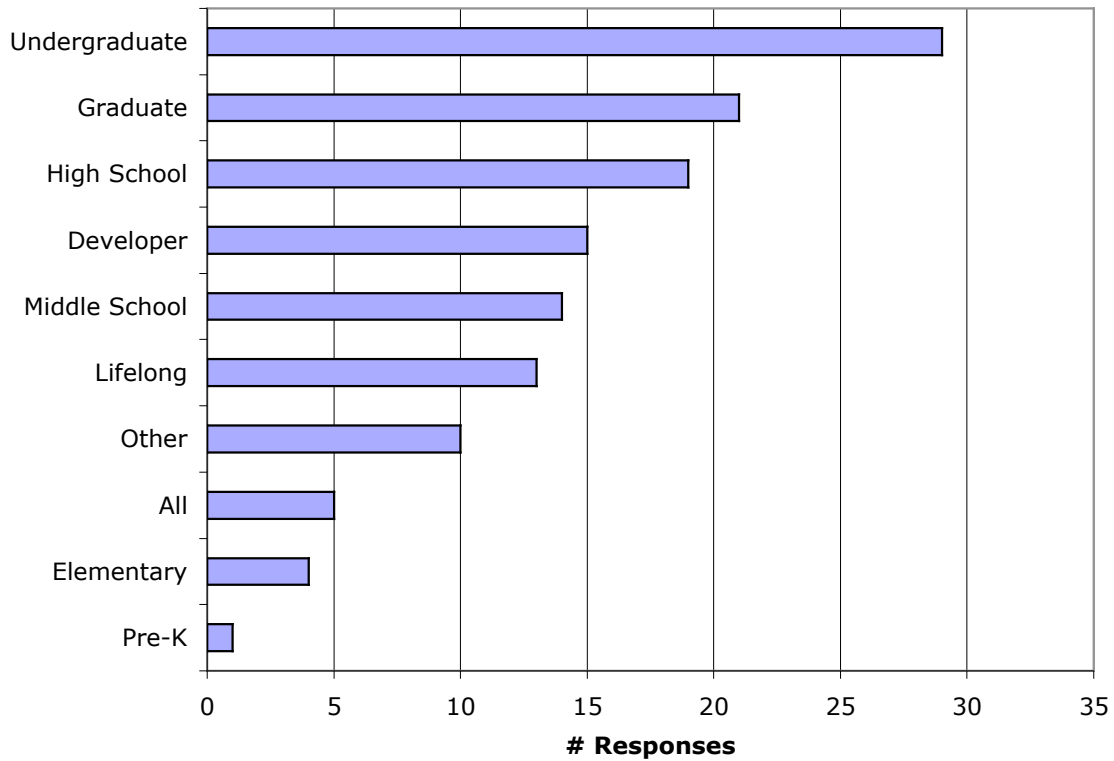
4 Resource creation and review processes

A central theme of the survey concerned projects' perceptions of the tasks of resource creation and review, and their evaluation of the extent to which NSDL had supported them in carrying out these tasks.

Of the 54 respondents to the survey, 32 (59%) replied that they created and/or reviewed digital resources in one way or another.

<u>Use of guidelines</u>

Of the 32 respondents who indicated that they had created and/or reviewed digital resources, 28 replied that they were following, had followed, or may have followed, a set of guidelines.

When asked about these guidelines, 18 answered that they had developed their own guidelines, 7 that they had modified other projects' guidelines, and 1 that they had adopted guidelines wholesale from another project.

In cases where respondents had used guidelines, the survey asked them to provide examples of these guidelines. While 28 respondents had indicated that they had used guidelines, only 8 respondents provided actual documents (web pages or pdfs) that concretely addressed the issue of resource creation and review. Other respondents linked to web pages that did not describe guidelines, or indicated that their guidelines were inaccessible in one way or another.[4]

The documents provided include:

- *ALSOS (Digital Library for Nuclear Issues)*
  http://alsos.wlu.edu/about.aspx

- *BEN (Bioscience Educational Network) (NSDL Pathway project)*
  http://www.biosciednet.org/project_site/PeerReviewProcessOfBENPartners.pdf

- *comPADRE (Physics and Astronomy Education) (NSDL Pathway project)*
  http://www.compadre.org/portal/documents/ComPADREMaterialSuggestionsFinal.pdf
  http://www.compadre.org/portal/documents/ComPADREPolicies.pdf
  http://www.compadre.org/portal/documents/SubmissionTutorial.pdf

- *DLESE (Digital Library for Earth Systems Education)*
  http://www.dlese.org/Metadata/collections/resource-quality.htm

- *iLumina (Educational Resources for Science and Mathematics)*
  http://www.ilumina-dlib.org/documents/
  Provides links to further documents, including:
      http://www.ilumina-dlib.org/documents/review/review_flowchart.htm
      http://www.ilumina-dlib.org/documents/review/reviewform_demo.htm
      http://www.ilumina-dlib.org/documents/review/review_summary.htm

- *NEEDS (NSDL Pathway project)*

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[4] Responses here included:
- providing the URLs of project front pages, rather than of guideline pages
- indicating that written guidelines existed, but did not provide either text or URL
- indicating that the guidelines were being worked on and were not yet ready
- indicating that they had used guidelines from another project, without naming the project
- indicating that guidelines were somehow unavailable (not written down, not locatable, stored on an old server, etc.)
- indicating that they did not know whether or not they had actually used guidelines

      http://needs.org:80/needs/public/premier/2006/2006-criteria-prelim.pdf
      http://needs.org/needs/?path=/public/premier/2006/submission/index.jhtml&

- *Journal of Chemical Education (Project Name?)*
      http://www.jce.divched.org/Contributors/Reviewers/guidelines.pdf

- *Reusable Learning Design*
      http://www.reusablelearning.org/index.asp?id=52
      Provides links to further documents, including:
          http://www.reusablelearning.org/docs/guidelines/guidelines-v3.1.1.pdf
          http://www.reusablelearning.org/docs/guidelines/guidelines-checklist-v3.1.1.pdf
          http://www.reusablelearning.org/index.asp?id=63

- *Teachers Domain (NSDL Pathway project)*
      http://www.teachersdomain.org/colpolicy.html

Copies of these documents will be compiled and annotated in a separate report. They represent a useful stock of organizational knowledge for NSDL, and hopefully can be used to support the efforts of future NSDL projects, guiding new projects through the processes of resource creation and review without them having to 're-invent the wheel.'

Task difficulty

Respondents were asked to rate the difficulty of the tasks of resource creation and review. Responses were broadly consistent for each task. Out of 105 responses to the four questions that rated task difficulty, 65 respondents (63%) reporting one or more of the tasks to be about as difficult as expected, while 38 respondents (36%) reporting one or more tasks to be more difficult than expected (chart 5). Only one respondent found a task to be easier than expected. In general, respondents found the tasks of resource creation and review to be somewhat more difficult than expected, but not very difficult.

Sources of support

Four questions at different points in the survey inquired as to the sources of support that projects looked for when working on resource creation and review. These questions received a total of 165 responses. Of these, 57 respondents (37%) replied that they had sought information from contacts in NSDL, and 37 (22%) that they had sought help at the NSDL Annual Meeting and other NSDL meetings and workshops. Only 2 (4%) of respondents replied that they had used the NSDL wikis, and only 1 (2%) replied that they had sought information from the NSDL e-mail lists (chart 6).

In general, NSDL project members preferred personal contacts and face-to-face interactions in forums such as the NSDL Annual Meeting. NSDL communication tools, such as e-mail lists and wikis, which were established with the intent of supporting the NSDL community development, were less popular.

A range of sources of help were included under the category of 'other' (Appendix A). Note the importance placed by respondents on social and face-to-face contexts, such as NSDL Annual Meetings and workshops, for obtaining help with their projects. These findings correlate with comments received in the surveys of the 2005 NSDL Annual Meeting, in which respondents stressed the importance of face-to-face contact and social interaction in supporting their work in and experience of NSDL.
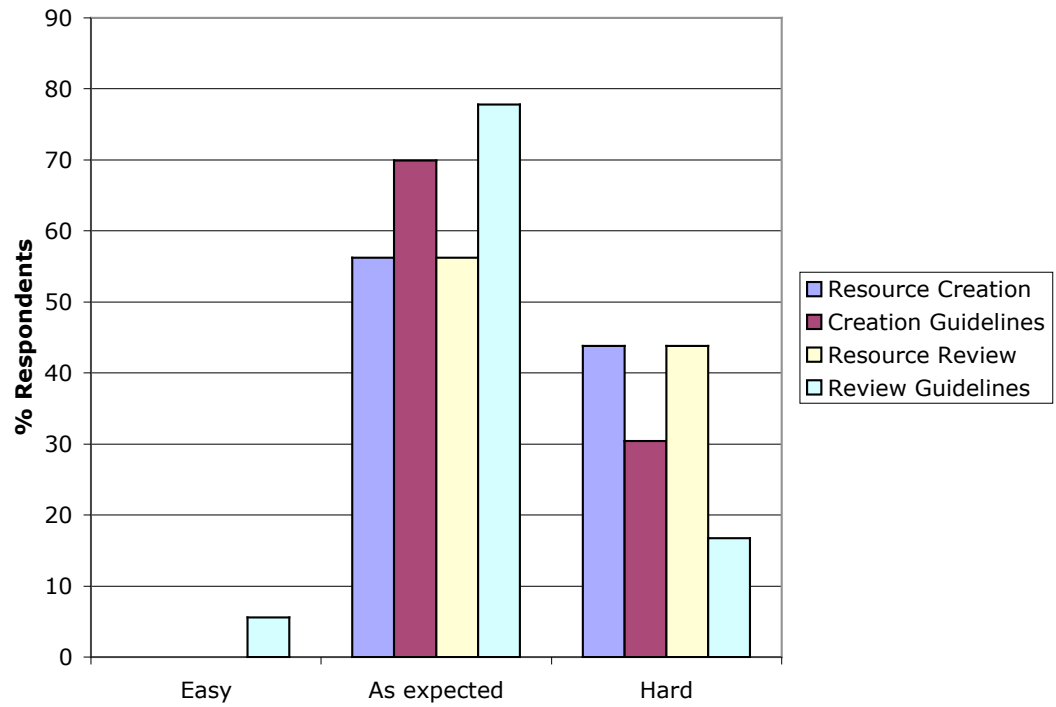
Chart 5: Perception of task difficulty
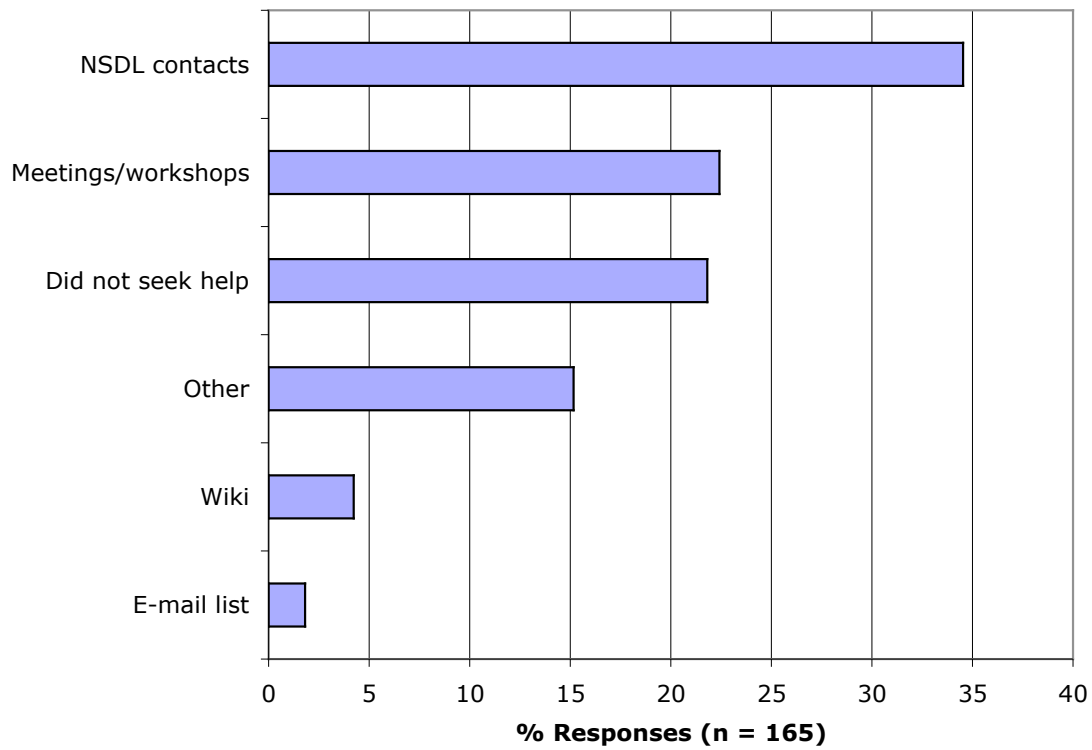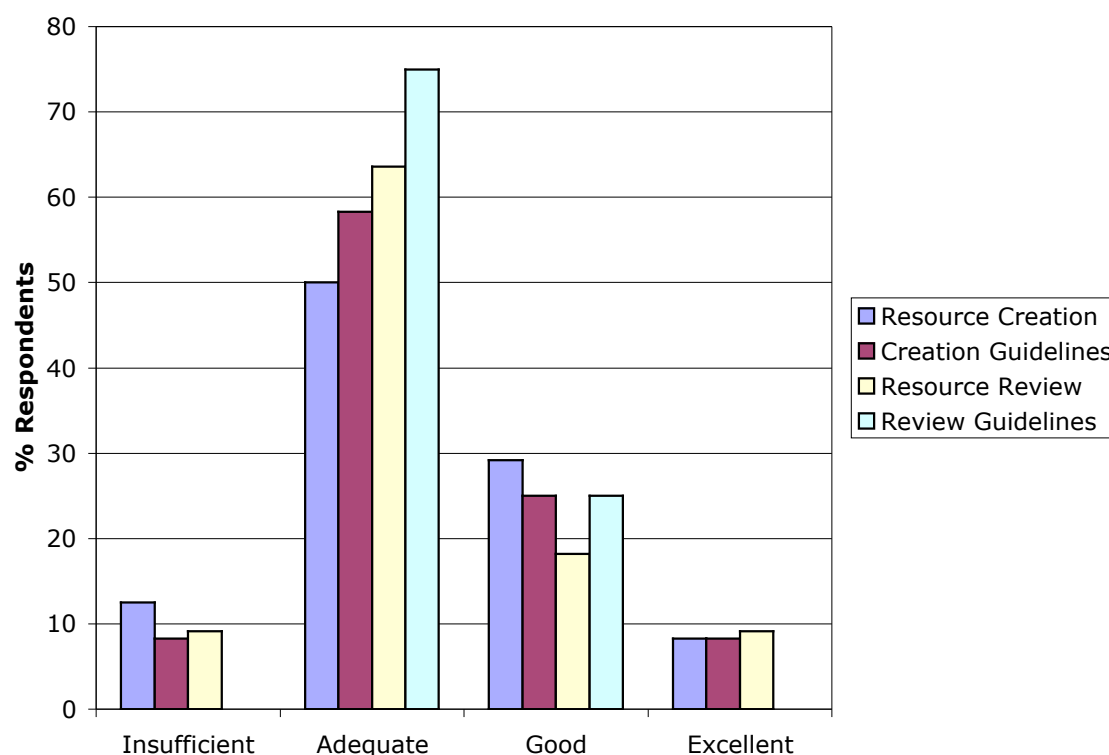

Chart 6: Sources of support

Chart 7: Satisfaction with help received from NSDL

Specific sources of help

Specifically named sources of help included the Core Integration group at Cornell, referenced on a number of occasions as being a useful source of information for help with metadata questions. A number of respondents also turned for help to DLESE, a non-NSDL project. The number doing so (n=7) was higher than those that had used NSDL wikis and e-mail lists for help (n=6), indicating that DLESE as an organization appears to be well-regarded as a source of digital library development knowledge.

Satisfaction with NSDL support

Four questions evaluated individual projects' satisfaction with the support they received from NSDL. A total of 51 responses were received to these questions. 29 (57%) respondents rated NSDL's support as 'adequate,' and 13 (25%) as 'good' (chart 7). The average score here was 3.3/5, indicating that while NSDL support for projects was adequate, it could also be improved.

Other observations on NSDL support

Respondents were asked, in open-ended questions, to comment on the support that they had received from NSDL. Allowing for repeat comments, positive comments that were actually negative, and *vice versa*, approximately 41 positive and 24 negative comments remained (Appendix B). Positive comments often referred to the importance of the NSDL community as a source of help, while negative comments often referred to the problems caused by a perceived lack of central clarity and direction in the overall NSDL mission.

Positive comments. Respondents were pleased with face-to-face or person-to-person communication within NSDL; and respondents rated NSDL meetings, Cornell's Core Integration team (particularly

the metadata developers), and DLESE, as good sources of help for their project work. A number of responses also referred generically to 'contacts' as a good source of help. In terms of the *type* of help received, frequently mentioned help topics involved assistance with understanding, developing, and/or implementing NSDL guidelines and standards.

Negative comments. Sources of dissatisfaction generally included feelings of being lost or adrift in terms of the wider NSDL program. Responses included references to:

- a feeling that an individual's project's work was disconnected from the 'bigger picture' of the NSDL program
- a lack of understanding of what Core Integration was up to, or what was expected from projects, although this source of dissatisfaction has decreased over time
- a lack of overall coordination, collaboration and standardization
- a lack of exemplars and best practices for new projects to follow
- several respondents detected a bias for K-12 and against higher education in NSDL (although this does not tally with the responses to the target audience question, which indicated that the most important target audience for projects was higher education)

5 Final comments from respondents

At the end of the survey, respondents were given a final chance to add any comments to the survey, and also to suggest possible directions for NSDL to develop support for resource creation and review processes. These comments often reflected in one way or another earlier comments made with respect to the helpful nature of the NSDL community but also the difficulties encountered in getting up to speed with NSDL (see Appendix C for a selection of these comments).

Other concerns included a lack of program-wide evaluation,[5] a lack of support for projects' sustainability initiatives,[6] and difficulties in searching the NSDL site, either for educational resources, or for internal NSDL documents.[7]

Suggestions from respondents for future NSDL development included:

- developing Web 2.0 applications

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[5] E.g.:
- I would like to see more evaluation of the learning impact of NSDL resources. Currently millions of pages exist and we do not know how many pages are used, relevant or effective. Currently the NSDL teams are organized to do what they have done. This does not lead to MORE effective or better used resources. It leads to more of the same. We need to look at what teachers and students need and will use, not what we as researchers think they will need and use.

[6] E.g.:
- We feel our project has been successful and we have a wide group of faculty volunteers to do reviews and a community of users for the site. However, on-going support for staff (editorial assistant, programmer) is an issue. It would be nice if NSDL provided a small grants program for that type of thing (e.g. 10% of original grant).
- Sustaining a collection is more difficult that anticipated. A relatively small amount of continuing funding from NSDL would making it much easier to maintain collections and make useful improvements.

[7] E.g.:
- I am amazed that after 6 years and lots of $$$, the core integration team has not been able to develop a useful search engine for the nsdl.org site. When I type 'nuclear power' I get 2728 references and really no way to filter them by media, time period, educational level. [We] have developed a reasonable search engine on a much smaller budget.
- I am very disappointed in the main NSDL web portal. I do not find it easy to find items, and I doubt teachers and others do either. Even access to the community pages is not easy to navigate.
- The most useful thing the core integration team can do is to develop a useful search engine for the nsdl site. This is an essential component to the success of the project.

- making the library interface easier to use
- developing simple, robust, open source tools for projects could share
- developing program-wide standards
- providing online help and documentation for common library development tasks
- providing easy-to-use forums for sharing project information

6 Discussion and initial recommendations

NSDL projects have developed and implemented a wide range of formal and informal practices for ensuring the overall quality of the resources that they create and review. These practices act as benchmarks for and guarantors of the overall quality of resources in NSDL. They act to boost the overall impact of NSDL, in that the more rigorous these practices are, the higher the quality of NSDL resources will be, and the more positive the impact of NSDL resources will be. It is therefore in NSDL's interests to support individual projects to achieve the best resource creation and review processes possible.

What therefore is the current state of resource creation and review practices in NSDL? Respondents to the survey described the processes of resource creation and review to be somewhat harder than expected, but not too hard. They rated the support that they received from NSDL in carrying out their tasks as being adequate to good, rather than good to excellent, indicating that there is room for improvement here.

Drawing on an analyses of responses to open-ended questions in the survey, this 'adequate to good' rating for NSDL support can be broken down into two further inter-related components: higher levels of satisfaction with personal and face-to-face community processes, and lower levels of satisfaction with distributed, electronic and asynchronous tools. The most popular sources of help for projects were personal and face-to-face in nature, and included contacts in NSDL, and NSDL Annual Meetings and workshops. Online sources of help provided by NSDL, including wikis and e-mail lists, were not highly rated.

The emphasis that survey respondents placed on the usefulness of personal contacts both within and without NSDL is very important. Since 2000, NSDL has developed a vigorous community across a range of professions and disciplines, and the survey indicated that many project members personally knew who to go to for help with their NSDL work. This achievement should not be underestimated; generating successful community in such distributed and heterogeneous settings is often regarded as the 'holy grail' of distributed organizations.

At the same time, however, the survey reflects findings from the 2005 Annual Meeting survey, suggest that NSDL's organizational communication and knowledge tools could be improved. Some respondents expressed frustration with what they perceived to be a lack of precision and clarity at the center of NSDL with regard to NSDL's mission and best practices, and they requested that NSDL provide simple and easy to understand sets of guidelines to support project activities. Generating standardized, easy to understand sets of resource creation guidelines and best practices, supported by contextualizing and 'how-to' documentation, would go some way towards addressing these problems. Such guidelines would give existing and new projects somewhere to go in NSDL to seek help with their work, and explain to NSDL users what collection and resource quality involved.

In addition, the survey revealed low levels of use of NSDL communication and knowledge tools such as wikis and e-mail lists. There could be for a number of reasons for these low levels of use, and these will have to be subject of further research. Some preliminary hypotheses in this direction include both technological and social explanations such as:

- a lack of relevant content (e.g. 'how tos,' standards, best practices, workflows, etc.)
- where relevant content exists, poor site architecture and document organization making it difficult to locate this content
- some usability problems with wikis, including a learning curve for adding content to wikis
- poorly structured and/or poorly written content (e.g. minutes, powerpoint slides, etc.) that is meaningful to a few people but cryptic for wider audiences
- a lack of critical mass in many NSDL sub-communities to support substantial discussion

Recommendations

Given that NSDL will continue to support resource and collection development in the future, it is recommended, as an initial outcome of this survey, that

- NSDL Core Integration consider the development of more coherent, easy-to-use, and standardized documentation to cover the workflows, activities, practices, standards, quality control, etc., associated with the tasks of resource creation and review

- That this documentation draw on the knowledge and best practices associated with resource creation and review that have already been developed by NSDL projects

- That this documentation include introductory technical backgrounds to digital library design issues associated with resource creation and review, in at least three areas (library and information science, computer science, and pedagogy)

- That this documentation be made accessible through a content management system that *easily and transparently* facilitates browsing and searching across multiple dimensions of NSDL's organizational knowledge

- That this documentation be maintained by a designated and knowledgeable expert in this area, easily contactable, who can provide further advice and support in this area

- That this documentation be supported and enriched through a series of subsidiary documentation, including FAQs, tutorials, white papers, published research, lists of external resources, and so on.

The development of such organizational knowledge structures and tools will support individual NSDL projects to produce better quality resources, and thus in turn boost the overall quality and impact of NSDL. Developing such structures will be particularly important for NSDL as it establishes itself as a component of cyberinfrastructure. While personal contacts have played a significant role in the 'start-up' stage of NSDL, they do not necessarily represent a scalable solution to supporting the creation of quality digital resources as NSDL continues to mature. In the future, NSDL will be faced with the task of capturing the organizational knowledge of key individual members, and making this available to the rest of the NSDL community in effortless ways.

APPENDIX A

NOTE: A number of comments containing personally identifiable information have been edited or removed

Qs 17, 27, 36 46: When creating/reviewing resources, what other services, besides NSDL, do/did you draw on?

- We had help from students, teachers, and scientists. Approximately 40 organizations spanning both the educational and research communities collaborated with our project. I would say the Digital Library for Earth Science Education (DLESE) helped the most.
- There is a local community of librarians and others on my campus that is most helpful in advising on curation of digital resources.
- Members of the general mathematical community.
- We … work with the Core Integration group.
- Scientists and educators in the larger community - the ones using these resources.
- We got some good input from the CI staff at Cornell.
- DLESE and DLESE Data Services projects.
- Contact with Core Integration staff.
- The Digital Library of Earth Science Education (DLESE) workshops, wikis, annual meeting, etc.
- Members of the general mathematical community.
- Target audience of teachers.
- People in the community - other projects that have developed guidelines, including ones funded by other agencies.
- DLESE's annual meetings, workshops, etc.
- Outside reviewers, test users; we have our own usability expert on team.
- Contacts through DLESE annual meeting and other DLESE events.
- Hard to interpret your question here: we did get help from MERLOT which is within NSDL.
- We have not sought help thus far because we have our own process. We did find the annual meeting sessions and poster displays helpful in identifying sites we may analyze for our project.
- DLESE workshops, annual meetings, etc.
- General mathematics community, particularly Association members
- DLESE Collections Core Services group.

APPENDIX B

Qs 19, 29, 38, 48: What were the most useful aspects of your contact with NSDL?

- People with knowledge of setting up websites with good metadata access.
- Understanding the harvesting protocol
- Our collaboration with the NSDL Communications Portal assisted with tools for creating content. This naturally impacted our creation guidelines. In addition, DLESE assisted greatly with workshops on how to create content and examples of their guidelines for content creation.
- Being pointed to web resources that we could employ without having to go through other people in real time accelerated our work. People are good for telling what resources are there (better than Google), but they are terrible for maintaining rapid interactivity.
- Clarifying policy.
- The metadata folks at Cornell.
- Talking with other project partners during the NSDL meeting to exchange approaches to authoring metadata and ways to extend LOM.
- We were well underway before NSDL resources became available. Guidelines for submission of materials do not reflect anything special from NSDL.
- Advice from experienced colleagues, suggestions from CI on strategies, seeing examples of parallel efforts by other libraries in NSDL annual meeting posters.
- Meeting other groups and people and understanding what mattered to them.
- Contacts with other projects, information on technical guidelines, metadata, vocabularies
- Standards and protocol definitions.
- Guidelines for reusability and for use of standards.
- Standards supporting reusability, rights management, and metadata.
- It gave us the opportunity to really expand the concept of putting a primary scientific reference and developing the infrastructure to support it. The contract was a huge boost in our ability to do this.
- Contacts made with a few other nsdl projects.
- Infrastructure - help with OAI and the data repository, metadata generation.
- More ideas.
- Seeing how other groups developed theirs.
- Their introduction of my project to DLESE.
- Developed guidelines prior to NSDL community services. However, we have built upon the discussions to refine and improve.
- Identifying contact names of people on other projects to talk to.
- Contacts with other projects
- Feedback on our guidelines, to help validate them or make them clearer
- Contacting other collections managers to ascertain their guideline creation process.
- Getting contacts to other, related projects in NSDL.
- The broad representation of the STEM digital library community.
- Incorporating educational guidelines.
- Our best source of NSDL contacts were with the core integration team at Cornell. Specifically [individual's name removed]. We were able to discuss things with him and proceed from there. We got little out of the 2 national meetings we attended and presented at.
- The DLESE contacts gained via NSDL.
- Other projects.

- Mostly information discussions and using some existing guidelines as a starting point.
- Incorporating educational components into the review process.
- Help in standardizing.
- The DLESE Community Review Service was the most useful tool for reviews that our project gained through our NSDL contacts.
- Expertise in usability and access strategies in colleagues in NSDL met at meetings.
- Suggestions regarding level of detail for controlled vocabulary. [project name] system for handling metadata.
- Getting appropriate contacts.
- Support for reviewing was through informal contacts with other projects, not official contacts with, for example, core integration.
- So far we have not had significant contact with NSDL for reviewing our resources. Any contact I had at the annual meeting I rated 'good.'
- Bringing in the educational components into the resource review stage.

Qs 20, 30, 39, 49: What were the least useful aspects of your contact with NSDL?

- Understanding the changes to the harvesting protocols that fedora may or may not affect.
- When our project started directions, assistance, and services were basically non-existent. This has changed significantly over the years, although there is still room for improvement.
- The preponderance of K-12 resources leaves those of us focused later in the 'food chain' with too few peers.
- It appears that the NSDL was not sure how to incorporate our project into the overall NSDL scheme. The highly specialized nature of molecular structures made item level metadata generation difficult.
- No the breadth of services was not clear. Also who was willing to offer them beyond what was written in their proposals.
- Most of the other Core integration components.
- Wasn't aware there were any resources available.
- Metadata creation was important and NSDL helped, but it was hard to get information in the early years.
- Main NSDL web pages not easy to navigate and find things quickly.
- Timing of projects was often out of whack with ours, and it often took a while to understand and work with the varying cultures of other groups.
- Sorting through the NSDL jargon can be quite daunting. But, people are always very helpful.
- Finding key information quickly on the web site has been difficult. Knowing which projects were working in similar areas took some research. One or two simple pages would be better than many that are outdated. The remodeled nsdl site and Expert Voices may help overcome the problem of too many or barely used discussion groups and threads.
- Lack of agreement across all projects on the standards.
- We have found that there is not a lot of collaboration across NSDL initiatives. For example discussions with other groups has produced little opportunity for collaboration. That being said we have a good working relationship with the core integration group at Cornell.
- NSDL focus on middle school level made things very difficult for us. It is very difficult to coordinate efforts of the many many individual NSDL projects that come and go every couple years.
- When I started there were few if any NSDL workshops to help guide developers, which would have been the most help.
- Sometimes it is hard to know who to contact on what issue. It would seem the main benefit would be to distill the best of all projects and help with dissemination. I haven't seen this.
- The lack of existing guidance when my project started.
- There were no guidelines when we needed them. NSDL moved too slow and delivered too late.
- The lack of an existing community for reviews. The lack of guidance on what makes good reviews.
- Many of the core NSDL resources are still in beta-testing with little documentation on how to implement the resources.
- It was difficult to find resources and in some cases contact with other NSDL projects produced no useful results. Usually NSDL meetings produced contacts, but getting useful information later was harder.
- We wished to disseminate information from our review process as annotation metadata, and it has been a continuing source of frustration that NSDL has no mechanism to harvest or

display annotations, even though from its earliest documents NSDL has been saying that annotations will be one of its means of adding educational value.

- I attended sessions on alignment but found them to be more 'topical' than the rigorous process we use and they do not include instructional effectiveness. Support for content alignment, as we define it, is not a service I would draw upon the NSDL for, except for the process of metatagging.

APPENDIX C

Q 50. Please add any other important comments you may have, including positive and/or negative criticism, lessons learned, and descriptions of obstacles faced in creating and reviewing resources

- We sensed at several levels that our review and publishing of the reviews of our materials was not appreciated by some of the CI communications. Several individuals indicated that the review process was 'promising something we did not have the resources to deliver' (paraphrase, of course). Our whole purpose in being in the NSDL community was and remains to help with this sort of review, so our early interactions left us (ok, me) confused.
- The people and projects involved in the NSDL are great. The preparation for supporting these people and projects was lacking at the onset of the NSDL program. This has improved over time, but there still needs to be a significantly larger focus on infrastructure support.
- Sorting useful sites from the massive amount of on-line material is still a problem. Getting reviewers to review rapidly is a challenge. Getting the science community to buy in to open source publishing rather than to feed the maw of the traditional publishers is frustratingly difficult. 'If you build it, they will yawn?'
- Our project was one of the few that was for the development of a highly specialized collection of items. This unfortunately meant that we did not interact extensively with the majority of the NSDL community that was involved primarily in creating metadata and indexing for material that was already created.
- It sometimes seems that our recommendations are ignored.
- I am amazed that after 6 years and lots of $$$, the core integration team has not been able to develop a useful search engine for the nsdl.org site. When I type 'nuclear power' I get 2728 references and really no way to filter them by media, time period, educational level. [We have] developed a reasonable search engine on a much smaller budget.
- My sense is that there is a large range of services available from NSDL, but few that I can apply to our project because of the unique nature of the kinds of resources we have and the particular technical configuration required to work.
- Active workshops that promote collaboration and integration of technologies. A community of resource developers finding ways to work together.
- Presentation is a big issue. We are still struggling with [our project].
- As noted above, our pathway project will not itself create or review resources. However, support for the creation of new resources is vital to the success of NSDL and does not get enough attention.
- Assigning metadata to resources is time consuming. To aid library users in finding our resources, metadata is crucial however.
- I am very disappointed in the main NSDL web portal. I do not find it easy to find items, and I doubt teachers and others do either. Even access to the community pages is not easy to navigate.
- Hard to say; just that review criteria depend a lot on how the resource will be used and by whom, and this varies from collection to collection, organization to organization, so it's hard to make the leap that if one group has reviewed a resource favorably, it's necessarily OK for your own criteria.
- The NSDL is a very big organization and it is difficult to maintain contact with other projects that might help. Most projects are so busy doing their own thing that interactions often fizzle.

- Alignment of curricular resources with educational content standards for all 50 states is the 500 pound gorilla sitting in our living room. Finalizing and maintaining a state-to-state cross-mapping tool for standards is critical for NSDL collections to be useful to K-12 teachers.
- NSDL made a big mistake, in my opinion, when it let go of its educational roots, changed its name from 'SMETE' to 'Science', and ingested thousands of resources for professional scientists with minimal utility for education. It especially galls me that the change was sneaked in without discussion or even announcement.
- We feel our project has been successful and we have a wide group of faculty volunteers to do reviews and a community of users for the site. However, on-going support for staff (editorial assistant, programmer) is an issue. It would be nice if NSDL provided a small grants program for that type of thing (e.g. 10% of original grant).
- Liked being able to email or pick up the phone and talk to folks at NSDL to work out difficult issues.
- I appreciate the cameraderie and sense of common purpose and commitment in NSDL.
- Being a part of the NSDL is a highly valuable experience, particularly the opportunities to collaborate with and learn from other projects.
- I would like to see more evaluation of the learning impact of NSDL resources. Currently millions of pages exist and we do not know how many pages are used, relevant or effective. Currently the NSDL teams are organized to do what they have done. This does not lead to MORE effective or better used resources. It leads to more of the same. We need to look at what teachers and students need and will use, not what we as researchers think they will need and use.
- I feel I am still too new to NSDL to comment at this point in time.
- Sustaining a collection is more difficult that anticipated. A relatively small amount of continuing funding from NSDL would making it much easier to maintain collections and make useful improvements.
- more focus on undergraduate education (including teacher training) rather than direct support of middle school learners directly
- It would have been good for the infrastructure to have been complete (or fairly far along) before the collections were funded. It seemed like we were building the plane while we were flying it.

Q 51. If NSDL was to develop organizational online tools to support these processes in the future, what features do you think should be incorporated into these tools?

- Easy to use interface.
- see our design and process. We will be glad to share all. Especially the lessons learned and functionality
- Web 2.0 capabilities, so that the tools would become more useful as more people used them.
- The NJIT Highlight system is the most useful search facility I've seen yet. It's not clear that NSDL, acting as a unified library, is the best answer to my field's needs. Rather, being an umbrella funding structure that supports infrastructure development until it reaches critical mass seems more important.
- For specific collections there is little the NSDL can offer. Each will have to develop their own creation and review specific to the collection.
- Shared resources that we could all use. Open source tools we could download and use.
- Forget it. The most useful thing the core integration team can do is to develop a useful search engine for the nsdl site. This is an essential component to the success of the project.
- I think the issue is that people don't like to share half-baked, in-progress work, so no online tool will support the trust needed between different NSDL project staff to share information. That's why the Annual Meeting is a good event for this. If there are tools, it would be better not to design any custom tools, but use existing tools that people use (excel, word, etc.) and make templates that people can use, and share these.
- They should be easy to incorporate into existing projects, and be customizable. A clear process for review of objects, and a standard for sharing review information would be useful.
- Hard to say. Like politics, much of this is local.
- Maybe online resources to help creators with simple tasks: HTML editing, using Java script, etc.
- Help with assigning metadata (i.e. standards).
- Develop some common vocabularies for granularity, production standards, content accuracy, etc.
- It is not clear to me that the NSDL projects would have time to make effective use of the online tools. I guess that if the tools would provide information about different areas in which NSDL had developed resources for those operating digital library programs and reminded people to look at them regularly, that might help. I used the annual reports to try to find other projects whose work would help us, but in many cases I never got to the point of interacting with the other projects because they did not respond to emails or I got onto a mail list that did not serve my needs.
- dynamic, state-to-state educational content standards mapping tools
- Common sharing of minutes from all committees without me remembering to check all the time.
- Providing simple tools or services that could be add value to multiple projects and opening more (or more streamlined) avenues to coordinate among projects beyond the annual meeting, e.g. metadata registries, adopting or recommending vocabularies for specific audiences such as K-12 teachers, sharing or providing assistance in locating evaluation sites, making project data gathering instruments available online
- The online tools should lead to quicker and more appropriate teacher and student choices. Thus thousands of new resources in a discipline is NOT what we should work towards. NSDL has achieved that. We also should not plan to give workshops to every teacher in the

country, thinking that will induce them to use NSDL. We will not succeed at that, and for the most part workshops are not effective as professional development. Research shows that little impact is made in the classroom. Now researchers need online tools that will help them make their resources appropriate, accessible and desired by students. These tools might help tag each resources for individual students, or classify the resource at a finer granularity level of difficulty. Resources might be tagged more in depth as to what they discuss. Currently a student or teacher received tens of thousands of resources if they ask for 'volcanoes' or 'algebra'. The teacher should receive carefully selected resources and choose form perhaps 5 alternatives.

- Standardizing review criteria and ratings, such as developing a vocabulary, would be useful for sharing reviews.
- I feel I am still too new to NSDL to comment at this point in time.
- Fedora-based online tools for resource creation and review that Pathways could customize would be very helpful.
- support for integration of online datasets into interactive educational modules – some mechanism for coalescing individual projects into something that spans projects – need a mechanism for continued support of data access systems developed during the short time of the project.