NISE network
NANOSCALE INFORMAL SCIENCE EDUCATION

Public Impacts Summative Evaluation: Study 2

Year 4 Progress Report

By Christine Reich and Juli Goss

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Executive Summary

This study, called Study 2, will look specifically at the activities of the Tier I, II and III institutions as a way of determining whether it is likely that NISE Net will have an impact on the public through the NSET public outreach activities of those institutions. The main question driving this study is the following: *To what extent is NISE Net reaching the public through the different tiers of the Network?* This study presents preliminary findings from the Study 2 investigation, looking specifically at the actions of the professionals who have come into contact with NISE Net (including those who have attended conference sessions, signed-up for nisenet.org, attended the NISE Net annual meeting, and signed-up for NanoDays) and whether those professionals are delivering programs to the public that are likely to have an impact on public awareness and understanding of NSET.

Study 2 reflects data derived from five separate sources:

- A survey of the individuals in the NISE Net database of contacts (which excludes individuals who attended the regional workshops);
- A survey of the individuals who attended the regional workshops;
- Web usage statistics from nisenet.org;
- NISE Net annual report metrics gathered from Tier I institutions; and
- NanoDays report submitted online by individuals who received a NanoDays kit.

This study looks across these five sources of data to see if there is evidence that institutions in all three NISE Net tiers of involvement are delivering programs to the public that address NSET-related topics. This study also looks to understand a bit more about the context in which nano informal science education experiences are being delivered to the public through these Tier I, II, and III institutions. This study is a data-mining exercise that utilizes data from other studies throughout the Network.

Preliminary findings from Study 2 include:

- Finding 1: Professionals from Tier I, II and III institutions conduct nano programs/exhibits
- Finding 2: Nano public outreach activities are still not widespread outside of NanoDays
- Finding 3: NISE Net developed programs account for about half of all public outreach activities in the Network
- Finding 4: NISE Net products are being modified by Tier II and III institutions prior to use
- Finding 5: Nano programs delivered cover a range of topics; some more widely covered than others
- Finding 6: Nano is delivered through a range of formats; some more widely used than others

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Introduction

The Nanoscale Informal Science Education Network (NISE Net) Public Impacts Summative Evaluation focuses on measuring the public outcomes of NISE Net activities. The design of the evaluation studies is driven by a program theory model that maps the pathways NISE Net has developed for delivering nanoscale science, engineering and technology (NSET) programs and exhibits to the public, as identified by the summative evaluation team. These pathways include the following:

- The Tier I Pathway, where the public programs and exhibits that were developed using NISE Net funding and placed into the NISE Net catalog are later implemented by Tier I institutions;
- The Tier II Pathway, where subawardees plus additional regional partner institutions attend workshops, connect with regional hub leaders, learn about NISE Net resources and then implement nano programs and exhibits at their institutions;
- The Tier III Pathway, where individuals (who did not attend the regional workshops) learn about NISE Net resources through nisenet.org and conference participation (amongst other avenues), download NISE Net products and deliver them to the public;
- The Tier II and III Product Pathway, where Tier II and III partners create nano-education products and add them to nisenet.org for others to use; and
- The NanoDays pathway, where Tier I, II and III institutions deliver NISE Net and non-NISE Net nano education products to the public during a specific timeframe that is sponsored by the Network.

This study, called Study 2, will look specifically at the activities of the Tier I, II and III institutions as a way of determining whether it is likely that NISE Net will have an impact on the public through the NSET public outreach activities of those institutions. The main question driving this study is the following: *To what extent is NISE Net reaching the public through the different tiers of the Network?* This study presents preliminary findings from the Study 2 investigation, looking specifically at the actions of the individuals who have come into contact with NISE Net (including those who have attended conference sessions, signed-up for nisenet.org, attended the NISE Net annual meeting, and signed-up for NanoDays) and whether those institutions are delivering programs to the public that are likely to have an impact on public awareness and understanding of NSET.

Methods

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- A survey of the individuals who attended the regional workshops;
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This study looks across these five sources of data to see if there is evidence that institutions in all three NISE Net tiers of involvement are delivering programs to the public that address NSET-related topics. This study also looks to understand a bit more about the context in which nano informal science education experiences are being delivered to the public through these Tier I, II, and III institutions. This study is a data-mining exercise that utilizes data from other studies throughout the Network. Using existing data, this study seeks to gain insight into the current workings of the Network and help plan for future investigations. Multiple sources were required as these data were originally intended to inform other evaluation studies for other aspects of the Network. For this reason, data are not always comparable between the sources.

Survey of the NISE Net database of contacts

The preliminary findings presented in this report focus specifically on results from a survey that was conducted in February 2009, prior to the NanoDays events that were held that year. This survey was sent to 695 individuals. These individuals included those who had signed-up for nisenet.org and those individuals who had come into contact with NISE Net through professional conferences or other personal contacts and had requested more information. Of the 695 who were sent an email survey, 175 responded (25%). The questions reported on in this report were part of a larger survey conducted by Inverness Research Associates. Participants were offered a $10 Amazon gift card as an incentive for completing the survey.

Regional workshop participants were specifically excluded from this survey as they were studied as part of a separate investigation. Analysis of the survey responses, however, reveals that 46 (26%) of the respondents reported participating in a regional workshop. It is unclear whether these respondents had misinterpreted the question or if certain workshop participants were not eliminated from the dataset. Most respondents who said they attended workshops worked at science museums; a few worked at universities.

Survey respondents represented a broad range of institution types and professional responsibilities. Most respondents work for either science museums (63 or 36%) or universities (62 or 35%). Other institutional affiliations include other museums, professional organizations, scientific research organizations, government and industry, and other educational institutions such as libraries and community centers (see Table 1). Professional responsibilities included science educators (35 or 20%), program/project

managers (32 or 18%), scientists/researchers (28 or 16%), amongst others (see Table 2). Almost all of the respondents (171 or 97%) were familiar with NISE Net.

Results from this survey were analyzed using descriptive statistics. In some cases inferential statistics were applied to make comparisons between different types of respondents (such as those who work for science museums versus those who work for universities). It should be noted, however, that the respondents were not chosen at random—the survey was sent to the entire population of individuals who were in the NISE Net database. Although inferential statistics are intended for use only in situations where there is a random sample of participants, an assessment of the non-responders conducted by Inverness Research Associates demonstrated that the non-responders had a similar attitude toward NISE Net than the responders (see the IRA "Reach and Impact" study). In addition, as demonstrated in Table 1, the institutional affiliations of the survey respondents were comparable to the nisenet.org membership. Therefore, inferential statistics were applied in some situations, but with cautious interpretations.

Table 1: Institutional affiliations of the respondents compared to nisenet.org members

	Number of survey respondents	Percent of survey respondents	Number of nisenet.org members	Percent of nisenet.org members
Museums total	79	45%	275	50%
Science Museums	63	36%		
Other Museum	16	9%		
University	62	35%	192	35%
Other Total	24	14%	37	7%
Other (unspecified)	13	7%		
Professional Organization	6	3%		
High School/ Community Center/ Library	5	3%		
Government and Industry	6	3%	20	4%
Scientific research organization	4	2%	29	5%

Table 2: Professional role of the survey respondents

	Number of respondents	Percent of respondents
Science educator	35	20%
Program/ project manager	32	18%
Scientist/ researcher	28	16%
Institutional director	17	10%
Other	17	10%
Outreach director	13	7%
Program staff	10	6%
Administrative staff	6	3%
Public relations	3	2%
Media staff	1	1%

Regional workshop evaluation

Amy Grack-Nelson of the Science Museum of Minnesota has conducted a formative evaluation of seven regional workshops, dating Fall 2008 through February 2009, that prepare partner institutions for delivering NSET programs to the public. Data collection methods used for this evaluation include a pre-workshop survey, a post-workshop survey, a post-workshop reporting form (distributed within six months after the workshop), post-workshop interviews, observations and a post-workshop facilitator debrief. Surveys were distributed to all workshop participants. The interviews were conducted with a random sample of the workshop participants.

Findings from the formative evaluation of the regional workshops are presented in full through regional workshop formative evaluation reports (Grack-Nelson, 2009; Grack-Nelson & Philippe, 2008). Select findings from this formative evaluation are presented here when they pertain to the results of the survey of the NISE Net database of contacts.

Web usage statistics

Sherry Hsi at the Exploratorium analyzed nisenet.org usage statistics for this report. Where possible, these data were used as a secondary data source to the survey to validate findings. Data reports were generated using Google Analytics and Drupal. While there are a number of investigations that could be conducted using these data sources, only those analyses that provided additional insights into the data collected through the survey of the NISE Net database of contacts are included in this report.

Google Analytics tabulates new and repeat web visitors that come to its site via a script that is installed on the NISEnet.org website, as well as the source of the web traffic. Drupal, the content management system that underlies nisenet.org, tabulates individual page views including pages that comprise the online catalog. A large number of page visits and page views is interpreted as audience interest.

NISE Net annual report metrics

This study includes findings compiled by mining the metrics gathered for the NISE Net annual report. Tier I institutions are required to semi-annually update the NISE Network database with information about their institution's nano-related activities. This information, commonly called "the metrics" amongst NISE Net Tier I partners, is used to inform the annual and mid-year reports that are sent to the National Science Foundation. Reporting data include activities and products in the areas of professional development and public engagement as well as other outreach events and publications within the reporting period. As the annual report is due at the end of June and the grant year is over at the end of September, this dataset exists for activities over an eight month period dating October 1, 2008 through June 1, 2009 and looks specifically at the public engagement activities of Tier I institutions.

NanoDays report

Similar to NanoDays 2008, the Network Community team required all institutions that received NanoDays kits to complete a NanoDays report in 2009. This report is submitted electronically through www.nisenet.org and information from the reports is available for all Network members to view. In 2008, the report focused on collecting narrative data where participating institutions described their NanoDays activities. In 2009, the report requested quantitative data for each institution's NanoDays events. More specifically, NanoDays participants were asked to provide details on how many activities of different types were delivered to the public during NanoDays, and in some cases, how many hours of activity took place during NanoDays. As an added incentive to complete the report, institutions were entered into a prize drawing for a free ASTC conference registration if they completed their report before May 1st. As of July 7, 109 institutions completed their NanoDays report (55%).

The NanoDays report was largely used to inform Study 3 which examines participation in NanoDays and categorized institutions by three institution types (small museum, large museum and university/other). This study examines the group activity of NanoDays by categorizing reporting institutions into the three Tiers.

Findings

Finding 1: Professionals from Tier I, II and III institutions conduct nano programs/exhibits

Nano education outreach activities are taking place within the Tier I institutions outside of NanoDays. According to the reporting metrics gathered from twelve Tier I institutions, there were 597 implementations of nano programs during the first eight months of grant Year 4. Additionally, one institution also hosted 91 days of exhibits.

Findings from the formative evaluation of the regional workshops confirm that Tier II partners are also delivering NISE Net programs and exhibits to the public. Thirty-three of 40 (83%) institutions that attended the regional workshops delivered programs or

exhibits with nano content within six months following their workshop participation. The total number of program implementations was 1,246, with 728 (58%) implementations representing programs developed by NISE Net and 518 (42%) representing programs that were not developed by NISE. (See Table 3) An additional 201 implementations of nano exhibits were also hosted by Tier II partners.[1]

Table 3: Nano programming implementation delivered by Tier II regional workshop respondents

	% of institutions delivering NSET programs/ exhibits to the public	% NISE Net program implementations	% Non-NISE Net program implementations
Delivered programs to the public	83%	58%	42%

According to the results of the survey of the NISE Net database of contacts, nano education activities are taking place amongst Tier III partners as well. In total, 132 individuals (75%) stated that they have conducted or plan to conduct nano informal science education experiences with the public. Of these individuals, 103 (59%) stated that they have delivered nano-related programs and/or exhibits to the public and an additional 29 (17%) stated that they plan to deliver nano education experiences in the future. NISE Net programs and exhibits are a part of the nanoscale informal science education experiences that are being offered to the public through these institutions. More specifically, 113 individuals stated that the have conducted or plan to conduct NISE Net programs and/or exhibits with the public (64% of the 175 respondents). (See Table 4)

Table 4: Number of respondents conducting NSET programs/exhibits with the public

	% delivering NSET programs/ exhibits to the public	% NISE Net programs/ exhibits	% Non-NISE Net programs/ exhibits	% Both NISE Net and Non-NISE Net
Delivered programs/exhibits to the public	59%	49%	54%	34%
Plan to deliver programs/exhibits to the public	17%	15%	4%	3%
Total (delivered or plan to deliver)	75%	64%	58%	37%

NISE Net programs/exhibits are being experienced by the public through both universities and science museums through the Tier II partners. Forty-two (68%) of the respondents who work at universities stated that either they or someone else from their institution have conducted NISE Net programs/exhibits or plan to do so in the future. Forty-six of the 63 science museum respondents (73%) stated that either they or someone

[1] The regional workshop survey reported the number of implementations therefore the exact number of days for this exhibit is unknown.

else at their institution have conducted NISE Net programs/exhibits or plan to do so in the future. NISE Net activities are also taking place at other institutions (see Table 5).[2]

While there was no significant difference between the likelihood that an individual working at a science museum versus a university Tier III institution had delivered a NISE Net program or exhibit to the public, there was a difference in the likelihood that an individual from a university versus a science museum would conduct a non-NISE Net program or exhibit with the public. Those working in universities were significantly more likely to conduct non-NISE Net (but nano-related) programs and exhibits with the public than those who work for science museums.[3]

Table 5: Places that have delivered NISE Net programs/exhibits or plan to in the future

	Number of respondents conducting NISE Net programs/exhibits	Percent of respondents from that institution type
Science Museums	46	73%
University	41	66%
Other Museum	11	69%
Other	3	23%
High School/ Community Center/ Library	4	80%
Government and Industry	3	50%
Professional Organization	3	50%
Scientific Research Organization	2	50%

Findings from the web data also confirm that the Tier III partners represent a variety of institution types and that these users are seeking out NISE Net educational resources. According to the Drupal logs, there have been 721 registered members and 547 user profiles created in nisenet.org since its launch in Feb 2008. These members affiliate themselves with museums (275), universities (192), government and industry (20), research organizations (29), and other (37). According to Drupal logs, the most frequently viewed individual web pages were about NanoDays, Viz Lab, and the Catalog of NISE Net products. Web traffic data from Google Analytics that sampled over five different periods also indicate a focus on the programmatic resources. These data point to programmatic resources related to NanoDays and Viz Lab as being the pages that are the most frequently viewed. In addition, these data suggest a steady growth of visitors to nisenet.org (see Figure 1). On average, 68% are new visitors and 32% are returning.

[2] It is possible that more than one person from an institution completed the survey so these results should not be interpreted as applying to institutions, only individuals.
[3] X^2 (1, N=110)=12.677, p<.0005

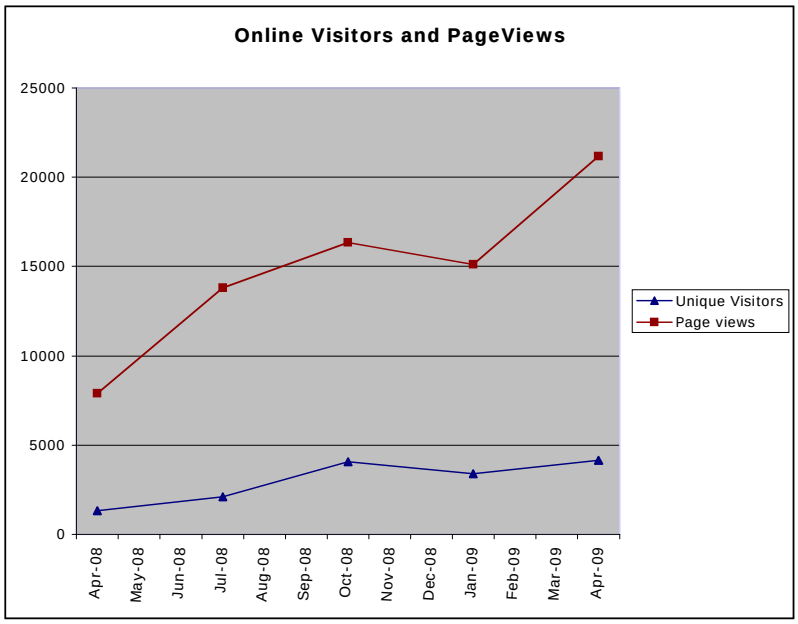

Figure 1: Change in nisenet.org visitors and page views over time

Finding 2: Nano public outreach activities are still not widespread outside of NanoDays

Further investigation of the annual report metrics tells us there is still further room for growth in the rate of nano activity outside of NanoDays. The 597 implementations reported by 12 Tier I institutions over an eight month period averages out to 1.4 activities per week per institution. The Museum of Science, Boston accounts for 41% of the program implementations and the actual implementation of these programs is not funded by NISE Net. Science Museum of Minnesota accounts for another 24% of the reported program implementations. Therefore combined, two of the main lead institutions account for 65% of the program implementations. Increasing nano programming activity outside of NanoDays would allow further opportunity to impact the public.

Findings from the formative evaluation of the regional workshops assert that Tier II institutions implement nano programming outside of NanoDays at a similar rate to Tier I institutions with an average of 1.3 implementations per week per institution. Pacific Science Center accounts for 36% of these implementations while the Louisville Science Center accounts for another 32%. When combined these two Tier II institutions account for 68% of the nano program implementations. It is worth noting that the regional workshops took place in order to prepare partner institutions for delivering NSET programs to the public. Part of this included assigning a NISE Net stage presentation to each institution and requiring its implementation after participation in the regional workshop. Seven of the 40 (18%) institutions did not implement their assigned program or any additional nano programming.

Finding 3: NISE Net developed programs account for about half of all public outreach activities in the Network

According to the results of the survey of the NISE Net database of contacts, nano education activities created by NISE Net are taking place amongst Tier III partners at an almost equal rate as nano education activities not created by NISE Net. In total, 113 individuals stated that the have conducted or plan to conduct NISE Net programs and/or exhibits with the public (64% of the 175 respondents). Comparatively, 58% of the respondents stated that they have conducted or plan to conduct Non-NISE Net programs and/or exhibits with the public. (See table 6)

Table 6: Number of respondents conducting NSET programs/exhibits with the public

	% NISE Net programs/ exhibits	% Non-NISE Net programs/ exhibits
Delivered programs/exhibits to the public	49%	54%
Plan to deliver programs/exhibits to the public	15%	4%
Total (delivered or plan to deliver)	64%	58%

Findings from the formative evaluation of the regional workshop similarly show that 58% of program implementations performed by Tier II institutions were originally created by NISE Net while 42% of the implementations featured programs that were not developed by NISE Net. (See table 7)

Table 7: NSET programming conducted by Regional Workshop respondents

	% NISE Net program implementations	% Non-NISE Net program implementations
Delivered programs to the public	58%	42%

The NISE Net annual report metrics show that Tier I institutions are implementing NISE Net created programs at the same rate as Tier II. Of the reported program implementations, 349 of 597 (58%) were from programs created by the NISE Net and are now part of the nisenet.org catalog. Comparatively, 248 of 597 (42%) of the program implementations were programs that are not part of the NISE Net catalog of products.[4] Programs in the catalog have gone through the NISE Net creation process requiring a scientist review, educator review and visitor evaluation. Programs implemented by Tier I institutions that are not included in the catalog might be added at a later time when the criteria had been met but will only then officially be credited to NISE Net. (See table 8)

[4] Catalog inclusion was used as the measurement for whether a program is NISE Net created.

Table 8: NSET programming conducted by Tier I institutions

	% NISE Net program implementations	% Non-NISE Net program implementations
Delivered programs to the public	58%	42%

There is one instance of nano programming that includes a significant larger amount of NISE Net created material. The online NanoDays report, required by all recipients of a NanoDays kit, had one pair of questions comparing NISE Net programming implementation and to that of Non-NISE programs. Findings from this report show that 2,114 of 2,588 (82%) of the hours of table-top demonstration came from the NISE Net NanoDays kit with the remaining 474 of 2,588 (18%) hours coming from Non-NISE Net activities. This finding suggests that as program materials are given to institutions at no cost, the institution is more likely to use it than their own. (See table 9)

Table 9: Cart demonstration hours conducted by reporting NanoDays institutions

	% NanoDays Kit hours of table-top demonstration	% Non-NanoDays Kit hours of table-top demonstration
Tier I	83%	17%
Tier II	84%	16%
Tier III	78%	22%
Tiers I, II and III combined	82%	18%

Finding 4: NISE Net products are being modified by Tier II and III institutions prior to use

The NISE Net products that are being implemented by the Tier II and III partners are being modified before they are implemented with the public. Of the 86 survey respondents who stated that they are delivering NISE Net programs and exhibits to the public, 49 (57%) stated that they have modified or altered these experiences. Findings from the formative evaluation of the regional workshops show that 14 of 40 (35%) of the workshop participants reported that they made alterations to a NISE Net program before they delivered it to the public (See table 10). Further evidence that modifications are being made to the programs/exhibits is provided by the comments section of the nisenet.org catalog of products. As of May 2009, there were 52 comments posted about NISE Net programs, of which 14 were posted by individuals from either Tier II or III institutions.

Table 10: Modification of NISE Net programs conducted by regional workshop respondents[5]

	% of institutions implementing NISE Net programs without modification	% of institutions implementing Modified NISE Net programs	% of institutions implementing Non-NISE Net programs
Delivered programs to the public	53%	35%	45%

This finding matches the program theory model for reaching the public. Part of the NISE Net theory of action is that Tier II and III partners will adapt and modify NISE Net products so that these products will better meet the needs of the various institutions and the publics these institutions serve. This theory of action assumes that the educators within each institution are best equipped to make determinations about how to implement programs and exhibits within their own institutions. The fact that individuals are modifying the programs and exhibits suggests that the partners and appropriators feel a sense of ownership of the programs they implement and that these educators feel qualified to make adjustments based on individual or institutional needs. What these data do not provide an indication of, however, is whether the NISE Net programs that are implemented at these institutions will have the same public impacts as those programs that are implemented at the subawardees institutions without modifications (which are currently being studied as part of Study 1).

One way to explore how the Tier II and III modifications might affect the public impacts is to explore the comments left by the Tier II and III partners about individual NISE Net programs or exhibits. The comments section of the nisenet.org database is intended to provide Tier II and III partners with the opportunity to inform the community of how they have modified a specific program or exhibit for use in their institution. Most of the current comments are logistical in nature, and information about where to buy products or how to conduct the program in a way that would improve the organization of materials. These comments suggest that the modifications to the programs mentioned in the survey and in the regional workshops reporting form may not be impacting the overall content of the presentations, but instead may be more focused on the materials or implementation.

Finding 5: Nano programs delivered cover a range of topics; some are more widely covered than others

Although this study does not measure whether visitors are learning specific concepts and topics, a review of the topics the respondents report covering in their programs and exhibits can provide an indication of the topic areas that members of the public have the potential to learn more about. Amongst the Tier III survey respondents who conduct or plan to conduct nano-related programs/exhibits in the future (132), a large portion are delivering experiences that cover the topic of the fundamentals of nanoscience (111

[5] This percentage totals over 100% as institutions could present programs in more than one category.

respondents, 84%). Many are also covering the topic of materials, tools and applications (88 respondents, 67%). It is worth noting that these two topics are the most frequently represented in the NISE Net catalog of products. Topic areas that are less frequently covered by the respondents include art and nature (36 respondents 27%), energy and the environment (54, 41%), and society, policy and economics (53, 40%). These topics are less frequently covered in the NISE Net catalog of products. (See Table 11)

The Tier III survey findings that the fundamentals of nanoscience and materials, tools and applications are the most widely delivered content areas are further confirmed by usage statistics from nisenet.org. As shown in Table 12, a review of the top ten visited programs/exhibits in the nisenet.org catalog found that most of these activities addressed the topics of the fundamentals of nanoscience or materials, tools and applications.

Table 11: NSET Topics covered by programs/exhibits delivered by Tier III respondents

	# of NISE Net catalog programs/ exhibits on this topic	# of respondents who delivered a NISE Net program/ exhibit on this topic	# of respondents who delivered non-NISE Net program/ exhibit on this topic	# of respondents who delivered both NISE Net and non-NISE Net program/ exhibit on this topic	Total # of respondents who delivered program/ exhibit on this topic
Fundamentals of nanoscience	38	74	84	47	111 (84%)
Materials, tools and applications	26	46	31	31	88 (67%)
Biology and medicine	10	25	50	12	63 (48%)
Energy and environment	3	26	13	13	54 (41%)
Society, policy and economics	6	23	10	10	53 (40%)
Art and nature	8	17	27	8	36 (27%)

Table 12: List of the ten most frequently viewed products in the NISE Net catalog[6]

	# of views	Topic areas	Format
NanoLab	1,235	Fundamentals of nanoscience; Materials, tools and applications	Exhibit
Zoom into the Human Bloodstream	1,195	Biology and medicine	Exhibit
Exploring Measurement: Ruler	1,188	Fundamentals of nanoscience	Cart demonstration
Exploring Materials: Liquid Crystals	1,183	Materials, tools and applications	Cart demonstration
Surface Area	1,160	Fundamentals of nanoscience	Cart demonstration
Balloon Nanotubes	1,153	Fundamentals of nanoscience; Materials, tools and applications	Cart demonstration
Inkjet Printer	980	Fundamentals of nanoscience; Materials, tools and applications	Cart demonstration
Forms of Carbon	948	Fundamentals of nanoscience; Materials, tools and applications	Cart demonstration
The Electric Squeeze	802	Fundamentals of nanoscience	Classroom activity/ cart demonstration
Exploring Materials— Nano Fabrics	789	Art and nature; materials, tools and application	Classroom activity/ cart demonstration

Tier III survey results suggest that there may be a difference between the topics covered by individuals who work for universities as compared to those who work for science museums. Survey respondents who work for universities were more likely to conduct programs/exhibits with the public that addressed the following topics: energy and the environment[7]; materials, tools and applications[8]; and society, policy and economics[9].

Finding 6: Nano is delivered through a range of formats; some more widely used than others

Findings from four of the five data sources show that nano programming is delivered through a range of formats and that some of these are more widely used than others. According to reporting data from Tier I, surveys of Tiers II and III and NanoDays participation by all three tiers, cart demonstrations are widely used by institutions in each of the different tiers. There is a possibility, however, that there is variation in the types of activities that are implemented by institutions in different tiers, with stage presentations being implemented at a high rate amongst Tier I partners and classroom activities being implemented at a high rate amongst Tier III partners. This potential difference should be explored more fully in Year 5 as differences in the way the data were collected across instruments makes it difficult to generate an accurate comparison.

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[6] It should be noted that "NanoLab" has 51 resources associated with it in the catalog, giving it a larger weighting than other resources. The exhibit "Zoom into the human bloodstream" is a graphic that likely had traffic drawn to it because it won the AAAS visualization award.

[7] X^2 (1, N=125)=6.198, p=0.013

[8] X^2 (1, N=125)=8.904, p<.0003

[9] X^2 (1, N=125)=15.588, p<.0005

The reporting metrics from Tier I institutions show that the most commonly implemented formats are stage presentations (292 of 597, 49%) and cart demonstrations (171, 29%).[10] (See Table 13). For Tier II, a survey of individuals who attended the regional workshops demonstrates that the cart demonstration (929 of 1,455, 64%) is the most commonly implemented format (See Table 14). Survey responses amongst Tier III partners suggest that the most commonly implemented formats amongst these partners include classroom activities (76 of 132, 58%) and cart demonstrations or programs (60, 45%). Currently, there are only 2 programs that are categorized as classroom activities in the NISE Net catalog of products, although there are many products in the catalog that can be adapted for use in the classroom. NISE Net might consider developing more products in this category, or better tagging or labeling of products so that users can more easily identify which products can be adapted for use in the classroom (see Table 15).

Table 13: Formats of nano informal education experiences delivered by Tier I reporting institutions

	# of implementations for Tier I institutions
Cart demonstration	171
Exhibit (days)	91
Stage presentation	292
Forum	6
Science Theater	101
Other	27

Table 14: Formats of nano informal education experiences delivered by Tier II survey respondents

	# of implementations for Tier II institutions
Cart demonstration	929
Exhibit	201
Stage presentation	150
Forum	3
Science Theater	4
Other	168

[10] These totals do not include the 91 days of exhibit display as the ongoing exhibit time cannot be quantified into number of unique implementations.

Table 15: Formats of nano informal education experiences delivered by Tier III survey respondents

	# of NISE Net catalog programs/ exhibits of this format	# of respondents who delivered NISE Net programs/ exhibits of this format	# of respondents who delivered non-NISE Net programs/ exhibits of this format	# of respondents who delivered both NISE Net and non-NISE Net programs/ exhibits of this format	Total # of respondents who delivered programs/ exhibits of this format
Classroom activity	2	39	59	22	76
Cart demonstration	20	47	36	23	60
Exhibit[11]	20	22	33	7	48
Stage presentation	6	23	28	10	41
Forum	3	13	16	5	27
Theater	2	6	6	1	11

The types of programs conducted by Tiers I, II and III institutions can be further examined by looking at the NanoDays report. These data demonstrate that 97 of 106 (92%) reporting institutions utilized the cart demonstration format during NanoDays 2009 (See Table 16). As exhibits and cart demonstrations were measured in hours and other programs were measured as number of implementations, it is difficult to compare frequency of implementation across program types. These data do show, however, that cart demonstrations were implemented at a high frequency by institutions all Tiers. This is not surprising given the NanoDays kit's focus on cart demonstrations.

Table 16: Formats of NanoDays experiences delivered by Tier I, II and III institutions

	# of Tier I implementations	# of Tier II implementations	# Tier III implementations	% of institutions implementing this format
Classroom activity	3	46	46	14%
Cart demonstration (hours)	496	1412	1073	92%
Exhibit (hours)	256	225	218	23%
Stage presentation	49	73	45	18%
Forum	2	16	18	4%
Lecture	6	28	18	32%

[11] The number of participants who report delivering NISE Net exhibits to the public is higher than anticipated based on the known touring schedule and development cycle of NISE Net exhibits. This could mean that there is a difference between what NISE Net and the survey respondents consider to be an exhibit.

Conclusion

The focus on this study was to look at three of the pathways NISE Net has developed for reaching the public and determine whether these pathways would likely have an impact:

- The Tier I Pathway, where the public programs and exhibits that were developed using NISE Net funding and placed into the NISE Net catalog are later implemented by Tier I institutions;
- The Tier II Pathway, where subawardees plus additional regional partner institutions attend workshops, connect with regional hub leaders, learn about NISE Net resources and then implement nano programs and exhibits at their institutions;
- The Tier III Pathway, where individuals (who did not attend the regional workshops) learn about NISE Net resources through nisenet.org and conference participation (amongst other avenues), download NISE Net products and deliver them to the public;

This study also provides preliminary about a fourth pathway:

- The Third Party Product Pathway, where Tier II and III partners create nano-education products and add them to nisenet.org for others to use; and

Findings from this investigation suggest that Tier I, II and III partners are delivering nano programs and exhibits to the public. The level of activity, however, is still somewhat limited. Furthermore, what is not known is whether the reported activity that is taking place amongst Tier II and III partners is separate from the NanoDays pathway that is the focus of Study 4. It is possible that most of the activities the survey respondents referred to took place during NanoDays 2008. Exploring whether and how much public outreach activity takes place outside of NanoDays will be a topic of investigation during Year 5.

These findings suggest the Tier II and III pathways would most likely contribute to public understanding of the fundamentals of NSET, and materials, tools and applications. It is less likely these pathways will contribute to public understanding of nano's relationship to energy and the environment, art and nature, and society, policy and economics.

At this point in time, there is insufficient evidence to draw inferences about the Third Party Product Pathway as this mechanism has not yet been established. Some data, however, point towards cautious optimism in terms of the viability of such an approach. The fact that new online audiences are continuing to discover the NISE Net website suggests that there is a growing group of nisenet.org users. In addition, there are potentially new programs and exhibits that could be added to the nisenet.org catalog as 59% of the Tier III survey respondents state that they conduct non-NISE Net nano programs/exhibits with the public (a large portion of these users also utilize NISE Net programs/exhibits). Tier I and II partners also appear to be implementing non-catalog activities with the public. It should be noted, however, that so far very few individuals who are not subawardees have taken the time to contribute to nisenet.org through existing mechanisms, such as posting comments in the catalog. Therefore, possible ways to motivate potential contributors should be explored.

References

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