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NANOSCALE INFORMAL SCIENCE EDUCATION

NISE Network Forum: "Nanomedicine in Healthcare"

Formative Evaluation

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THIS IS A FORMATIVE EVALUATION REPORT

Formative evaluation studies like this one often:

- **are conducted quickly**, which may mean
  - small sample sizes
  - expedited analyses
  - brief reports

- **look at an earlier version** of the exhibit/program, which may mean
  - a focus on problems and solutions, rather than successes
  - a change in form or title of the final exhibit/program

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Table of Contents

Executive Summary

This study was conducted as part of the formative evaluation of the NISE Network Forum "Nanomedicine in Healthcare." The purpose of the forum was to bring members of the public together to discuss the conditions under which nanotechnology applications in medicine and personal care products should be made available to the public. During the forum, participants learned about nanotechnology and its societal and ethical impacts from expert speakers, had a chance to ask questions of the experts, participated in a small group discussion in which they talked about the pros and cons of releasing nanotechnology-based medical and personal care products to the public, and reported out to the larger group about their discussion.

During 2007, this forum was conducted and formatively evaluated six times by the NISE Net Forum Team (which is comprised of professionals from the Exploratorium, Museum of Science, Museum of Life and Science, Science Museum of Minnesota, and Oregon Museum of Science and Industry). As a part of the presentation of the forum, formative evaluation information was collected through various sources including registration surveys, pre/post exit surveys, observations, educator debriefs, evaluator discussion debriefs, and speaker follow-up emails. This information, along with data collected through other sources, was used to help the team modify and optimize the forum for future participants and program educators. It was also felt that this data could be used to help future forum educators and expert presenters understand the needs of potential forum audiences and gain advice from past forum educators. It is for this second reason that the data is presented in this report.

Based on the results of the formative evaluation, advice to those presenting future "Nanomedicine in Healthcare" forums includes the following:

- When marketing the forum, consider targeting people:
  - Who are already familiar with your institution, by marketing through internal email lists and to people who attend other similar programming;
  - Who are personally or professionally interested in the topic, such as those who work in the medical field, by marketing through related organizations; and
  - Who are not as familiar with your institution, by partnering with diverse community organizations who may be interested in co-hosting or co-developing an event.
- When setting the agenda and content for the program, make sure to:
  - Balance the time allowed for expert presentations and small group discussion because participants find both of these segments important;
  - Clearly frame the purpose of the forum and instructions for the small group discussion and report-out;
  - Cover the full range of content relevant to the discussion scenarios during the expert presentation, including information about nanoscale science, engineering, and technology, applications mentioned in the scenarios, and some of their potential societal and ethical impacts; and
  - Prepare the speaker(s) for the forum by telling them who you expect to attend, working with them to craft their presentation, and giving them forum background materials such as the scenarios and agenda ahead of time.
- When picking a time and location for the event, make sure to:
  - Consider what refreshments to provide, and modify these refreshments based on the time of day and length of the program; and
  - Think about the cost in time and money of holding the event on-site versus off-site.

I. Introduction

About the Forum

The "Nanomedicine in Healthcare" forum was created in 2007 by the NISE Network Forum Team. The museum professionals who comprise the NISE Net Forum Team represent the following institutions:

- Exploratorium, San Francisco, CA (Explo),
- Museum of Life and Science, Durham, NC (MLS),
- Museum of Science, Boston, MA (MOS),
- Science Museum of Minnesota, St. Paul, MN (SMM), and
- Oregon Museum of Science and Industry, Portland, OR (OMSI).

The purpose of the forum was to generate discussion among members of the public about when medical and personal care products that contain nanotechnology should be released to the public. These forums lasted two hours. During that time, participants learned about nanotechnology and its societal and ethical implications from one to two expert speakers, asked the experts questions, discussed in small groups the conditions under which medical and personal care products containing nanotechnology should be released to the public, and reported out to the larger group about their discussions. The educational and programmatic goals for all NISE Net forums including "Nanomedicine in Healthcare" are the following:

Overarching Goal: To provide experiences where adults and teenagers from a broad range of backgrounds can engage in discussion, dialogue, and deliberation by:

- Enhancing the participants' understanding of nanoscale science, technology and engineering and its potential impact on the participants' lives, society, and the environment.
- Strengthening the public's and scientists' acceptance of, and familiarity with, diverse points of view related to nanoscale science, technology, and engineering.
- Engaging participants in discussions and dialogues where they consider the positive and negative impacts of existing or potential nanotechnologies.
- Increasing the participants' confidence in participating in public discourse about nanotechnologies and/or the value they find in engaging in such activities.
- Attracting and engaging adult audiences in in-depth learning experiences.
- Increasing informal science educators' knowledge, skill, and interest in developing and conducting programs that engage the public in discussion, dialogue, and deliberation about societal and environmental issues raised by nanotechnology and other new and emerging technologies. (NISE Network, 2007)

The materials needed to conduct this forum can be found at http://www.nisenet.org/ as can two evaluations conducted about the "Nanotechnology on Healthcare" forum: focus groups about Spanish materials created for English-Spanish bilingual forums (Morgan, Del Campo, & Kollmann, 2011), and a summative evaluation (Flagg & Knight-Williams, 2008). In addition, further information about other NISE Net forums can be found at nisenet.org, in the *NISE Network Public Forums Manual* (NISE Network, 2007), and in the article "Fostering civic dialogue: A new role for science museums?" (Reich, Bell, Kollmann, & Chin, 2007).

About the Evaluation

As part of the creation of the "Nanomedicine in Healthcare" forum, the program was presented and formatively evaluated six times between March and September 2007 (see Table A1 in Appendix A). Evaluators from the NISE Net Evaluation Team (comprised of staff members from the Museum of Science, Science Museum of Minnesota, and Oregon Museum of Science and Industry) conducted the evaluation of the program under the direction of the Research and Evaluation Department at the Museum of Science. The purpose of the formative evaluation was to collect data from participants and forum educators in order to understand what changes should be made to optimize the forum experience. Based on these findings, changes have been made which are reflected in the "Nanomedicine in Healthcare" materials available at http://www.nisenet.org. Those changes included the following:

- The title of the forum was changed in order to find a name that would be more attractive to potential participants. Titles used during the course of this evaluation included the following:
    - "Public Forum on Nano-Enabled Medical Technologies" (used for MLS 2.1)
    - "Nanotechnology in Health Care: Possibilities, Risks, and Benefits" (used for SMM 2.1 & Explo 2.1)
    - "Nanomedicine: Nanotechnology in Health and Healing" (used for MOS 2.1, OMSI 2.1, & MOS 2.2)
    - "Nanotechnology in Healthcare" (final title)
- The overarching question for the small group discussion was changed to create greater alignment between it and the discussion scenarios. The overarching questions used over the course of the evaluation included the following:
    - *Should new nanotechnology applications in medicine be made available to the public before we are confident of the possible risks?* (used for MLS 2.1)
    - *Should new nanotechnology applications in medicine be made available to the public before we understand the possible risks?* (used for SMM 2.1)
    - *New nanotechnology applications in medicine should be made available for use before we understand the possible risks.* (used for Explo 2.1, MOS 2.1, & OMSI 2.1)
    - *Under what conditions should nanotechnology applications in personal and medical products be made available to the public?* (used for MOS 2.2)
    - *Under what conditions should nanotechnology applications in medicine and personal care products be made available to the public? Why?* (final wording)
- Voting on the overarching question was changed and then removed because visitors were confused about the logistics and instructions for voting.
- Some scenarios were changed or removed because of participant confusion. Changes to the scenarios included the following:
    - Adding or removing nanotechnology applications that correspond with applications being developed near the forum location.
    - Removing the second scenario about lab diagnostic testing using nanoparticles because it was felt that the scenario did not fit with the two scenarios about public uses of nanotechnologies.

The following report contains copies of the formative evaluation memos created about the programmatic implementations of "Nanomedicine in Healthcare." Though the analysis was conducted to help the NISE Net Forum Team make informed decisions about changes to the program, it is hoped that these memos will also aid people who have never presented this forum to host similar events at their institutions. In order to do this, this report contains a description of forum participants' experiences including why participants were likely to attend the forum,

what reactions participants had to the event, and what participants were likely to value and learn through their participation. This report also contains the experiences of the educators and speakers who presented the forums and advice collected from the NISE Net Forum Team about how to run "Nanomedicine in Healthcare." Besides being useful to informal science educators planning to run a forum, the findings presented are also potentially useful to forum speakers because nanotechnology topics of interest to participants and the level of information the participants' desire are included.

Based on the results of the formative evaluation, advice to those presenting future "Nanomedicine in Healthcare" forums includes the following:

- When marketing the forum, consider targeting people:
    - Who are already familiar with your institution and its programming, by marketing through internal email lists and to people who attend similar programming like science cafes;
    - Who are personally or professionally interested in the programming such as those who work in the medical field, by marketing through related organizations; and
    - Who are not as familiar with your institution, by partnering with diverse community organizations who may be interested in co-hosting or co-developing a forum event.
- When setting the agenda and content for the program, make sure to:
    - Balance the time allowed for expert presentations and small group discussion because participants find both of these segments important;
    - Clearly frame the purpose of the forum and instructions for the small group discussion and report-out;
    - Cover the full range of content relevant to the discussion scenarios during the expert presentation, including information about nanoscale science, engineering, and technology, applications mentioned in the scenarios, and some of their potential societal and ethical impacts; and
    - Prepare speakers for the forum by telling them who you expect to attend, working with them to craft their presentation, and giving them forum background materials such as the scenarios and agenda ahead of time.
- When picking a time and location for the event, make sure to:
    - Consider what refreshments to provide, and modify these refreshments based on the time of day and length of the program; and
    - Think about the cost in time and money of holding the event on-site versus off-site.

These findings and recommendations are based on the formative evaluation of the "Nanomedicine in Healthcare" forum as conducted by the NISE Net Forum Team at the locations reported in Appendix A (Table A1). Readers should keep in mind that these findings may not be applicable to all institutions that choose to host this forum. These forums were marketed predominantly to people who were museum members or on a museum email list so it is possible that program presenters reaching out to other audiences may experience different results.

II. Methods

Data were collected in 2007 during the "Nanomedicine in Healthcare" forums conducted by the NISE Net Forum Team. The purpose of the formative evaluation was to generate data that could be used to make informed changes to the forums and provide advice to future forum presenters. Multiple methods of data collection were employed including registration surveys, pre/post exit surveys, observations, evaluator discussion debriefs, educator debriefs, and speaker follow-up emails. By using multiple data collection methods, the evaluators were able to develop a more complete picture of the forum experience for visitors and educators (Table 1). Data collection instruments which other museums can use to conduct their own forum formative evaluations can be found in the *NISE Network Public Forums Manual* (NISE Network, 2007).

Table 1. Methodology matrix.

Evaluation Questions	Data Collection Instruments					
	Registration survey	Pre/post exit survey	Observations	Evaluator discussion debrief	Educator debriefs	Speaker follow-up emails
What marketing methods are effective at attracting audiences to the NISE Net forum events?	X	X			X	
What aspects of the program are valued by the key stakeholders?		X	X	X	X	X
What aspects of the program appear to contribute to the program's ability to achieve its stated goals?		X	X	X	X	X
What changes should be made to the program so that it becomes cheaper and easier for other museums to implement?			X		X	X
How can the programmatic model be refined so that it better achieves the stated goals and objectives?	X	X	X	X	X	X
How can the program be improved so that it better meets the needs of key program stakeholders?		X	X	X	X	X

Selection of Study Forums

Over the course of 2007, each NISE Network Forum Team institution committed to presenting the "Nanomedicine in Healthcare" forum at least once. However, the team ended up presented this forum 17 times between 2007 and 2008. This report contains the data collected from six of the 17 "Nanomedicine in Healthcare" forums. These forums were chosen for inclusion in this report because they retained the original forum purpose of giving participants a chance to discuss the conditions under which medical and personal care products containing nanotechnology should be released to the public. In addition, these six forums were selected because they represent all of the NISE Network Forum Team institutions (Exploratorium, Museum of Science, Museum of Life and Science, Oregon Museum of Science and Industry, and Science Museum of Minnesota), and were not a part of the NISE Net forum summative evaluation (Flagg & Knight-Williams, 2008). The forum dates and locations from which data were collected can be found in Appendix A (Table A1).

Data Collection Methods

Forms of data collection used for "Nanomedicine in Healthcare" included registration surveys, pre/post exit surveys, observations, evaluator discussion debriefs, educator debriefs, and speaker follow-up emails. Sometimes additional data collections methods such as small group videotapes were also collected. However, the list below contains only those methods mentioned within each formative evaluation memo. The forums at which each data collection method was used can be found in Appendix A (Table A2).

Registration survey: The registration survey primarily served as a registration tool for the NISE Net Forum Team so that educators at each of the institutional sites knew who was coming to the forum. This survey was also used by the evaluation team to understand the participants' relationship to the topic, how they learned about the forum, and if they had a disability. The registration surveys were collected for all six evaluated forums. In total, 134 surveys were collected from 225 participants (60% return rate). This return rate is a result of the nature of the online registration system in that people were allowed to register more than just themselves. Additionally, the forums allowed for drop-in participants who had not previously registered which contributes to a lower rate of return.

Pre/post exit survey: This method focused on capturing information about who attended the forum, what they learned from the forum, and what they perceived to be the most valuable aspects of the experience. Exit surveys were collected at all six of the evaluated forums. In total, 209 surveys were collected from 225 participants (93% return rate). Participants were given the survey at the beginning of the forum. The first side of the survey contained questions that participants were expected to answer before the forum, and the back side of the survey contained post-forum questions. Survey questions addressed participants' interests and backgrounds, recommendations for improving the program, what they learned and valued about the experience, and the clarity of the information presented during the forum.

Observations: Observational data provided insights on the topics participants were most interested in discussing during the event. These notes were collected at all six of the forums. Data recorded included content discussed by the speakers during their presentations, questions asked by the participants during the forum, topics covered during participants' small group discussion, and groups' major summary points from their small group discussion stated during the report-out.

Evaluator discussion debrief: During four of the six forums, evaluators observed one to two small group discussions. After observing a small group discussion, evaluators completed a debrief form that summarized the content discussed by the participants. Additionally, evaluators recorded how the small group used the discussion scenarios and whether the small group incorporated the expert presentations into their discussion.

Educator debrief: In the days following the forum, program staff were asked to gather together to discuss their forum experience. Debriefs were conducted following all six forums. Staff members were asked to talk about their thoughts on the success of the forum, how they felt about their preparation for the event, their thoughts on the structure and format of the forum, and what changes they would recommend for future implementations of the program.

Speaker follow-up email: Within a week following the forum, speakers were contacted and asked to fill out an email survey. A reminder email was sent out a week after the first email. Follow-up emails were collected from the speakers at all six of the evaluated forums. The survey

asked the speakers what value he or she found in participating, how the museum helped him or her prepare, and how the museum could have better helped him or her prepare for the forum.

Data Analysis

By collecting data in a variety of ways, the evaluator was able to triangulate the data. The logic behind triangulation is that "no single method ever adequately solves the problem of rival causal factors" (Patton, 2002, p.247). Therefore, if data is collected through many sources, evaluators can avoid the problems of a one-method study, which is "vulnerable to errors linked to that particular method (e.g., loaded interview questions, biased or untrue responses)" (Patton, 2002, p.248). Studies that utilize multiple methods allow "cross-data validity tests" (Patton, 2002, p.248), and thus reduce the likelihood that the evaluator will draw a false conclusion based on the limits of any one instrument. In this case, data from registration surveys, pre/post exit surveys, observations, evaluator discussion debriefs, educator debriefs, and speaker follow-up emails were compared whenever possible to ensure that findings are not susceptible to error, and to allow for an exploration of differences among data.

Data collected through the instruments were both qualitative and quantitative in nature. Quantitative data were analyzed through descriptive statistics such as percentages, counts, and means. Qualitative data were analyzed using inductive coding. Inductive coding analysis involves "immersion in the details and specifics of data to discover important patterns, themes, and interrelationships" and allowing the coding scheme to emerge from the data (Patton, 2002, p.41).

III. Museum of Life and Science Nanomedicine Forum Formative Evaluation Memo

The following summary provides an overview of the findings from the formative evaluation of the NISE Net nanomedicine forum that took place at the Museum of Life and Science in Durham, NC on Tuesday, March 27, 2007 (identified as MLS 2.1). The forum, called "Public Forum on Nano-Enabled Medical Technologies," was the first attempt at implementing this forum which was tested at all five NISE Net Forum institutions (Exploratorium, MOS, MLS, OMSI, and SMM) at least once during 2007.

The format of the event was similar to many of the "Risks, Benefits, and Who Decides?" forums held in 2006. The event involved a speaker, a question and answer session, a discussion, and a report-out. A nanotechnology expert from a local university gave the audience general information about nanotechnology/nano-science and discussed his research in nano-medicine. During and following the presentation, the audience asked the expert clarifying questions. Then, the audience discussed three scenarios meant to cause them to consider the overarching question: *Should new nanotechnology applications in medicine be made available to the public before we are confident of the possible risks?* The scenarios increased in potential risk to humans from use in sunscreen on the skin, to use in the lab for diagnostic purposes, to use in the human body as a treatment for cancer and other diseases. Audience members voted on the overarching question after each scenario, and they discussed their votes and thoughts as a large group during the report-out.

1. What marketing methods were effective at attracting attendees to the program?

The forum audience reflected the marketing methods used by MLS in that many individuals who registered for the forum heard about the program through word of mouth or through a museum-related contact. The greatest number of registrants said that they heard about the forum through their work (33%). Others said that they found out about the forum through a museum email (29%) or a friend/family member (24%). Organizers from MLS reported that though they tried many methods to attract participants to the forum, emails to contacts including research companies and colleges and universities seemed to bring in the most participants because the "power to forward in every email got us the best participants" (MLS 2.1 debrief). (See Table 2)

Table 2. Registration survey: Demographic data.

	MLS 2.1 Number of Registrants (N=21)	%
Relationship to forum topic		
Museum member	6	29%
Educator/Teacher	5	24%
Personally interested	14	67%
Researcher/Student studying nano or a related topic	4	19%
Community/Advocacy interest group member	1	5%
NISE Network Affiliate	2	10%
Other	1	5%
No Answer	0	0%
How heard about the program		
From the museum website	2	10%
From Craig's List	0	0%
From another website	0	0%
From a museum email	6	29%
From another email	2	10%
From a club/organization	0	0%
Through a friend/family member	5	24%
From a paper mailing	0	0%
Through my work	7	33%
Through my college/university	3	14%
From print media	0	0%
Other	0	0%
No Answer	0	0%
Temporary or permanent disabilities		
Mobility	0	0%
Cognitive	0	0%
Visual	0	0%
Auditory	0	0%
Learning	0	0%
Other	0	0%
No Answer	0	0%

The participant demographics also showed that emails from the museum were the most effective way to attract visitors to the MLS 2.1 forum. Many participants said that they wanted to come to the forum because they were personally interested in the topic (67%), but they also indicated that they were museum members (29%), educators/teachers (24%), and researchers/students (19%). In addition, when these participants were asked what their work/topic affiliation was, many people mentioned that they were associated with a local college or university (33%), an area company (19%), or the Museum of Life and Science (19%). These data indicated that many forum participants were closely affiliated with MLS or the forum topic. (See Tables 2 & 3)

Table 3. Registration survey: Participant professional/topic affiliation.

	MLS 2.1 Number of Registrants (N=21)	%
Local college/university	7	33%
Local company	4	19%
Home museum	4	19%
No answer	4	19%
Other museum	3	14%

The marketing methods used meant that the forum audience was not very diverse. Though the audience was composed of half males and half females, the audience did not vary in many other ways. A majority of the participants were between the ages of 35 and 64 (60%) which is similar to the age range attracted to the NISE Net "Risks, Benefits, and Who Decides?" forums. In addition, most of the participants were white (85%), and had visited MLS in the last three months (50%). Interestingly, the second largest group of participants (25%) had never been to the museum before which means that this program did reach some new visitors. (See Table 4)

These data showed that email can be an effective way to attract participants to the forum. This tool is powerful because you do not just reach those you email but also those who receive a forwarded email. Nevertheless, the data also showed that it is important to consider your initial email's recipient list in order to attract a broad audience.

Table 4. Exit survey: Demographic data.

	MLS 2.1 Number of Survey Respondents (N=20)	%
Gender		
Male	8	40%
Female	10	50%
No Answer	2	10%
Age		
<18	0	0%
18-24	4	20%
25-34	2	10%
35-44	3	15%
45-54	7	35%
55-64	2	10%
65-74	0	0%
75-84	0	0%
85+	0	0%
No Answer	2	10%
Race/Ethnicity (Check all that apply)		
African American	0	0%
American Indian/Alaskan Native	1	5%
Asian American	1	5%
Hispanic/Latino	1	5%
White, not of Hispanic origin	17	85%
Other	0	0%
No Answer	1	5%
Last visit to Museum		
Never	5	25%
Within the last three months	10	50%
3 - 6 months ago	1	5%
6 months to 1 year ago	0	0%
1 - 2 years ago	2	10%
2 - 5 years ago	0	0%
5 - 10 years ago	1	5%
More than 10 years ago	0	0%
Not sure	0	0%
No Answer	1	5%
Key reasons you decided to attend (Check all that apply)		
To meet people, socialize	2	10%
Professional networking	4	20%
To learn about nanotechnology	16	80%
To learn about medical technology	9	45%
To hear others' perspectives	8	40%
To share my ideas with others	1	5%
To get involved at the Museum	3	15%
Sounds like fun	6	30%
Other	2	10%
No Answer	1	5%

2. What aspects of the program were valued by the key stakeholders and should therefore be included in future iterations of the forum?

The aspects of the forum that stakeholders most valued and that most contributed to the achievement of the forum goals were the same: the presentation and small group discussion. Participants reported that the key reason they came to the forum was to learn about nanotechnology (80%) and medical technology (45%) and also to hear others' perspectives (40%). Participant expectations for the forum matched the key reasons they attended. Half of the participants indicated that what they expected was to learn. They were less likely to expect a discussion (10%). (See Tables 4 & 5)

Table 5. Exit survey: Participant expectations of the forum.

	MLS 2.1 Number of Survey Respondents (N=20)	%	MLS 2.1 Quotes
I will learn.	10	50%	"Informational…" (MLS 2.1 Survey #05)
No Answer	4	20%	--
I have no idea.	4	20%	"Didn't really know what to expect." (MLS 2.1 Survey #04)
It will have a discussion.	2	10%	"...discussion oriented" (MLS 2.1 Survey #05)
I got misinformation.	2	10%	"...Did not expect table top but it was fun." (MLS 2.1 Survey #03)
It will be fun/interesting.	1	5%	"...interesting like NOVA on PBS." (MLS 2.1 Survey #02)
It will include interaction.	1	5%	"… participatory" (MLS 2.1 Survey #16)
I will meet new people.	1	5%	"...meet folks in different fields…" (MLS 2.1 Survey #14)
Other	1	5%	"...maybe confusing at times." (MLS 2.1 Survey #07)
It will have a presentation and discussion.	2	10%	"talk and then discussion-based" (MLS 2.1 Survey #11)
It will have science content.	1	5%	"Enlightening and informative about current nanotechnologies…" (MLS 2.1 Survey #06)

After the forum, participants agreed that they valued the small group discussion and being able to learn about nanotechnology. When asked an open-ended question about what they valued most about their experience, the most common responses given by participants were that they appreciated being able to discuss the topic with others (30%) and to learn about the topic (20%). Other aspects of the presentations and discussion were also valued highly including: the diverse range of opinions expressed by participants (15%), both the small group and the expert presentation (15%), and the discussion scenarios (15%). (See Table 6)

Table 6. Exit survey: Aspects of the forum participants valued most.

	MLS 2.1 Number of Survey Respondents (N=20)	%	MLS 2.1 Quotes
Discussing with others	6	30%	"...discussing about how to use it on the public…" (MLS 2.1 Survey #19)
Opportunity to learn/access to information	4	20%	"...learning tidbits about new technologies and research" (MLS 2.1 Survey #17)
Diverse range of viewpoints	3	15%	"Opportunity to hear a diverse group of opinions" (MLS 2.1 Survey #20)
The small groups discussion and the experts	3	15%	"The introduction to the subject a starting point for further discussions." (MLS 2.1 Survey #16)
The discussion scenarios	3	15%	"I liked the scenarios and lively discussions…" (MLS 2.1 Survey #13)
Listening/access to experts	2	10%	"[The speaker's] talk…" (MLS 2.1 Survey #11)
No answer	2	10%	--
Other	2	10%	"new experience" (MLS 2.1 Survey #10)
Societal/ethical issues discussed	2	10%	"...thinking / discussing about how to use it on the public and the associated risks and benefits to be considered." (MLS 2.1 Survey #19)
The topic of nanotechnology	1	5%	"The exposure to a new technology…" (MLS 2.1 Survey #19)
Meeting other participants	1	5%	"Meeting new people" (MLS 2.1 Survey #15)

Both the MLS organizers and the speaker agreed that the discussion was important to the forum, but also thought that the question and answer period was key. The speaker said, "I enjoyed seeing the active discussion" (MLS 2.1 speaker follow-up). One of the event organizers concurred, "I was very pleasantly surprised at the amount of engagement around the table, sometimes I see that, sometimes I don't. I think the scenarios worked to do what we wanted--to provoke conversation" (MLS 2.1 debrief). The organizers also indicated that they were pleased with the questions asked by participants during the question and answer periods. One of them said, "My earliest indication that the forum was successful was that the audience was asking the speaker thoughtful questions" (MLS 2.1 debrief). The speaker was heard to have the same opinion when he said during the forum that he wished some of his students would ask him such attentive questions (MLS 2.1 observations).

3. What aspects of the program appeared to contribute to the program's ability to achieve its stated goals and should therefore be included in future iterations of the forum?

The aspects of the forum that appeared to contribute to the achievement of the goals were both the discussion scenarios and the expert presentation. Visitors appeared to be learning the most from the expert presentation. Before the MLS forum, only 15% of the participants either

"agreed" or "strongly agreed" that they felt informed about nanotechnology. After the forum, 90% of the participants either "agreed" or "strongly agreed" that they felt more informed about nanotechnology. The types of content that visitors said they learned from the forum included: the uses/applications of nanotechnology (40%) and the science of nano (25%). Both of these topics were present in the expert discussion and were key educational goals for the forum. (See Tables 7 – 9)

The discussion scenarios also promoted the achievement of the forum goals. Before the forum, few participants (30%) indicated that they felt comfortable discussing their opinions about nanotechnology. However, after the forum a large majority of participants (90%) "agreed" or "strongly agreed" that they felt comfortable discussing their opinions. In addition, most participants (95%) "agreed" or "strongly agreed" that they weighed the pros and cons of nano-enabled medical technologies during their small group discussion. Participants also said that the pros and cons of nanotechnology were the hot topics discussed during the small group. The most common things that participants said they talked about during the discussion were environmental issues and risks (35%) and risks and benefits in general (35%). (See Tables 7, 8, & 10)

The data illustrated that it was important to maintain the small group discussion and to keep the scenarios largely as they already were. In addition, it was important to have an expert to teach the participants about nanotechnology and allow participants to ask clarifying questions.

Table 7. Exit survey: Participant comfort with nanotechnology before the forum.[1]

	MLS 2.1 Mean Rating (N=20)	% of Survey Respondents Choosing "Agree" or "Strongly Agree"
I have a strong understanding of nanotechnology.	2.0	15%
I feel comfortable expressing my opinions on nanotechnology.	2.1	30%
I have a strong opinion about releasing nano-enabled medical technologies to the public.	2.3	30%

[1] Participants were asked to rate these questions on a scale of 1 to 4 where 1 is "Strongly Disagree," 2 is "Disagree," 3 is "Agree," and 4 is "Strongly Agree."

Table 8. Exit survey: Participant feelings after the forum.[2]

	MLS 2.1 Mean Rating (N=20)	% of Survey Respondents Choosing "Agree" or "Strongly Agree"
I enjoyed the experience.	3.4	95%
The experience matched my expectations.	2.7	65%
I felt comfortable expressing my opinions.	3.2	90%
I feel more informed about nanotechnology.	3.2	90%
I feel more informed about the risks and benefits of nano-enabled medical technology.	3.1	85%
It was clear what we were supposed to do during the forum.	3.1	85%
The presentations were easy to understand.	3.3	90%
The discussion cards were easy to follow.	3.0	80%
We weighed the pros and cons of nano-enabled medical technologies during our discussion.	3.3	95%
A diverse range of viewpoints were represented in our small group discussion.	3.2	80%

Table 9. Exit survey: Things participants reported learning from the forum.

	MLS 2.1 Number of Survey Respondents (N=20)	%	MLS 2.1 Quotes
Uses of nanotechnology	8	40%	"current applications" (MLS 2.1 Survey #01)
About science/technology of nano	5	25%	"Current nanotechnology research…" (MLS 2.1 Survey #04)
Places nanotechnology is researched	3	15%	"...centers for nano biotechnology, and companies associated with nano biotechnology." (MLS 2.1 Survey #05)
About the risks of nano	3	15%	"I hadn't thought about the environmental risks from the toxicity of some of the nanotechnologies" (MLS 2.1 Survey #11)
Funding of nanotechnology	2	10%	"The amount of money going towards nanotech in N.C." (MLS 2.1 Survey #16)
No answer	1	5%	--
Nothing	1	5%	"I didn't really learn any new concrete facts - because the scenarios were pretty vague and hypothetical it seemed…" (MLS 2.1 Survey #17)
Societal aspects of nano	1	5%	"... The ethical ramifications." (MLS 2.1 Survey #13)

[2] Participants were asked to rate these questions on a scale of 1 to 4 where 1 is "Strongly Disagree," 2 is "Disagree," 3 is "Agree," and 4 is "Strongly Agree."

Table 10. Exit survey: Hot topics that participants said came up during their discussion.

	MLS 2.1 Number of Survey Respondents (N=20)	%	MLS 2.1 Quotes
Environmental concerns/issues/risks	7	35%	"Environmental impacts (disposal of waste)…" (MLS 2.1 Survey #17)
Risks and benefits in general	7	35%	"The risks associated with each option versus the gains/assets." (MLS 2.1 Survey #19)
Health Care System issues	4	20%	"...universal healthcare (diagnostic pro/cons)" (MLS 2.1 Survey #15)
The overarching question and scenarios	3	15%	"Scenario #1 - very "vanity based" applications. It was HARD to get past that to the heart of the issue." (MLS 2.1 Survey #11)
Regulation of nano	3	15%	"...FDA approval before products are released to the public…" (MLS 2.1 Survey #14)
Human concerns/issues/risks	2	10%	"Safety - in humans…" (MLS 2.1 Survey #02)
Other	2	10%	"...prioritizing problems" (MLS 2.1 Survey #05)
No Answer	1	5%	--

4. How could the programmatic model be refined so that it better achieves the stated goals and objectives?

Despite the fact that most visitors enjoyed their experience (95%), there was still room for improvement within the forum format as it was presented at MLS. It was suggested that this change should be focused on the content of the expert presentations and the discussion scenarios and overarching question. (See Table 8)

Key stakeholders largely agreed that they liked the timing and flow of the forum. Over 90% of the participants thought that the right amount of time was spent in the welcome/introduction, question and answer period, and report-out. Just under 90% of participants also agreed that they liked the amount of time spent on the speaker presentation. A few people (17%) thought that the small group discussion should be made shorter than 45 minutes; however, most people (78%) thought that the length of the discussion was fine as well. The forum organizers agreed that they felt the right amount of time was spent on each of the aspects of the forum (MLS 2.1 debrief). Therefore, the data showed that the speaker presentation(s) should make up at least 20 minutes of the forum with at least 10 minutes left for question and answer while participants should be given about 45 minutes for the small group discussion. (See Table 11)

Table 11. Exit survey: Participant feelings about the time breakdown.

	MLS 2.1 Number of Survey Respondents choosing "Too Short"	%	MLS 2.1 Number of Survey Respondents choosing "Too Long"	%	MLS 2.1 Number of Survey Respondents choosing "Just Right"	%
Welcome/Introduction (n=18)	0	0%	1	6%	17	94%
The speaker presentations (n=18)	1	6%	1	6%	16	89%
The small group discussion (n=18)	1	6%	3	17%	14	78%
The question and answer period (n=16)	1	6%	0	0%	15	94%
The report out (n=13)	1	8%	0	0%	12	92%

The main thing that participants wanted to see changed was the overarching question of the scenarios. Almost half of the participants (45%) said that they had problems with the question because of the use of the word "confident" or because they felt it did not fit well with the scenarios. One participant said, "[The] overarching question wording [was] fuzzy. State clearer the question: fairly confident? 100% confident?" (MLS 2.1 Survey #08). Another participant suggested that this problem might be solved by changing the question to: "Should new nanotechnologies be used before specific risks are identified and assessed?" (MLS 2.1 Survey #06). Other participants did not like the overarching question because they felt it did not match the scenarios. A participant said, "Make sure people know their discussions of the scenario are intended to be focused around the overarching question and not just about whether they agree with the scenario or not in general" (MLS 2.1 Survey #17). The organizers agreed that the overarching question was problematic. They said, "The word confident came up--maybe we should change it to change to somewhat confident… [Even] the speaker said they don't even use the word confident, it's overachieving" (MLS 2.1 debrief). Therefore, it was suggested that the overarching question needed to be changed so that the links between the question and the scenarios were clearer, and that the word confident needed to be removed and replaced with a more specific term. (See Table 12)

Table 12. Exit survey: Ways participants say the forum could be improved.

	MLS 2.1 Number of Survey Respondents (N=20)	%	MLS 2.1 Quotes
Change the overarching question	9	45%	"The word 'confident' became confounding as the scenarios proceeded closer to 'human body'" (MLS 2.1 Survey #07)
No Answer	6	30%	--
Change the amount of time spent on different segments of the program	2	10%	"more time in forum" (MLS 2.1 Survey #10)
Change the food service	2	10%	"Have hot tea and coffee." (MLS 2.1 Survey #04)
Other	1	5%	"Understand better the answers. Maybe a later reflection about." (MLS 2.1 Survey #20)
Invite a broader range of/or different experts	1	5%	"more speakers" (MLS 2.1 Survey #18)
Improve the audio-visuals	1	5%	"Sometimes it was hard to hear…" (MLS 2.1 Survey #11)

While people did not like the overarching question, many did like the scenarios. This even came up for some participants (15%) as a part of the forum they found most valuable. Therefore, it appeared that the scenarios do not need to be changed very much. However, it should be noted that two of the tables had some problems with the sunscreen scenario because they did not understand what sunscreen had to do with medicine, or they felt that invisible sunscreen was a "vanity" issue (MLS 2.1 discussion debrief). Therefore, it was suggested that it might be helpful to make the link between sunscreen and medicine more obvious or to change this scenario to a nanotechnology application more closely associated with medicine. (See Table 6)

The other aspect of the forum that stakeholders felt needed changing was the expert presentation. Participants rarely mentioned (5%) the need to change anything about the expert presentation when asked what improvements needed to be made to the forum. Nevertheless, when participants were asked what additional information should be included in the forum, the need for some changes to the presentation came out. The most common response given by participants was that they wanted to know more about nanoscience (20%). One participant noted, "The idea that nano objects have VERY different properties than larger objects - this wasn't made entirely clear or brought into the questions" (MLS 2.1 Survey #11). Others (15%) wanted more information about research that has been conducted on the risks and benefits of nanotechnology. A participant said, "Statistics - we need more numbers/stats to reach a more informed decision that I feel confident about" (MLS 2.1 Survey #18). (See Tables 12 & 13)

Table 13. Exit survey: Other information participants said should be included.

	MLS 2.1 Number of Survey Respondents (N=20)	%	MLS 2.1 Quotes
No Answer	6	30%	--
More about nano-science	4	20%	"more background on nanoparticles that are naturally occurring" (MLS 2.1 Survey #01)
Clarification of the overarching question	3	15%	"The question was confusing. I suggest 'Should new nanotechnologies be used before specific risks are identified and assessed?'" (MLS 2.1 Survey #06)
Relevant studies/data on risks and benefits	3	15%	"statistics - we need more numbers/stats to reach a more informed decision that I feel confident about" (MLS 2.1 Survey #18)
More about nano applications	2	10%	"A few more specific examples of products in development." (MLS 2.1 Survey #04)
Positive comment/no change	2	10%	"Great job!" (MLS 2.1 Survey #14)
More about the societal implications	1	5%	"more societal implications in opening speech" (MLS 2.1 Survey #16)
Other	1	5%	"Possibly provide the agenda in advance, i.e. when we are registering" (MLS 2.1 Survey #19)

Forum organizers agreed that it was important to present participants with more information about basic nano-science so that they could have better informed discussions. They also felt that in some ways the speaker did not give the participants a good understanding of "Nano 101" (MLS 2.1 debrief). They suggested the following:

- *[Maybe we should] put together Nano 101 presentation slides to help give [the speaker] suggestions.*
- *[Include slides that talk about] why does size matter, [that the ideas behind nano are not new] but that now it is possible to manipulate and control things.*
- *You have to hear it a million times before it sinks in.* (MLS 2.1 debrief)

These data indicated that it was important to make sure that the audience has a good grounding in "Nano 101" before the small group discussion. Therefore, it was suggested that it would be important that an expert speaker gives a basic background in nano-science including the ideas that "stuff" at the nanoscale is super small, that it's different down there, and that researchers are trying to figure out how to make things at the nanoscale that have novel properties.

5. What changes should be made to the program so that it becomes cheaper and easier for other museums to implement?

Forum organizers felt that they did their best to produce the forum as cheaply as possible. Marketing was done primarily through email and posts to community calendars. The only food provided was bottled water. Materials used included copies of the scenarios that were shared among participants and sticky dots for voting, and registration took place through a free web tool (WuFoo -- http://wufoo.com/). Organizers felt that staff time and effort consumed most of the forum resources (MLS 2.1 debrief). They did not feel that they could have done anything to have produced a cheaper forum.

The organizers did feel that some things should be changed compared to how MLS produced the forum. They thought that it was important for future forum organizers to do the following:

- Find an expert speaker early;
- Prepare the speaker(s) by helping them with their presentation to make sure certain topics are touched on; and
- Make sure to start marketing early so that you can get into newspapers and on community calendars. (MLS 2.1 debrief)

6. How could the program be improved so that it better meets the needs of the key program stakeholders (including adult learners, museum educators, and nano-researchers)?

Three things stood out as needing to be improved in order to better meet the needs of key stakeholders: changing marketing strategies, better preparing the experts, and modifying the overarching question.

The marketing strategies needed to be changed in order to broaden the audience in terms of their familiarity with the museum and the topic of nanotechnology. The MLS 2.1 forum audience appeared to be very educated. Many people who came to the event worked at Research Triangle Park companies or the University of North Carolina. It is possible that an educated audience was attracted to the forum because of the way the program was promoted. Therefore, it is important to try to make sure that the general public is exposed to forum marketing and that the program is attractive to them. For this reason, it was suggested that the marketing blurb and forum title should be changed so that less technical vocabulary was used and the program sounded more interesting and relevant. In addition, it was suggested that groups including cancer survivor groups should be marketed to in order to bring a different perspective to the forum. It was felt that this should help to attract new visitors to the museums and ensure that not only scientists are present at the forum.

Another way to better meet the needs of key stakeholders was to better prepare the speakers. The speaker felt that he was given enough preparation from museum staff, but the participants and organizers felt that some changes needed to be made to the presentation. It was suggested that it is important that the speaker understand what content needs to be presented. Therefore, it was suggested that forum organizers consider presenting the speakers with bullet points that need to be covered in their presentations in order to ensure that participants are getting all the information they need for their small group discussion. It was felt that this would help future organizers and ensure that educational goals are met.

Finally, it was important to change the overarching question to improve the flow of the small group discussion. The part of the forum that participants found most difficult was the overarching question. They did not understand how the overarching question related to the discussion scenarios, had a hard time understanding how to vote after they discussed each scenario, and did not like the use of the word “confident” in the question. In order to help the participants in their discussion, it was suggested that it is important to provide participants with clear instructions which explain how the overarching question relates to the scenarios and how to vote. It was also suggested that it is important to re-write the overarching question and scenarios in order to make the links between them clearer. This will help the visitors have a more meaningful discussion and will help forum organizers be consistent in their presentation of the scenarios.

IV. Science Museum of Minnesota Nanomedicine Forum Formative Evaluation Memo

The following summary provides an overview of the findings from the formative evaluation of the NISE Network nanomedicine forum that took place at the Science Museum of Minnesota on Thursday, April 26, 2007 (identified as SMM 2.1). The forum, called "Nanotechnology in Health Care: Possibilities, Risks, and Benefits," was the second attempt at implementing this forum which was tested at all five NISE Net forum team institutions (Exploratorium, MLS, MOS, OMSI, and SMM) at least once during 2007.

The format of the event was similar to many of the "Risks, Benefits, and Who Decides?" forums as well as the previous nanomedicine forum that took place at the Museum of Life and Science (MLS 2.1) in March 2007. The two-hour event involved two speakers, questions and answers with the audience, a discussion, and a report-out. A graduate student from the University of Minnesota studying nanotechnology applications gave the audience general information about nanotechnology/nano-science and discussed research in nano-medicine. A professor studying science, technology, and public policy at the Humphrey Institute discussed medical nanotechnology applications and ethical implications. Following each of the presentations, the audience was able to ask the experts clarifying questions. Then, the audience discussed three scenarios meant to cause them to consider the overarching question: *Should new nanotechnology applications in medicine be made available to the public before we understand the possible risks?* The scenarios increased in potential risk from topical use in sunscreen and dental fillers to use in the lab for diagnostic purposes to use in the human body as a treatment for cancer and other diseases. Audience members voted on the overarching question after each scenario, and they discussed their votes and thoughts as a large group during the report-out.

1. What marketing methods were effective at attracting attendees to the program?

The Science Museum of Minnesota marketed the forum through only one source—an email list of 20,000 SMM members. By using this list, SMM easily filled up the event causing registration to be closed after just two days. The demographics of the participants reflected this marketing method. A majority of registration respondents said that they were SMM members (84%) who learned about the event through a SMM email (74%). The registration respondents said they came because they were personally interested in the topic (68%). (See Table 14)

Table 14. Registration survey: Demographic data.

	SMM 2.1 Number of Registrants (N=19)	%
Relationship to forum topic		
Museum member	16	84%
Museum volunteer/staff	0	0%
Educator/Teacher	1	5%
Personally interested	13	68%
Researcher/Student studying nano or a related topic	0	0%
Researcher/Student studying science	1	5%
Community/Advocacy interest group member	2	11%
NISE Network Affiliate	1	5%
Other	3	16%
No Answer	0	0%
How heard about program		
From the museum website	1	5%
From Craigs List	--	--
From another website	0	0%
From a museum email	14	74%
From another email	1	5%
From a club/organization	0	0%
Through a friend/family member	1	5%
From a paper mailing	2	11%
Through my work	0	0%
Through my college/university	0	0%
From print media	0	0%
Other	0	0%
No Answer	0	0%
Temporary or permanent disabilities		
No Disability	19	100%
Mobility	0	0%
Cognitive	0	0%
Visual	0	0%
Auditory	0	0%
Learning	0	0%
Other	0	0%
No Answer	0	0%

Using the SMM member email list as the only marketing method might have been one of the reasons that the forum attendees were not very diverse. The registration respondents were composed of more than half males (56%), no one had a temporary or permanent disability, and most survey respondents (72%) were between the ages of 45 to 64 years old. In addition, most SMM 2.1 survey respondents were White (88%) and only a few were African American (3%), Asian American (6%), or American Indian/Alaskan Native (3%). Over half of the survey respondents (56%) had been to SMM in the last three months. These demographics were very similar to the demographics of participants from the "Risks, Benefits, and Who Decides?" forums and from the MLS 2.1 forum. (See Tables 14 & 15)

Table 15. Exit survey: Demographic data.

	SMM 2.1 Number of Survey Respondents (N=32)	%
Gender		
Male	18	56%
Female	14	44%
No Answer	0	0%
Age		
<18	1	3%
18-24	0	0%
25-34	4	13%
35-44	2	6%
45-54	10	31%
55-64	13	41%
65-74	1	3%
75-84	1	3%
85+	0	0%
No Answer	0	0%
Race/Ethnicity (Check all that apply)		
African American	1	3%
American Indian/Alaskan Native	1	3%
Asian American	2	6%
Hispanic/Latino	0	0%
White, not of Hispanic origin	28	88%
Other	0	0%
No Answer	0	0%
Last visit to museum		
Never	1	3%
Within the last three months	18	56%
3 - 6 months ago	6	19%
6 months to 1 year ago	5	16%
1 - 2 years ago	1	3%
2 - 5 years ago	1	3%
5 - 10 years ago	0	0%
More than 10 years ago	0	0%
Not sure	0	0%
No Answer	0	0%
Key reasons you decided to attend (Check all that apply)		
To meet people, socialize	5	16%
Professional networking	2	6%
To learn about nanotechnology	31	97%
To learn about medical technology	17	53%
To hear others' perspectives	12	38%
To share my ideas with others	3	9%
To get involved at the Museum	5	16%
Sounds like fun	10	31%
Other	1	3%
No Answer	0	0%

While using the SMM member email list allowed the museum to quickly fill up the forum, there were some problems with this marketing method. Seventy-six people registered for the forum, but only 32 came. This low attendance rate (42%) was similar to the one experienced at the MLS 2.1 forum (50%). The SMM 2.1 forum staff suggested that the high attrition rate might have been due to the fact that the program was free. They said that it was important to let people know how important their attendance is, to let them know that there were people on the waitlist (in this case 36 people tried to register after registration was closed), and to encourage people to let the museum know if they are not able to attend. SMM forum staff suggested that charging a small fee may also drive up attendance (SMM 2.1 debrief). Another option may be to overbook a forum knowing that it is likely that many registrants will not show up.

These data showed that museum member lists can be an effective way to attract participants to a forum about nanotechnology. It is a powerful method because it reaches out to people who are already familiar and comfortable with the institution. In addition, using a member list means that the people being recruited are already interested in science. However, the benefits of this method are also its drawbacks. Because this method was used, people from traditionally underrepresented audiences in science, technology, engineering, and math (STEM) did not come to the program in large numbers nor did people who were unfamiliar with the museum.

2. What aspects of the program were valued by the key stakeholders and should therefore be included in future iterations of the forum?

The parts of the forum most valued by stakeholders were the small group discussion and the expert presentations. Most SMM 2.1 survey respondents reported that the key reasons that they attended the forum were to learn about nanotechnology (97%) and medical technologies (53%). Additionally, over half of the survey respondents (17 of 32) said that they expected to learn during the forum, and some survey respondents (5 of 32) said they specifically expected to learn science content. Evidence that visitors expected to learn from the forum was also apparent because they anticipated presentations (2 of 32 survey respondents) or presentations and discussions (2 of 32 survey respondents). The fact that a few visitors expected discussions shows that some visitors were aware that they would be talking with other participants during the course of the forum. Further evidence that survey respondents expected a discussion with peers was that some of them (38%) said one of the key reasons they attended was to hear others' opinions. (See Tables 15 & 16)

Table 16. Exit survey: Participant expectations of the forum.

	SMM 2.1 Number of Survey Respondents (N=32)	SMM 2.1 Quotes
I will learn.	17	"Educational" (SMM 2.1 Survey #32)
No Answer	10	--
It will have science content.	5	"...I hope to learn more about nanotechnology in healthcare." (SMM 2.1 Survey #31)
It will be fun/interesting.	4	"...compelling…" (SMM 2.1 Survey #35)
Other	4	"...honest" (SMM 2.1 Survey #24)
I have no idea.	2	"I have no idea!..." (SMM 2.1 Survey #2)
It will have a presentation and discussion.	2	"Discussion groups after an initial presentation…" (SMM 2.1 Survey #4)
It will have a presentation.	2	"A presentation on nanotech by people in the field…" (SMM 2.1 Survey #8)
It will have a discussion.	1	"...sharing opinions about a real emerging potential healthcare technology" (SMM 2.1 Survey #29)
It will be challenging.	1	"challenging" (SMM 2.1 Survey #11)

Not only did visitors expect to learn and hear others' opinions at the forums, this was also what they valued most. The top two things that survey respondents reported they valued about the SMM 2.1 forum were the discussion with other participants (9 of 32 respondents) and the opportunity to learn (7 of 32 respondents). One visitor summed up this sentiment when he said that he most appreciated "the sure information and communicating in discussion groups" (SMM 2.1 Survey #5). Survey respondents (6 of 32) also highly valued the diverse opinions they heard during the forum. One participant explained the importance of this diversity when he said, "[I valued] engaging in intelligent discussion-- listening and understanding other viewpoints" (SMM 2.1 Survey #8). These data indicated that for visitors, both the expert presentations and the small group discussion were important parts of the forum. (See Table 17)

Table 17. Exit survey: Aspects of the forum participants valued most.

	SMM 2.1 Number of Survey Respondents (N=32)	SMM 2.1 Quotes
Discussing with others	9	"Discussing complex topics…" (SMM 2.1 Survey #6)
No answer	9	--
Opportunity to learn/access to information	7	'Learning about nanotechnology" (SMM 2.1 Survey #10)
Diverse range of viewpoints	6	"...understanding other viewpoints" (SMM 2.1 Survey #8)
The small groups discussion and the experts	2	"The sure information and communicating in discussion groups" (SMM 2.1 Survey #5)
Listening/access to experts	2	"Presentations very, very interesting and well delivered." (SMM 2.1 Survey #1)
Other	1	"The risks" (SMM 2.1 Survey #15)
Societal/ethical issues discussed	1	"Ethical implications of the application of nanotechnology" (SMM 2.1 Survey #12)
Meeting other participants	1	"Meeting new people…" (SMM 2.1 Survey #8)

Other stakeholders including the forum developers and speakers indicated that they also strongly valued the small group discussion and expert presentations. One of the speakers said that one of the reasons that she participates in the forums is because she believes in "importance of public understanding/engagement," and that she found it valuable "listening to public reactions/attitudes to nano scenarios" (SMM 2.1 speaker follow-up). One of the SMM 2.1 forum developers agreed that she was happy that participants were "engaged [and] gained some new knowledge of nano and thinking about ethical questions" (SMM 2.1 debrief). Another developer went on to say that the "presentations were right-on… [One speaker]'s [presentation] was basic, light, funny, not too much depth. [The other] was more academic but provided intellectual framework for societal implications" (SMM 2.1 debrief).

3. What aspects of the program appeared to contribute to the program's ability to achieve its stated goals and should therefore be included in future iterations of the forum?

Besides the value that stakeholders found in the presentations and small group discussion, these segments of the forum also contributed to the achievement of the program goals. One of the main goals of the forum was that visitors would learn about nanotechnology. Before the SMM 2.1 forum, less than a quarter of the survey respondents (22%) agreed that they had a strong understanding of nanotechnology. After the SMM 2.1 forum, almost all of the survey respondents (91%) agreed that they were more informed about nanotechnology. The types of information that the survey respondents said they learned were the uses/applications of nanotechnology (11 of 32) which includes "the medical aspects currently using nanotech" (SMM 2.1 Survey #11) and the science/ technology of nano (7 of 32) which includes "… the fact that nanoparticles exist in the environment and that the distinguishing factors are the ability to manipulate" (SMM 2.1 Survey #30). Many of the survey respondents (75%) also agreed that they were more informed about the risks and benefits of medical nanotechnologies. Most of this

material was presented to the participants through the expert presentations though some applications were also presented in the small group scenarios. (See Tables 18-20)

Table 18. Exit survey: Participant comfort with nanotechnology before the forum.[3]

	SMM 2.1 Mean (N=31)	% of Survey Respondents Choosing "Agree" or "Strongly Agree"
I have a strong understanding of nanotechnology.	2.1	22%
I feel comfortable expressing my opinions on nanotechnology.	2.5	53%
I have a strong opinion about releasing medical nanotechnologies to the public.	2.3	38%

Table 19. Exit survey: Participant feelings after the forum.[4]

	SMM 2.1 Mean (N=32)	% of Survey Respondents Choosing "Agree" or "Strongly Agree"
I enjoyed the experience.	3.7	100%
The experience matched my expectations.	3.0	75%
I felt comfortable expressing my opinions.	3.4	91%
I feel more informed about nanotechnology.	3.4	91%
I feel more informed about the risks and benefits of medical nanotechnologies.	3.1	75%
It was clear what we were supposed to do during the forum.	3.1	88%
The presentations were easy to understand.	3.4	100%
The discussion scenarios were easy to follow.	3.2	88%
We weighed the pros and cons of medical nanotechnologies during our discussion.	3.6	100%
A diverse range of viewpoints were represented in our small group discussion.	3.3	91%

[3] Participants were asked to rate these questions on a scale of 1 to 4 where 1 is "Strongly Disagree," 2 is "Disagree," 3 is "Agree," and 4 is "Strongly Agree."
[4] Participants were asked to rate these questions on a scale of 1 to 4 where 1 is "Strongly Disagree," 2 is "Disagree," 3 is "Agree," and 4 is "Strongly Agree."

Table 20. Exit survey: Things participants reported learning from the forum.

	SMM 2.1 Number of Survey Respondents (N=32)	SMM 2.1 Quotes
No answer	13	--
Uses of nanotechnology	11	"Varied uses of the technology" (SMM 2.1 Survey #26)
About science/technology of nano	7	"I learned many new things but the fact that nanoparticles exist in the environment and that the distinguishing factors are the ability to manipulate" (SMM 2.1 Survey #30)
About the risks of nano	2	"...The uncertainty of nano disposal." (SMM 2.1 Survey #6)
Other	2	"...web page of consumer products…" (SMM 2.1 Survey #13)
Societal aspects of nano	1	"...unknown implications create complex ethical question" (SMM 2.1 Survey #25)
About civic discourse/ public involvement	1	"...consensus is possible" (SMM 2.1 Survey #24)
About the complexity of the issue	1	"How difficult and complex the issues of nanotechnology appear to be…" (SMM 2.1 Survey #2)
Lots of information	1	"Everything nano" (SMM 2.1 Survey #28)
What others are thinking	1	"Other people's viewpoints" (SMM 2.1 Survey #27)

Other forum goals were specifically intended to be addressed during the small group discussion. One goal was to increase participant comfort discussing nanotechnology issues. Before the SMM 2.1 forum, just over half of the survey respondents (53%) agreed that they felt comfortable discussing their opinions about nanotechnology. After the SMM 2.1 forum, this number went up to 91% of survey respondents. The data indicate that SMM 2.1 survey respondents were considerably more comfortable expressing their opinions after participating in the forum. Not only did the survey respondents feel more comfortable expressing their opinions about nanotechnology after the forum, all of them agreed (100%) that they weighed the pros and cons of medical nanotechnologies, and almost all of them (91%) agreed that they heard a diverse range of viewpoints during the small group discussion. (See Tables 18 & 19)

Another goal for the small group discussion was that participants would consider the societal implications and consequences of nanotechnology. In order to learn whether participants were achieving this goal, the SMM 2.1 survey respondents were asked what topics discussed during the small group made them think differently about medical technologies. While a few of the SMM 2.1 survey respondents (3 of 32) said that nothing discussed during the small group made them think differently about medical nanotechnologies, many more (9 of 32) said environmental concerns like "waste and disposal of nanoparticles" (SMM 2.1 Survey #29) made them reconsider their stance on medical nanotechnologies. Other topics that made survey respondents reconsider their views included the risks and benefits of nanotechnologies (3 of 32 survey respondents) and human concerns (3 of 32 survey respondents) like "how this is going to affect our health in the long run" (SMM 2.1 Survey #31). (See Table 21)

Table 21. Exit survey: Topics participants said made them think differently about medical nanotechnologies.

	SMM 2.1 Number of Survey Respondents (N=32)	SMM 2.1 Quotes
No Answer	13	--
Environmental concerns/issues/risks	9	"Thinking through filtering and disposal issues and the unintended consequences" (SMM 2.1 Survey #30)
Risks and benefits in general	3	"-broader risk associated with nanotechnology…" (SMM 2.1 Survey #23)
Human concerns/ issues/ risks	3	"- risk vs. saving lives" (SMM 2.1 Survey #23)
None	3	"nothing of significance" (SMM 2.1 Survey #11)
Societal issues	2	"...cost/availability" (SMM 2.1 Survey #28)
Other	1	"The power of these particles. To be more positive about going forward faster." (SMM 2.1 Survey #24)
Regulation of nano	1	"World application other places are doing it without the same ethic leases" (SMM 2.1 Survey #5)
Applications produced through nanotechnology	1	"...medical applications, non medical applications…" (SMM 2.1 Survey #6)

These data show that visitors gained a lot from the expert presentations and the small group discussion. SMM 2.1 participants learned about the science of nanotechnology and applications of nanotechnology, especially in medicine, through the presentations. Visitors gained confidence in their ability to discuss their opinions about nanotechnology, weighed their own opinions and feelings, and heard a diversity of opinions through the small group discussion. These data indicated that experts and the small group discussion were leading to the achievement of many of the forum goals. However, the goals still needed some refinement.

4. How could the programmatic model be refined so that it better achieves the stated goals and objectives?

More survey respondents (100%) agreed that they enjoyed the NISE Net nanomedicine forum this time than those who agreed at the forum's previous implementation, MLS 2.1 (95%). (See Table 19) Nevertheless, there were some parts of the program that stakeholders thought needed to be changed. SMM 2.1 participants raised concerns about the expert presentations, question and answer periods, and small group scenarios. The forum developers and speakers raised concerns about the introduction, small group discussion, report out, and next steps.

At this forum, the speakers were each given about 10 minutes for their presentations and five minutes for questions and answers. SMM 2.1 participants were asked how they felt about the length of different parts of the forum including these two segments, and over half of the survey respondents (17 of 32) felt that the presentations were too short while fewer (14 of 32) felt that the presentations were the right length. When asked what changes would improve the forum, the most common response was changing the length of different segments of the forum (6 of 32). Almost all of these participants (5 of 6) wanted more time listening to the presentations. One visitor summed up participants' concerns when he said, "The subject is very complex, and the exercise was driven more by our experiences than by the substantive content of the

presentation. To truly influence knowledge, the presentation should be longer, and the material covered in greater detail" (SMM 2.1 Survey #32). Other survey respondents (3 of 32) wanted more time for the forum as a whole. This extra time could be used to accommodate the expert presentations. The survey respondents thought the length of the other program segments were fine though they were split over whether the question and answer period was too short (14 of 32) or the right length (14 of 32). In addition, a few participants (5 of 32) wanted the small group discussion shortened. These data indicate participants wanted more time added to the expert presentations while they thought that the amount of time spent on other forum segments could be left the same. (See Tables 22 & 23)

Table 22. Exit survey: Participant feelings about the time breakdown.

	SMM 2.1 Number of Survey Respondents choosing "Too Short"	SMM 2.1 Number of Survey Respondents choosing "Too Long"	SMM 2.1 Number of Survey Respondents choosing "Just Right"
Welcome/Introduction	1	0	29
The speaker presentations	17	0	14
The small group discussion	3	5	22
The question and answer period	14	0	14
The large group discussion	5	1	12

Table 23. Exit survey: Ways that participants say the forum could be improved.

	SMM 2.1 Number of Survey Respondents (N=32)	SMM 2.1 Quotes
No Answer	10	--
Change the amount of time spent on different segments of the program	6	"...To truly influence knowledge, the presentation should be longer, and the material covered in greater detail." (SMM 2.1 Survey #32)
Don't change a thing	4	"Found the session was very helpful. The Forum worked well." (SMM 2.1 Survey #23)
Change the overarching question	3	"Word the problem as a statement that we can agree or disagree with, not as a question." (SMM 2.1 Survey #6)
Make the program longer	3	"Make it longer" (SMM 2.1 Survey #5)
Other	1	"If you want to foster team/group discussions, help direct seating or assign seats." (SMM 2.1 Survey #16)
Invite a broader range of/or different experts	1	"more speakers" (SMM 2.1 Survey #17)
Improve the audio-visuals	1	"Improve the lighting for the screen-- very difficult to read" (SMM 2.1 Survey #13)
Provide information to the participants	1	"More information (if available)…" (SMM 2.1 Survey #31)
Start on time	1	"start on time" (SMM 2.1 Survey #7)
Change small group discussion scenarios	1	"clarify- more specific data scenarios, we made some assumptions" (SMM 2.1 Survey #22)
Change the content/topic	1	"More factual information" (SMM 2.1 Survey #18)

Another concern for stakeholders was the small group discussion scenarios. While some survey respondents (4 of 32) said no changes were needed for the forum, almost the same number of survey respondents (3 of 32) said they were concerned about the overarching question. One participant said, "Word the problem as a statement that we can agree or disagree with, not as a question" (SMM 2.1 Survey #6). Another participant said, "Clarify the central question" (SMM 2.1 Survey #4). Evaluators observing the small group discussion found that participants also had some problems with the second small group discussion scenario. Because this scenario mentions not just technologies used in the lab but also some that are used in the body, several participants were confused about the main topic of this scenario. Participants were also puzzled about the relationship between the overarching question and this scenario because the scenario was discussing use in the lab but the overarching question asked participants to consider release to the public (SMM 2.1 discussion debrief). (See Table 23 and 24)

These data indicated that components of the scenarios were a problem for visitors. To improve the second scenario, it was suggested that any reference to the use of nanotechnology in the body should be removed and use in the laboratory should be emphasized. In addition, it was suggested that changes to the overarching question would help visitors better understand the scenarios. Instead of talking about making nanotechnology available to the public, it was thought that it might make more sense to talk about making nanotechnology available for use. Because some visitors had a hard time figuring out how to vote on the overarching question, it was suggested that it might make more sense to visitors if they were asked to rate a statement. Suggestions for ways that the overarching question could be changed included the following:

- Rate your agreement with the following statement: "New nanotechnology applications in medicine should be made available *to the public* before we understand the possible risks."
- Rate your agreement with the following statement: "New nanotechnology applications in medicine should be made available *for use* before we understand the possible risks."
- Rate your agreement with the following statement: "New nanotechnology applications in medicine should be made available before we understand the possible risks."

Table 24. Ways participants voted for the overarching question: "Should new nanotechnology applications in medicine be made available to the public before we understand the potential risks?"

	SMM 2.1 Number of Participants choosing "Strongly Disagree"	SMM 2.1 Number of Participants choosing "Disagree"	SMM 2.1 Number of Participants choosing "Agree"	SMM 2.1 Number of Participants choosing "Strongly Agree"
Registration (N=29)	8	18	2	1
Scenario #1 (N=34)	10	14	9	1
Scenario #2 (N=34)	6	16	9	3
Scenario #3 (N=32)	3	12	14	3

Stakeholders also recognized some problems with the small group discussion instructions. The evaluators and forum developers found that many groups asked them whether they should vote before and after they discussed a scenario or only after. In addition, the discussion observation sheets collected showed that the discussion was sometimes unbalanced. At one of the tables observed by evaluators, one person had only two utterances while another participant had 78 utterances (SMM 2.1 discussion debrief). In order to lessen these issues, it was suggested that

the discussion ground rules be emphasized and made clear at the start of the discussion. Rules need to be stated that clarify to the group that everyone's opinions are valuable and that all points of view should be elicited. In addition, it was suggested that visitors start off the discussion with introductions and start each scenario discussion by going quickly around the table and saying how they would vote. The participants could then be told that they should not make their final vote until after the scenario discussion. In addition to stating these instructions before the discussion, it was suggested that they should be made available throughout the entire small group discussion either through a display of the rules at the front of the room or as a handout on the tables.

Other areas of concern for the forum developers were the introduction and report-out/next steps. The developers felt that the forum introduction, report-out, and next steps had problems because developers did not clearly explain to visitors why they should participate in the forum or the value of their participation. In order to lessen these problems, the forum developers suggested coming up with loose scripts for these forum segments (SMM 2.1 debrief). It was suggested that a script for the introduction would help to clarify the purpose of the forum for the museum and visitors. A script for the report-out and next steps would standardize the questions moderators ask visitors and allow developers to optimize the questions through evaluation.

The developers also discovered another problem with the report-out and next steps. They spent a lot of time creating graphs to represent how people voted on the overarching question after each of the scenarios, but when they went to present the results the graphs did not work. The developers felt it was valuable for visitors to see their votes and how they change, so they suggested creating a table displaying the vote counts instead of graphs.

5. What changes should be made to the program so that it becomes cheaper and easier for other museums to implement?

The SMM 2.1 forum developers felt that there was not much that they could have changed to make the forum cheaper. Registration was done through a Museum of Science online survey tool, so it was free. Staff preparation was not extensive as the developer had seen the previous MLS 2.1 forum run and been provided with those materials. In addition, not very much time had to be spent on marketing because registration filled up quickly. The forum developer estimated that she spent about 70 hours preparing for the forum. Though this did not feel like very much time to her, she felt that future iterations of the forum could be put together even more quickly and that some of the work could be passed on to part-time employees or interns. Despite the fact that forum developers thought the forum was cheap, there were two things they felt could be changed to make it even cheaper: food service and location. The developers said that it would have been cheaper for them to hold the forum off-site at a place like a community center, church, or school. They also felt that money was wasted on dessert since so much was left over. The forum developers suggested that next time they would order fewer desserts.

The forum developers had a few recommendations to help with the implementation of future forums. First of all, they recommended putting together an advisory committee of local nanotechnology experts to gain expertise on the subject. Additionally, they suggested meeting with the speakers beforehand to discuss with them what to expect at a forum and what level of information the audience needs. The forum developers also suggested sharing the forum scenarios with the speakers both to get feedback on the scenarios and to provide the speakers with the context of what participants would be talking about. This would allow the speakers to shape their presentations around the scenarios and overarching question.

6. How could the program be improved so that it better meets the needs of the key program stakeholders (including adult learners, museum educators, and nano-researchers)?

Information gathered from stakeholders indicated that there were a few areas where the nanomedicine forum could be improved so that it better meets the needs of stakeholders including marketing, flow of the program, and content of various forum segments.

It was felt that the marketing strategies needed to be changed in order to broaden the audience in terms of their familiarity with the institutions and science. Because so many participants were SMM members, they were already very familiar with the museum and had a strong interest in science. In order to reach out to people underrepresented in science, technology, engineering, and math (STEM), it is important to market to groups that work with minorities and people with disabilities. In order to ensure diverse perspectives, it was suggested that it is important to reach out to various groups that medical nanotechnology impacts including people working in research, people working in nano-related industries, and patients who may be impacted by medical nanotechnology.

One area of concern to participants was that they did not get enough time with the speakers. Though the SMM 2.1 forum lasted two hours, the forum speakers were only given 15 minutes each for their presentations including time for questions and answers. Many of the participants felt that the short length meant that they did not get to learn as much from the speakers as they would have liked, and some of them even suggested that they would not mind staying for a longer program. Therefore, it was suggested that the forum developers should consider giving each speaker more time (15 minutes or more) for their presentation plus five minutes for questions and answers while keeping the lengths of other forum segments the same. While this would lengthen the forum, it would give the participants more time to learn about and get comfortable with the topic of nanotechnology before the small group discussion.

Stakeholders also showed concern with the discussion scenarios and overarching question. Participants felt that the connection between the question and scenarios needed to be strengthened, and many of them seemed to be confused by the second scenario. To improve the overarching question, it was suggested that forum developers should change it from a question to a statement or consider modifying the question so that participants are considering the release of these technologies not just to the public. It was felt that instructions for voting on the overarching question and rules for the discussion should be made clear by the moderator before the discussion, but instructions and rules should also be placed in the front of the room or on tables during the discussion as a reference. Finally, any reference to use of nanotechnologies in the human body should be removed from the second scenario. It was felt that taking these steps could make the small group discussion more balanced and comfortable for visitors.

Lastly, it was felt that modifications should be made to the introduction, report-out, and next steps. Forum developers felt that the content of these sections were the weakest since they had not been standardized. Therefore, it was suggested that loose scripts should be written so that presenters explain the purpose of the forum, why participation is valuable, and what will happen with visitor feedback. Additionally, it was suggested that team members should come up with questions for the report-out that promote discussion among participants and allow visitors to reflect on their feelings about medical nanotechnologies. Creating scripts for these forum segments would make it easier for institutions inside and outside of NISE Net to implement the forum.

V. Exploratorium 2.1 and Museum of Science 2.1 Nanomedicine Forums Formative Evaluation Memo

The following summary provides an overview of the findings from the formative evaluation of two NISE Network nanomedicine forums. The forums took place at the Exploratorium on Tuesday, June 5, 2007 (identified as Explo 2.1), and at the Museum of Science on Monday, June 18, 2007 (identified as MOS 2.1). The findings from these two forums were presented together in this memo because there were only two weeks between the programs. Therefore, it was not possible to complete the Explo 2.1 forum memo before the MOS 2.1 forum was implemented. The forums were the third and fourth attempts at implementing the NISE Net nanomedicine forum which was implemented and formatively evaluated at all five NISE Net Forum institutions (Exploratorium, MLS, MOS, OMSI, and SMM) at least once during 2007.

The forum conducted at the Exploratorium (Explo 2.1) was marketed as "Nanotechnology in Health Care: Possibilities, Risks, and Benefits." The format of the event was similar to many previous NISE Net forums (e.g. "Risks, Benefits, and Who Decides?" and "Nanomedicine in Healthcare"). The event was two hours long and involved two speakers, questions and answers with the audience, a discussion, and a report-out. The first speaker, an assistant professor in chemistry at Portland State University, talked about how nanotechnology covers a range of scientific disciplines, and that nanotechnology is a new term for science that has existed for a while. A professor studying science, technology, and public policy at the Humphrey Institute discussed medical nanotechnology applications, ethical frameworks for thinking about new technologies, and how these frameworks may relate to nanotechnology. Following the two presentations, the audience was able to ask the experts clarifying questions. Then, the audience discussed three scenarios meant to cause them to consider the overarching statement: *New nanotechnology applications in medicine should be made available for use before we understand the possible risks.* The scenarios used were the same that were used during the first nanomedicine forum (MLS 2.1) at the Museum of Life and Science. They increased in potential risk from topical use in sunscreen to use in the lab for diagnostic purposes to use in the human body as a treatment for cancer and other diseases. Audience members voted on the overarching statement after each scenario, and they discussed their votes and thoughts as a large group during the report-out.

The forum conducted at the Museum of Science (MOS 2.1) was marketed as "Nanomedicine: Nanotechnology in Health and Healing." The format of this event was also like the other NISE Net nanomedicine forums that had already been presented (MLS 2.1 & SMM 2.1). The MOS 2.1 event was two hours long and involved two speakers, questions and answers with the audience, a small group discussion, and a report-out. The first speaker, the founder and chief scientific officer of a Massachusetts biotechnology company, talked about how materials act differently at the nanoscale and discussed the science behind medicines. The other speaker, from the Harvard Center for Environmental Health at the Harvard School of Public Health, discussed the potential effects of inhaled nanoparticles on the lungs and some risks and benefits of nanotechnology. Following the two presentations, the audience was able to ask the experts clarifying questions. Then, the audience discussed three scenarios meant to cause them to consider the overarching statement: *New nanotechnology applications in medicine should be made available for use before we understand the possible risks.* The scenarios were modified versions of those used at the other nanomedicine forums (MLS 2.1, SMM 2.1, & Explo 2.1). The historical contexts were removed from the scenarios, and many of the nanotechnology applications were changed. However, the scenarios still increased in potential risk from topical use in sunscreen to use in the lab for diagnostic purposes to use in the human body as a treatment for cancer and to

enhance medical imaging. Audience members voted on the overarching statement after each scenario, and they discussed their votes and thoughts as a large group during the report-out.

1. What marketing methods were effective at attracting attendees to the program?

Both the Exploratorium and the Museum of Science marketed the forums through a series of sources including institution email lists, their websites, and potentially interested organizations such as cancer support groups and science blogs. In addition, some Museum of Science registrants were recruited as part of a National Science Foundation (NSF) site visit involving scientists and informal science education professionals. Many attending registrants heard about the events through a museum email (Explo 2.1: 50%; MOS 2.1: 39%) which was the way that the institutions contacted people who were on both internal lists and from outside organizations. However, other attending registrants heard about the forums through different sources. Some attending registrants heard about the Explo 2.1 event through a friend or family member (28%), and some attending registrants heard about the MOS 2.1 event through the museum website (27%). (See Table 25)

The institutions were most successful at recruiting participants from a pool of current members and people familiar with the forum institutions. Despite the fact that both institutions attempted to recruit participants through a number of sources, many of the attending registrants were museum members (Explo 2.1: 50%; MOS 2.1: 39%). These percentages match the percentages of attendees who heard about the forums through email, but further inspections shows that not all the attendees who reported they heard about the events through email were members. Still, most attendees had been to the institutions recently. At least half of the survey respondents (Explo 2.1: 50%; MOS 2.1: 61%) had been to the institutions in the past three months and most (Explo 2.1: 80%; MOS 2.1: 77%) had been to the institutions within the last year. However, a few people who came to each of the forums (Explo 2.1: 10%; MOS 2.1: 9%) said that they had never been to the institution before. At the MOS 2.1 forum, many of these participants probably came as a part of the NSF site visit. It was also possible that these new visitors came to the forums as a result of marketing to outside groups. Program organizers felt that marketing to an audience outside of museum lists allowed them to reach out to diverse audiences. However, they recognized that "when it went to the member newsletter there was a big jump [in the registration]" (Explo 2.1 debrief), and that even though MOS "marketed it to hospitals and people with disabilities, and we had ASL interpreters, no one needed it" (MOS 2.1 debrief). (See Tables 25 & 26)

Table 25. Registration survey: Demographic data.

	Explo 2.1 Number of Registrants (N=18)	%	MOS 2.1 Number of Registrants (N=33)	%
Relationship to forum topic				
Museum member	9	50%	13	39%
Museum volunteer/staff	2	11%	1	3%
Educator/Teacher	3	17%	7	21%
Personally interested	9	50%	14	42%
Researcher/Student studying nano or a related topic	1	6%	3	9%
Researcher/Student studying science	1	6%	3	9%
Community/Advocacy interest group member	0	0%	0	0%
NISE Network Affiliate	0	0%	3	9%
Other	2	11%	4	12%
No Answer	0	0%	1	3%
How heard about program				
From the museum website	2	11%	9	27%
From Craigs List	0	0%	0	0%
From another website	0	0%	0	0%
From a museum email	9	50%	13	39%
From another email	0	0%	0	0%
From a club/organization	0	0%	1	3%
Through a friend/family member	5	28%	3	9%
From a paper mailing	0	0%	3	9%
Through my work	1	6%	4	12%
Through my college/university	2	11%	--	--
From print media	0	0%	1	3%
Other	0	0%	5	15%
No Answer	0	0%	0	0%
Temporary or permanent disabilities				
No Disability	15	83%	32	97%
Mobility	0	0%	0	0%
Cognitive	0	0%	0	0%
Visual	0	0%	0	0%
Auditory	1	6%	0	0%
Learning	0	0%	0	0%
Other	0	0%	0	0%
No Answer	2	11%	1	3%

Table 26. Exit survey: Demographic data.

	Explo 2.1 Number of Survey Respondents (N=30)	%	MOS 2.1 Number of Survey Respondents (N=56)	%
Gender				
Male	16	53%	20	36%
Female	14	47%	33	59%
No Answer	0	0%	3	5%
Age				
<18	3	10%	2	4%
18-24	2	7%	5	9%
25-34	5	17%	8	14%
35-44	9	30%	10	18%
45-54	4	13%	9	16%
55-64	5	17%	12	21%
65-74	0	0%	4	7%
75-84	2	7%	3	5%
85+	0	0%	0	0%
No Answer	0	0%	3	5%
Race/ethnicity (Check all that apply)				
African American	1	3%	0	0%
American Indian/Alaskan Native	0	0%	1	2%
Asian American	2	7%	2	4%
Hispanic/Latino	1	3%	1	2%
White, not of Hispanic origin	24	80%	47	84%
Other	2	7%	4	7%
No Answer	1	3%	3	5%
Last visit to museum				
Never	3	10%	5	9%
Within the last three months	15	50%	34	61%
3 - 6 months ago	4	13%	9	16%
6 months to 1 year ago	5	17%	0	0%
1 - 2 years ago	2	7%	2	4%
2 - 5 years ago	0	0%	0	0%
5 - 10 years ago	0	0%	2	4%
More than 10 years ago	1	3%	2	4%
Not sure	0	0%	0	0%
No Answer	0	0%	2	4%
Key reasons you decided to attend (Check all that apply)				
To meet people, socialize	2	7%	4	7%
Professional networking	3	10%	9	16%
To learn about nanotechnology	26	87%	43	77%
To learn about medical technology	13	43%	30	54%
To hear others' perspectives	11	37%	25	45%
To share my ideas with others	1	3%	8	14%
To get involved at the Museum	5	17%	7	13%
Sounds like fun	13	43%	15	27%
Other	0	0%	6	11%
No Answer	1	3%	2	4%

The demographics of the people who came to the two forums were similar, in most ways, to the demographics observed at the previous "Risks, Benefits, and Who Decides?" and "Nanomedicine in Healthcare" forums. Many people who came reported that their relationship to the topic was that they were personally interested (Explo 2.1: 50%; MOS 2.1: 42%). In addition, very few had a disability (Explo 2.1: 6%; MOS 2.1: 0%) and most were between the ages of 35 and 64 (Explo 2.1: 60%; MOS 2.1: 55%). Additionally, at the Exploratorium, over half of the survey respondents were men (53%). The percentages of racial and ethnic minorities were also low just like the previous "Risks, Benefits, and Who Decides?" and "Nanomedicine in Healthcare" forums. Most of the survey respondents were White (Explo 2.1: 80%; MOS 2.1: 84%) while only a few were African American (Explo 2.1: 3%; MOS 2.1: 0%), Hispanic (Explo 2.1: 3%; MOS 2.1: 2%), Asian American (Explo 2.1: 7%; MOS 2.1: 4%), American Indian/Alaskan Native (Explo 2.1: 0%; MOS 2.1: 2%) or other race/ethnicity (Explo 2.1: 7%; MOS 2.1: 7%). (See Tables 25 & 26)

Despite these similarities with other previous forum audiences, there were ways that these audiences were different. At the MOS 2.1 forum, there were more teacher/educators (21% attending registrants) than seen at other nanomedicine forums (SMM 2.1 & Explo 2.1) except MLS 2.1, and over half the survey respondents were female (59%). One of the reasons for these differences may be the number of female participants and informal science educators attending as a part of the NSF site visit. At the Exploratorium, the percentage of survey respondents younger than 24 (17%) was similar to the levels seen at MLS 2.1 (20%). Last year, the percentage of attendees at the MLS 1.1 (13%) and Explo 1.1 (10%) forums under the age of 24 were also higher than other forum institutions (MOS 1.1: 5%; SMM 1.1: 2%). This seems to indicate that either the adult audiences at MLS and Exploratorium are younger than the adult audiences found at the other forum institutions, or that the marketing used by these institutions appeals to younger audiences. (See Tables 25 & 26)

These data signified that institutional email lists were an effective way to attract people to the forum events, but that reaching out to outside organizations might be more difficult. Institutional lists work well because they reach people already familiar with the institutions and interested in the content they provide. However, it was felt that it is more difficult to market to groups not familiar with the institutions even if their purpose matches the forum topic in some way because their members may not yet be familiar with the types of programming provided by the NISE Net institutions. It was suggested that the NISE Net Forum Team needed to continue to test ways to reach out to members of the community who are not actively involved with their organizations (as defined by frequency of visitation and membership).

2. What aspects of the program were valued by the key stakeholders and should therefore be included in future iterations of the forum?

As with the other "Risks, Benefits, and Who Decides?" and "Nanomedicine in Healthcare" forums, the aspects of the forums that stakeholders valued most were the expert presentations and the small group discussion. Before the Explo 2.1 and MOS 2.1 forums, most of the survey respondents said that the key reason they attended the forum was to learn about nanotechnology (Explo 2.1: 87%; MOS 2.1: 77%). Many also said that the key reason they attended was to learn about medical technologies (Explo 2.1: 43%; MOS 2.1: 54%). In addition, on an open-ended question, the most common thing that survey respondents said they expected from the events was to learn (Explo 2.1: 12 of 30; MOS 2.1: 24 of 56). One participant said, "If it is anything like previous lectures I have attended here at the Exploratorium, I expect it to be very informative!" (Explo 2.1 Survey #23). Some MOS 2.1 survey respondents (12 of 56) expressed in their responses to this question that they also expected science content. One

participant said, "[I expect] some understanding of nanotechnology" (MOS 2.1 Survey #17). These data gave evidence that most survey respondents expected the forum to involve learning about nanotechnology. However, some survey respondents expected discussion as well. A key reason that some people came to the forums was to hear others' perspectives (Explo 2.1: 37%; MOS 2.1: 45%). Additionally, more MOS 2.1 survey respondents (14%) than those at the other forum institutions said that a key reason they came was to share their ideas with others. Even though these percentages are small they suggest that some visitors knew that they were not just going to be able to learn about nanotechnology but also discuss it. (See Tables 26 & 27)

Table 27. Exit survey: Participant expectations of the forum.

	Explo 2.1 Number of Survey Respondents (N=30)	MOS 2.1 Number of Survey Respondents (N=56)	MOS 2.1 and Explo 2.1 Quotes
I will learn.	12	24	"Quite informative hopefully…" (Explo 2.1 Survey #1)
No Answer	8	19	--
It will have science content.	3	12	"...the topic of nanotech in heath…" (MOS 2.1 Survey #48)
It will be fun/interesting.	4	11	"fun-educational" (Explo 2.1 Survey #20)
It will have a discussion.	2	4	"thoughtful discussion" (Explo 2.1 Survey #2)
I have no idea.	6	3	"...No idea." (MOS 2.1 Survey #41)
Other	2	3	"...I'm hoping it will be cordial, academic, and not terribly emotional." (MOS 2.1 Survey #48)
It will be intellectually stimulating.	1	2	"...intellectually stimulating." (MOS 2.1 Survey #11)
It will have societal impact content.	0	2	"...how to use it rightly." (MOS 2.1 Survey #30)
It will have a presentation.	3	1	"I expect to hear an informative talk…" (Explo 2.1 Survey #17)
It will include interaction.	2	1	"conversations w/ scientists; an open question session" (Explo 2.1 Survey #19)
It will have a presentation and discussion.	1	1	"I thought it was a lecture but I see we are in breakout tables so I am expecting it will be like a discussion?..." (MOS 2.1 Survey #41)
I got misinformation.	0	1	"sounds like a court jury, or a debate" (MOS 2.1 Survey #42)
It will be challenging/confusing.	1	0	"...I'm somewhat intimidated but intrigued/open." (Explo 2.1 Survey #6)

A majority of survey respondents did not expect the small group discussion before the event; however, they ended up valuing the discussion as much or more than learning about nanotechnology after their participation. At the MOS 2.1 forum, the survey respondents were most likely to say they valued the diverse range of opinions they heard (14 of 56) and discussing

nanotechnology with others (12 of 56). One participant said, "[I valued the] opportunity to discuss and debate various perspectives" (MOS 2.1 Survey #16). A smaller number of MOS 2.1 survey respondents said they valued the opportunity to learn (11 of 56). About the same number of survey respondents at the Exploratorium valued the opportunity to learn (7 of 30) as the small group discussion (6 of 30 survey respondents). One Explo 2.1 participant summed up the importance of learning and the discussion when he said, "[I valued having] a free opportunity to learn about and discuss something outside my normal realm of consciousness" (Explo 2.1 Survey #8). (See Table 28)

Table 28. Exit survey: Aspects of the forum participants valued most.

	Explo 2.1 Number of Survey Respondents (N=30)	MOS 2.1 Number of Survey Respondents (N=56)	MOS 2.1 and Explo 2.1 Quotes
Diverse range of viewpoints	4	14	"Hearing other opinions…" (MOS 2.1 Survey #39)
No answer	12	13	--
Discussing with others	6	12	"...discuss something outside my normal realm of consciousness" (Explo 2.1 Survey #8)
Opportunity to learn/access to information	7	11	"...gaining new knowledge" (MOS 2.1 Survey #39)
Listening/access to experts	1	7	"The speaker's talks." (MOS 2.1 #43)
The topic of nanotechnology	3	4	"...the scientific and policy perspectives on nanotechnology…" (Explo 2.1 Survey #18)
Other	2	3	"... The people at my table were thoughtful and intelligent and knowledgeable in the medical research arena." (MOS 2.1 Survey #20)
The small groups discussion and the experts	1	2	"I liked the presentation and discussion format." (MOS 2.1 Survey #24)
Meeting other participants	0	2	"Meeting with several people at my table (#3) who were very sharp." (MOS 2.1 Survey #22)
Societal/ethical issues discussed	1	1	"Ethical issues which arose & were discussed" (Explo 2.1 Survey #30)
The discussion scenarios	0	1	"I liked the scenarios to think about for myself." (MOS 2.1 Survey #51)
The format	3	0	"... I also value tremendously that thought that went into making this accessible, engaging, and participatory. Bravo!!!" (Explo 2.1 Survey #6)

Other stakeholders, including program developers and speakers, also found the most value in the discussion and presentations. To the forum speakers, it was important to teach the public about nanotechnology through their presentations. One of the Explo 2.1 speakers said, "It is important for scientists, engineers, and other academic experts to engage with the public on

issues associated with nanotechnology. I feel that my work can inform public conversations about the ELSI issues associated with nano" (Explo 2.1 speaker follow-up). The other Explo 2.1 speaker felt it was important to share his perspective as well as learn the perspective of the participants. He said, "[It was important to me] to learn from the audience what their concerns were [and] to convey the perspective of a scientist that works daily with nanomaterials" (Explo 2.1 speaker follow-up). While the speakers seemed to derive the greatest value from being able to educate the public, the program developers felt that the participant discussion lent the most value to the forum. One of the MOS 2.1 team members said, "An indicator of success was the fact that conversation seemed lively. People brought their personal values [to the discussion]" (MOS 2.1 debrief). Another team member said, "With these scenarios, there is plenty to discuss and a lot of context… At the table I was sitting at they had an easy time relating to the topic" (Explo 2.1 debrief). The speakers viewed themselves as educators, so they found the most value in this role. The program developers were most concerned with the discussion so they focused their attention on this forum segment. As the forums continue, it was suggested that it will be important for the program developers to understand the presenters' reasons for participating and also discuss their goals for the presenters if they want them to think beyond their role as experts and expand it to include themselves as receivers of information from the public.

3. What aspects of the program appeared to contribute to the program's ability to achieve its stated goals and should therefore be included in future iterations of the forum?

The presentations were not only valuable because stakeholders valued them but also because they contributed to the achievement of the forums' goals. One forum learning goal was that visitors would have increased knowledge of nanoscale science and technology. However, before the Explo 2.1 and MOS 2.1 forums, a higher percentage of survey respondents (Explo 2.1: 30%; MOS 2.1: 41%) than participants in the previous nanomedicine forums (MLS 2.1: 15%; SMM 2.1: 22%) agreed that they had a strong understanding of nanotechnology. In addition, a higher percentage of MOS 2.1 survey respondents (45%) agreed that they had a strong opinion about the release of medical nanotechnologies to the public. It was unknown why Explo 2.1 respondents had a greater understanding of nanotechnology, but it was possible that the MOS 2.1 participants had a greater understanding because many of those who came for the NSF site visit were familiar with nanotechnology. (See Table 29)

Table 29. Exit survey: Participant comfort with nanotechnology before the forum.[5]

	Explo 2.1 Mean (N=29)	% of Survey Respondents Choosing "Agree" or "Strongly Agree" (N=30)	MOS 2.1 Mean	% of Survey Respondents Choosing "Agree" or "Strongly Agree" (N=56)
I have a strong understanding of nanotechnology.[6]	2.2	30%	2.3	41%
I feel comfortable expressing my opinions on nanotechnology.[7]	2.4	50%	2.7	68%
I have a strong opinion about releasing medical nanotechnologies to the public.[8]	2.2	23%	2.4	45%

After the forums, the mean rating and percentage of survey respondents who agreed they felt more informed about nanotechnology were low (MOS 2.1: M=3.1, % ≥ "agree" = 77%; Explo 2.1: M=3.2, % ≥ "agree" = 67%) compared to the previous nanomedicine forums (SMM 2.1: M=3.4, % ≥ "agree" = 91%; MLS: M=3.2, % ≥ "agree" = 90%). It should be noted that a number of Explo 2.1 and MOS 2.1 visitors did not answer this question making the percentage of total respondents who agreed with it lower than the other institutions which had close to a 100% response rate. However, even when the non-respondents are removed, the percentages of people who "agreed" or "strongly agreed" that they felt more informed about nanotechnology (MOS 2.1: 88%; Explo 2.1: 87%) were still low compared to the other institutions.

Despite the fact that people felt less informed about nanotechnology, the MOS 2.1 and Explo 2.1 survey respondents (Explo 2.1: M=3.0, % ≥ "agree" = 57%; MOS 2.1: M=3.0, % ≥ "agree" = 70%) felt about as informed about the risks and benefits of medical nanotechnologies as did previous respondents (MLS 2.1: M=3.1, % ≥ "agree" = 85%; SMM 2.1: M=3.1, % ≥ "agree" = 75%). It was possible that Explo 2.1 and MOS 2.1 survey respondents generally felt less informed about nanotechnology issues than other participants after the forums because they already had a high understanding of nanotechnology. Two Explo 2.1 evaluators noted that many participants at the tables contained people working in the health industry (Explo 2.1 discussion debrief). At the Museum of Science, many attending registrants reported they were science researchers or students (27%) or NISE Network affiliates (9%). Another reason fewer survey respondents reported they felt more informed might have been the content of the expert presentations. (See Tables 25 & 30)

[5] Participants were asked to rate these questions on a scale of 1 to 4 where 1 is "Strongly Disagree," 2 is "Disagree," 3 is "Agree," and 4 is "Strongly Agree."
[6] MOS 2.1 Mean N=53
[7] MOS 2.1 Mean N=52
[8] Explo 2.1 Mean N=21, MOS 2.1 Mean N=51

Table 30. Exit survey: Participant feelings after the forum.[9]

	Explo 2.1 Mean (N=24)	% of Survey Respondents Choosing "Agree" or "Strongly Agree" (N=30)	MOS 2.1 Mean (N=49)	% of Survey Respondents Choosing "Agree" or "Strongly Agree" (N=56)
I enjoyed the experience.[10]	3.5	77%	3.5	82%
The experience matched my expectations.[11]	3.0	60%	3.1	77%
I felt comfortable expressing my opinions.[12]	3.6	70%	3.4	84%
I feel more informed about nanotechnology.[13]	3.2	67%	3.1	77%
I feel more informed about the risks and benefits of medical nanotechnologies.	3.0	57%	3.0	70%
It was clear what we were supposed to do during the forum.[14]	3.0	70%	3.2	82%
The presentations were easy to understand.[15]	3.3	73%	2.9	70%
The discussion scenarios were easy to follow.	3.2	67%	3.0	70%
We weighed the pros and cons of medical nanotechnologies during our discussion.	3.5	80%	3.2	84%
A diverse range of viewpoints were represented in our small group discussion.[16]	3.1	63%	3.2	82%

Even though some participants at the Explo 2.1 and MOS 2.1 forums reported that they were familiar with nanotechnology and did not feel more informed as a result of the forum, they still reported specific items that they learned from the events in answers to the open-ended question on the survey. The most common response given by survey respondents at both forums was that they learned about the science and technology of nano (Explo 2.1: 6 of 30; MOS 2.1: 13 of 56). One MOS 2.1 respondent said, "[I learned the] affects of nanotech on environment and body" (MOS 2.1 Survey #25). Other visitors said that they learned about specific nanotechnology applications (Explo 2.1: 6 of 30; MOS 2.1: 12 of 56). One Explo 2.1 participant replied, "[I learned about] some of the specific applications of nanomolecules in both cosmetics and medicine" (Explo 2.1 Survey #19). (See Table 31)

[9] Participants were asked to rate these questions on a scale of 1 to 4 where 1 is "Strongly Disagree," 2 is "Disagree," 3 is "Agree," and 4 is "Strongly Agree."
[10] MOS 2.1 Mean N=51
[11] Explo 2.1 Mean N=23, MOS 2.1 Mean N=50
[12] Explo 2.1 Mean N=22, MOS 2.1 Mean N=50
[13] Explo 2.1 Mean N=23
[14] MOS 2.1 Mean N=50
[15] MOS 2.1 Mean N=51
[16] Explo 2.1 Mean N=23, MOS 2.1 Mean N=51

Table 31. Exit survey: Things participants reported learning from the forum.

	Explo 2.1 Number of Survey Respondents (N=30)	MOS 2.1 Number of Survey Respondents (N=56)	MOS 2.1 and Explo 2.1 Quotes
No answer	13	21	--
About science/technology of nano	6	13	"Specific details about gold nanobars" (Explo 2.1 Survey #24)
Uses of nanotechnology	6	12	"I learned more about drug delivery systems that I was hoping to know." (MOS 2.1 Survey #35)
About the risks of nano	3	6	"...what some of the concerns are." (Explo 2.1 Survey #11)
What others are thinking	2	3	"People are very concerned about hazards of nanotechnology - without much scientific basis." (MOS 2.1 Survey #52)
Lots of information	1	3	"Everything I heard was new" (Explo 2.1 Survey #6)
Significance of nanotechnology	1	3	"...Nanotechnology is more well known than I expected." (MOS 2.1 Survey #7)
Other	0	3	"I did not know much about the topic before the presentation." (MOS 2.1 Survey #30)
Societal aspects of nano	2	2	"...how nanotechnology is affecting each person's life in both directly and indirectly." (MOS 2.1 Survey #19)
Regulations and policies of nanotechnology	1	1	"I learned about the regulatory procedures…" (Explo 2.1 Survey #18)
About the complexity of the issue	0	1	"the complex" (MOS 2.1 Survey #18)
Nothing	0	1	"Nothing" (MOS 2.1 Survey #27)
About civic discourse/public involvement	1	0	"...ways to frame ethical discussions" (Explo 2.1 Survey #2)

Other forum goals were specifically intended to be addressed during the small group discussion. One goal was to increase participants' comfort discussing nanotechnology. Before the forum, only half of the Explo 2.1 survey respondents said they felt comfortable expressing their opinions on nanotechnology (M=2.4, % ≥ "agree" = 50%). After the event, these survey respondents reported the highest average rating of comfort (M=3.6, % ≥ "agree" = 70%) of all the "Risks, Benefits, and Who Decides?" and "Nanomedicine in Healthcare" forums conducted as of June 2007. MOS 2.1 had the highest mean rating and percent of survey respondents that agreed that they felt comfortable expressing their nanotechnology opinions before the forum (M=2.7, % ≥ "agree" = 68%). Nonetheless, these survey respondents also felt more comfortable expressing their opinions after the forum (M=3.4, % ≥ "agree" = 84%). Furthermore, the survey respondents at both the Explo 2.1 and MOS 2.1 forums agreed that they weighed the pros and cons of medical nanotechnologies (Explo 2.1: M=3.5, % ≥ "agree" = 80%; MOS 2.1: M=3.2, % ≥ "agree" = 84%) and heard diverse opinions (Explo 2.1: M=3.1, % ≥ "agree" = 63%; MOS 2.1: M=3.2, % ≥ "agree" = 82%) during their small group discussion. The percent of Explo 2.1 survey respondents who agreed they heard a diversity of opinions was low because seven people did not

answer the question. However, when examining only those who responded to this question, the percent of Explo 2.1 respondents (83%) who said they heard a diverse range of opinions at the forum increased. (See Tables 29 & 30)

Another goal for the small group discussion was that visitors would discuss the societal implications and consequences of nanotechnology. In order to gauge this goal, visitors were asked what issues raised during the small group discussion made them think differently about medical nanotechnologies. Some participants in both of the forums said that nothing made them think differently about medical nanotechnologies (Explo 2.1: 3 of 30; MOS 2.1: 4 of 56). However, other Explo 2.1 survey respondents (4 of 30) said that health care issues like "the availability of information gained through screening using medical nanotechnology methods and the discrimination issues that can result" (Explo 2.1 Survey #1) made them reconsider their view, and some MOS 2.1 survey respondents said environmental issues and concerns (6 of 56) like "disposal issues" (MOS 2.1 Survey #26) or human issues and concerns (5 of 56) such as the "potential of nanoparticles to aggregate in the body" (MOS 2.1 Survey #52) made them re-think their position on medical nanotechnologies. (See Table 32)

Table 32. Exit survey: Topics participants said made them think differently about medical nanotechnologies.

	Explo 2.1 Number of Survey Respondents (N=30)	MOS 2.1 Number of Survey Respondents (N=56)	MOS 2.1 Quotes
No Answer	13	28	--
Environmental concerns/issues/risks	1	6	"always worry re: waste, breakdown of product" (Explo 2.1 Survey #13)
Human concerns/issues/risks	1	5	"...that nanoparticles can get into cells" (MOS 2.1 Survey #36)
Health care issues	4	4	"...Should we proceed to clinical trials sooner?" (MOS 2.1 Survey #19)
Risks and benefits in general	3	4	"risks" (Explo 2.1 Survey #20)
None	3	4	"neither" (MOS 2.1 Survey #13)
Societal issues	2	4	"...social issues" (Explo 2.1 Survey #7)
Regulation of nano	1	4	"The impact of government regulation on new technologies." (MOS 2.1 Survey #55)
Applications produced through nanotechnology	3	3	"I hadn't considered less severe cases such as sunscreen." (Explo 2.1 Survey #18)
One of the scenarios	0	3	"Scenario 2" (MOS 2.1 Survey #7)
Other	2	2	"Research medical solutions more than previously have been done." (MOS 2.1 Survey #25)

These data illustrated that there were many different ways that people could learn from the forums. If participants were familiar with nanotechnology, they might still learn about the societal and ethical implications of the technology. If they were already informed about the potential risks and benefits of nanotechnology, they could still learn about the viewpoints of

others. In other words, there were a range of opportunities for people to learn from the NISE Net forums.

4. How could the programmatic model be refined so that it better achieved the stated goals and objectives?

As with the previous nanomedicine forums, the mean rating of participant enjoyment was high (Explo 2.1: M=3.5; MOS 2.1: M=3.5). However, program stakeholders indicated that there were some areas of the programmatic model that could be refined. The areas of concern to the participants, program developers, and speakers were the speaker presentations, the discussion scenarios, and the overarching statement. Of additional concern to the participants was the length of the program segments, especially the question and answer period. Of additional concern to the program developers was the introduction to forums, the discussion instructions, and the report-out. (See Table 30)

One of the parts of the forum of most concern to the participants was their interactions with the experts. At the Explo 2.1 forum, participants were given 50 minutes to interact with the experts. Each speaker gave a 20 minute presentation, and there was a 10 minute question and answer period at the end. Almost all the Explo 2.1 survey respondents (18 of 22) said the ten minutes given to them for the question and answer period was just the right amount of time. Additionally, most said that the presentations were easy to understand (Explo 2.1: M=3.3, % ≥ "agree" = 73%). The percentage of Explo 2.1 survey respondents who agreed that the presentations were easy to understand was artificially low because a number of people did not answer the question. However, for question respondents alone, almost all (92%) agreed that the presentations were easy to understand. At the MOS 2.1 forum, participants were given 45 minutes to interact with the experts. The speakers were each scheduled to talk for 15 minutes though each took 20 minutes. Additionally, fifteen minutes were scheduled for questions and answers, but this segment was cut down to five minutes. The MOS 2.1 participants were less satisfied with the expert presentations than the Explo 2.1 participants. Fewer MOS 2.1 survey respondents (M=2.9, % ≥ "agree" = 70%) reported that they understood the expert presentations. In addition, one of the changes MOS 2.1 survey respondents (6 of 56) thought should be made was to have a broader range of/or different experts. The MOS 2.1 survey respondents wanted speakers who could "…speak more directly to general audiences…" (MOS 2.1 Survey #46) and "…connect [their content] with our discussions…" (MOS 2.1 Survey #29). In addition to these issues with the content, many MOS 2.1 survey respondents (25 of 47) said the five minutes they had to ask questions of the experts was too short. (See Tables 30, 33, & 34)

Table 33. Exit survey: Exploratorium participant feelings about the time breakdown.

	Explo 2.1 Number of Survey Respondents choosing "Too Short"	Explo 2.1 Number of Survey Respondents choosing "Too Long"	Explo 2.1 Number of Survey Respondents choosing "Just Right"
Welcome/Introduction (N=22)	2	3	17
The speaker presentations (N=21)	9	1	11
The small group discussion (N=22)	2	4	16
The question and answer period (N=22)	4	0	18
The large group discussion (N=17)	2	1	14

Table 34. Exit survey: Museum of Science participant feelings about the time breakdown.

	MOS 2.1 Number of Survey Respondents choosing "Too Short"	MOS 2.1 Number of Survey Respondents choosing "Too Long"	MOS 2.1 Number of Survey Respondents choosing "Just Right"
Welcome/Introduction (N=47)	3	2	42
The speaker presentations (N=48)	12	6	30
The small group discussion (N=48)	6	4	38
The question and answer period (N=47)	25	1	21
The large group discussion (N=39)	5	7	27

The program developers and speakers from the MOS 2.1 forum agreed that there were problems with the content of the presentations. One speaker said, "I suggest that there should be a teleconference between Museum of Science staff and the two speakers. Things went very well, but the two speaker presentations might have been better coordinated if there had been a chance for the two speakers to talk in advance" (MOS 2.1 speaker follow-up). The Museum of Science program developer agreed that the presentations could have been better coordinated, but she was also worried about the level of content provided by the speakers (MOS 2.1 debrief). One of the Exploratorium program developers was also worried that the participants were not getting the right information from the presentations. She said, "With respect to the speakers, I was concerned that there wasn't enough about what a nanometer is" (Explo 2.1 debrief). These comments showed that some work still needed to be done in coordinating the content given by the speakers and making sure necessary content was covered. In addition to talking to the individual speakers about content, developers suggested producing and showing certain nanotechnology information through a video or museum educator presentation. This would ensure that visitors are receiving a baseline of information and allow the experts to focus on content related to their interests and areas of research.

Table 35. Exit survey: Ways that participants say the forum could be improved.

	Explo 2.1 Number of Survey Respondents (N=30)	MOS 2.1 Number of Survey Respondents (N=56)	MOS 2.1 and Explo 2.1 Quotes
No Answer	16	19	--
Change the overarching question	4	6	"Depends on what you are going for. If you are ok with a rich scenario discussion followed by a much more restricted limited issue that is voted on this structure works- but it doesn't capture the scenario discussion as a vote." (Explo 2.1 Survey #4)
Change the food service	2	6	"In the past events, there had something to eat which was good coming right from work and going 'til 9. I got hungry…" (MOS 2.1 Survey #51)
Invite a broader range of/or different experts	0	6	"Coach the presenters to speak more directly to general audiences…" (MOS 2.1 Survey #46)
Improve the conditions of the location (lighting, etc.)	0	6	"better lighting, presentations hard to see from all tables" (MOS 2.1 Survey #26)
Change either the overarching question or scenarios (can't tell which)	0	6	"Try to make the questions less simplistic." (MOS 2.1 Survey #8)
Change the amount of time spent on different segments of the program	3	5	"Longer presentations by speakers" (Explo 2.1 Survey #7)
Don't change a thing	1	4	"This format/topic was perfect." (MOS 2.1 Survey #22)
Improve the connection between the presentations and discussion	0	3	"...speakers' talks did not seem to connect with our discussions as much as they could have." (MOS 2.1 Survey #29)
Make the program longer	1	2	"Have it be a little longer…" (Explo 2.1 Survey #1)
Improve the audio-visuals	1	2	"...The slides were hard to read…" (Explo 2.1 Survey #6)
Other	0	2	"...You should have mentioned upcoming forums too." (MOS 2.1 Survey #3)
Provide information to the participants	0	2	"...More data, FDA specs clinical trials" (MOS 2.1 Survey #47)
Change small group discussion scenarios	0	2	"Questions were presented as 'black and white' - they are really shades of gray with many intricacies and possibilities (are we assuming proper safeguards?, e.g.)." (MOS 2.1 Survey #14)
Provide more organizational structure	1	1	"Better time management" (Explo 2.1 Survey #9)
Change the discussion format	0	1	"...A monitor is needed at each table." (MOS 2.1 Survey #18)
Improve the sign-up system	0	1	"...printed name tags…" (MOS 2.1 Survey #18)
Increase the number of participants	2	0	"Make it larger to reach more people…" (Explo 2.1 Survey #17)
Change the content/topic	2	0	"...more depth in the introductory talks" (Explo 2.1 Survey #17)
Include the speakers in the small group discussions	1	0	"More experts circulating during the group discussion period." (Explo 2.1 Survey #19)

The other area that participants felt needed to be refined was the small group discussion. At both forums, the most common problem that survey respondents (Explo 2.1: 4 of 30; MOS 2.1: 6 of 56) thought needed to be addressed was the overarching statement. One respondent said, "I feel the central question 'New nanotech should be released before we know all the risks' is a bit meaningless. We NEVER know all the risks. A much better question would have been to vote on whether or not to approve each item in the scenarios" (Explo 2.1 Survey #10). Another respondent said, "Rephrase the question to allow more nuances" (MOS 2.1 Survey #38). The program developers also found that visitors had a hard time with the overarching statement. One developer said, "The overarching question is not a good indicator of the discussion limiting the choice of what we talk about" (MOS 2.1 debrief). Problems with the scenarios were reported less often than problems with the overarching statement by survey respondents at both of the institutions (Explo 2.1: 0 of 30; MOS 2.1: 2 of 56). One survey respondent said, "Make the scenarios more case-specific and concrete" (MOS 2.1 Survey #11). Other MOS 2.1 survey respondents (6 of 56) made comments that could not be linked specifically to the scenarios or overarching statement, but which seemed to concern the scenarios. One participant said, "Be more specific on the questions for each scenario" (MOS 2.1 Survey #55). Some forum team members were also concerned about potential issues with the scenarios like the removal of the historical context from the MOS 2.1 forum scenarios. One team member said, "Are they going to be able to bring the historical context up accurately?" (MOS 2.1 debrief). Another team member responded, "I don't know much about insurance companies, but my group was just making things up, and I'm not sure if it was true" (MOS 2.1 debrief). (See Table 35)

The data showed that changes still needed to be made to both the scenarios and overarching statement. Visitors had some confusion about the new scenarios used during the MOS 2.1 forum. Most of this confusion seemed to come about because participants recognized that the issues surrounding the release of nanotechnology applications were complex. For this reason, some visitors were not content with the questions posed for consideration in the scenarios or the overarching statement. Therefore, it was suggested that the scenarios needed to be clarified so that visitors understood why these questions were being raised. It was suggested that one way to do this might be to provide answers to the questions in the scenarios by adding back in the historical context. Another reason to add the historical context back into the scenarios was that visitors added their own historical contexts to the discussion even after it had been removed. Therefore, it was felt that adding this content would ensure that participants were discussing historical contexts that were accurate and relevant to the applications discussed. Besides these suggested changes to the scenarios, it was suggested that changes to the overarching statement needed to be considered for the same reasons. Since tweaks to the original statement have not improved the experience for visitors, it was suggested that it might be best to change the statement altogether. Some suggestions for changes to the statement included the following:

- Rate your agreement with the following statement: I think [the new nanotechnology application mentioned in the scenario] should be approved for use.
- Rate your agreement with the following statement: I think the potential benefits of [the new nanotechnology application mentioned in the scenario] outweigh the potential risks.

(See Tables 36 & 37)

Table 36. Ways Explo 2.1 participants voted for the overarching statement: "New nanotechnology applications in medicine should be made available for use before we understand the possible risks."

	Explo 2.1 Number of Participants choosing "Strongly Disagree"	Explo 2.1 Number of Participants choosing "Disagree"	Explo 2.1 Number of Participants choosing "Agree"	Explo 2.1 Number of Participants choosing "Strongly Agree"
Registration (N=28)	1	16	9	2
Scenario #1 (N=29)	6	14	8	1
Scenario #2 (N=29)	1	10	15	3
Scenario #3 (N=29)	0	4	20	5

Table 37. Ways MOS 2.1 participants voted for the overarching statement: "New nanotechnology applications in medicine should be made available for use before we understand the possible risks."

	MOS 2.1 Number of Participants choosing "Strongly Disagree"	MOS 2.1 Number of Participants choosing "Disagree"	MOS 2.1 Number of Participants choosing "Agree"	MOS 2.1 Number of Participants choosing "Strongly Agree"
Registration (N=53)	3	31	17	2
Scenario #1 (N=55)	6	24	23	2
Scenario #2 (N=54)	0	12	26	16
Scenario #3 (N=59)	5	15	31	8

The other areas of the forums that the team members felt could be improved were the introduction to the forums, the discussion instructions, and the report-out. One MOS 2.1 forum team member said, "I had wanted to set up why we were having [the forum]. I think maybe we need a better set-up. I never know exactly what to say" (MOS 2.1 debrief). Other team members were concerned about the instructions for the small group discussion. One MOS 2.1 team member said, "Have a power-point slide that lays out the ground rules and talks about timing of the discussion so that people are aware of what's going on" (MOS 2.1 debrief). Another team member agreed, "Spelling out and modeling the directions [is important]" (Explo 2.1 debrief). The team members were also concerned about the report-out. One team member suggested, "Have questions that the participants discuss at the end of the small group discussion before the wrap-up. Have people write down their questions from the discussion. Warm them up to start talking to the whole group" (MOS 2.1 debrief). Someone else recommended, "During the report-out at the end, we should ask [them if] there was anything that surprised you" (MOS 2.1 debrief). The comments suggest that content bullet points for the introduction, small group discussion instructions, and report-out supplemental questions would help the program presenters ensure that necessary information is being discussed at the forum.

5. What changes should be made to the program so that it becomes cheaper and easier for other museums to implement?

The forum developers did not have many suggestions for how to make the forums cheaper. However, one area where both forums tried to limit their spending was on food. The

Exploratorium had cookies and water, and the Museum of Science had only water. Despite these efforts, survey respondents at both institutions (Explo 2.1: 2 of 30; MOS 2.1: 6 of 56) suggested that better food services would be appreciated. One MOS 2.1 participant said, "In the past events, there had something to eat which was good coming right from work and going 'til 9" (MOS 2.1 Survey #51). The data suggested that there needs to be a balance made between cost savings and the needs of the participants especially if the forums are going to be long and conducted during meal times. (See Table 35)

Team members at both institutions felt that most of their budgets were spent on logistics. For the Exploratorium, much of the time was spent marketing to organizations and trying to increase registration numbers. For the Museum of Science, much of the effort was placed on modifying the discussion scenarios to ensure that they were accurate. Developers at both organizations felt that once the materials for the forums were finalized, a majority of the forum costs would be finding and preparing speakers and marketing. They felt that spending time with the speakers was especially important. One forum developer said, "90% of the time was worrying about the speakers" (MOS 2.1 debrief). Another developer said, "One thing that was easy was that we used known quantities for our speakers. I didn't have any questions about it" (Explo 2.1 debrief). One MOS 2.1 speaker agreed that it was crucial to be familiar with the forum content and format. He said, "I would take additional steps to make certain that my talk provided an appropriate context for the cases [if I was given scenarios ahead of time]" (MOS 2.1 speaker follow-up). An Explo 2.1 speaker concurred that it is helpful to "send all the scenario information in advance" (Explo 2.1 speaker follow-up). These comments illustrated the importance of prepping speakers to make them comfortable and helping to shape their presentations. It was suggested that program developers could make the process of preparing speakers easier by preparing a series of guidelines for them. In addition, the NISE Net Forum Team could create a list of speakers willing to travel and participate in forums which would make the process of finding good speakers easier.

6. How could the program be improved so that it better meets the needs of the key program stakeholders (including adult learners, museum educators, and nano-researchers)?

Data gathered from the stakeholders indicated that the parts of the forum that could be improved were the marketing and content of the events. Despite their best efforts, both institutions' program developers seemed to have difficulty marketing to and recruiting people from outside their core constituency. Developers from both institutions tried to attract people from organizations that cover topics like science or medicine. In addition, Museum of Science developers tried to reach out to people with disabilities. If people from these groups had responded to the marketing, higher percentages of people who were either currently unfamiliar with the museums, were not familiar with nanotechnology, or were under-represented in STEM might have attended. However, most participants were museum members who heard about the event through a museum email. This showed that in order to attract new audiences to the NISE Net forums it might be necessary to partner with outside organizations or community members to create specialized forums that fit the needs of the community that is being targeted.

Another area of concern to the speakers, the program developers, and the participants was the content of the speakers' presentations. The speakers expressed an understanding of the importance of connecting their content to the discussion and adjusting their level of content to the level of the audience. However, some felt frustrated that they were not given the information they needed to make these adjustments. The participants also felt that the speakers could better

connect their talks to the small group discussion and found that some of the presentations were not on their level. The program developers felt that the speakers were still not covering content that was necessary for the audience to have an adequate understanding of nanotechnology. Therefore, it was suggested that program developers engage with their speakers as early as possible in the program development process. They need to be explicit with the experts about the content that needs to be covered and should also ensure that the speakers coordinate content before the event. It was suggested that the best way to ensure that these things happen might be through the creation of speaker guidelines which describe the forum audience, provide content suggestions, and explain the purpose of the forum discussion.

Another aspect of the forum in need of change was the small group discussion materials. Despite the changes made since previous forum implementations, participants continued to have a difficult time with the overarching statement. Therefore, it was suggested that the team needed to consider ways to change the statement and make sure it matched up with the scenarios. Since a goal of the forum was that participants better understand the risks and benefits of nanotechnology, it was suggested that one way to change the overarching statement might be to ask visitors if they think the benefits of the application outweigh the risks. It was suggested that another way to alleviate the issue of the overarching statement might be to remove it altogether or have different, related questions for participants to answer for each of the discussion scenarios. An additional issue participants were having was with the scenarios themselves. Some visitors seemed confused by the diversity of questions brought up in the scenarios. It was suggested that it might be necessary to remove some of the questions or present them in a different way in order to help visitors' understandings.

A final area of concern was the content provided in the forum introduction, discussion instructions, and report-out. To ensure that similar information and instructions are provided at any forum implementation, it was suggested that a series of bullet points for presenters should be created. These could explain to visitors the purpose of the forums and the NISE Network and also help the developers streamline instructions for the small group discussion and report-out. It was suggested that questions for the report-out should also be created and tested in order to understand the best ways to promote a large group discussion. It was felt that working on these changes would improve the implementation of the forums as they are expanded past the five original partner institutions (Explo, MLS, MOS, OMSI, and SMM).

VI. Oregon Museum of Science and Industry Nanomedicine Forum Formative Evaluation Memo

The following summary provides an overview of the findings from the formative evaluation of the NISE Net nanomedicine forum, "Nanomedicine: Nanotechnology in Health and Healing," presented by staff from the Oregon Museum of Science and Industry on July 16, 2007 (identified as OMSI 2.1). Unlike previous nanomedicine forums, this forum was not presented at OMSI but rather at the campus of the Oregon Health & Science University.[17] The forum marked the fifth attempt at presenting the nanomedicine forum which had been presented at all five NISE Net forum institutions (Exploratorium, MLS, MOS, OMSI, and SMM) at least once before this date.

The format of the event was similar to the nanomedicine forums that took place at the other NISE Net forum institutions (Explo 2.1, MLS 2.1, MOS 2.1, and SMM 2.1). The two-hour event involved two speakers, questions and answers with the audience, a small group discussion, and a report-out. The time breakdown of the event, as presented on the agenda, was as follows:

- 5 minutes for an introduction to forum,
- 40 minutes for speaker presentations and questions and answers,
- 15 minutes for directions for the small group discussion,
- 45 minutes for the small group discussion, and
- 15 minutes for the report-out.

The content covered in the forum was similar to the content seen in the other nanomedicine forums. The two speakers covered information about nanotechnology 101 and societal/ethical impacts surrounding the topic of nanotechnology. The first speaker, an assistant professor in chemistry at Portland State University, discussed how nanoscale science covers many disciplines including engineering and medicine, described the scale of nano, and discussed his own research using gold nanoparticles for cancer treatment. The second speaker, an associate professor in biology at Portland State University talked about frameworks for how people make decisions about technologies, discussed deliberative democracy, and cited a study about how the public is making decision about nanotechnology. Following the two presentations, the audience was able to ask the experts clarifying questions. Then, the audience discussed three scenarios meant to cause them to consider the overarching statement: *New nanotechnology applications in medicine should be made available for use before we understand the possible risks.* The scenarios were modified versions of the ones used at the previous forum, MOS 2.1, in that the historical context that had been removed from the MOS 2.1 scenarios was added again. In addition, some of the text was removed or clarified. Despite these changes, the overall content of the scenarios was the same. The three scenarios increased in potential risk of nanotechnology from topical use in sunscreen to use in the lab for diagnostic purposes to use in the human body as a treatment for cancer and to enhance medical imaging. Audience members voted on the overarching statement after each scenario, and they discussed their votes and thoughts as a large group during the report-out.

[17] Oregon Health & Science University is located in Portland, OR.

1. What marketing methods were effective at attracting attendees to the program?

The OMSI 2.1 forum was marketed through a number of sources including community websites such as Craigslist and upcoming.org, flyers and emails sent to Science Pub[18] participants, and the OMSI website. Despite the diversity of marketing sources, most of the attending registrants heard about the event through Science Pub (44%) or a museum email (33%). Even though OMSI marketed to the Science Pub members through email, and an OMSI staff member noticed an increase in the registration numbers "after I sent [the marketing information] to the Science Pub mailing list" (OMSI 2.1 debrief), few of the attending registrants who heard about the forum from Science Pub said they heard about the forum through a museum email (25%). Therefore, the population of people who said they heard about the event through Science Pub and the population of people who heard about the event through a museum email were most likely different. (See Table 38)

The institution was most successful at recruiting participants who were not museum members, although they were familiar with OMSI and its Science Pub program. At the other nanomedicine forums (MLS 2.1, SMM 2.1, Explo 2.1, and MOS 2.1), many of the attending registrants (29% - 84%) were museum members, but at the OMSI 2.1 forum, only one attending registrant (6%) was a member. It was possible that few museum members attended because the OMSI 2.1 forum was held offsite at a college. It was also possible that these numbers were a reflection of the people who attend OMSI's Science Pub and who, based on the information available through this forum, appeared not to be museum members. Despite the fact that the participants were not museum members, they were still very familiar with OMSI. Similar to survey respondents from the other nanomedicine forums, over half of the OMSI 2.1 survey respondents (58%) had been to the museum in the last three months and almost all had been to the museum in the last year (79%). (See Tables 38 & 39)

[18] Science Pub is an informal science lecture geared toward an adult audience in which alcoholic drinks are served. This OMSI program has rotating topics and has events in five different cities in Oregon.

Table 38. Registration survey: Demographic data.

	OMSI 2.1 Number of Registrants (N=18)	%
Relationship to forum topic		
Museum member	1	6%
Museum volunteer/staff	1	6%
Educator/Teacher	4	22%
Personally interested	13	72%
Researcher/Student studying nano or a related topic	2	11%
Researcher/Student studying science	3	17%
Community/Advocacy interest group member	1	6%
NISE Network Affiliate	0	0%
Other	4	22%
No Answer	0	0%
How heard about program		
From the museum website	2	11%
From Craigs List	2	11%
From another website	1	6%
From a museum email	6	33%
From another email	0	0%
From a club/organization	0	0%
Through a friend/family member	2	11%
From a paper mailing	--	--
Through my work	0	0%
Through my college/university	0	0%
From Science Pub	8	44%
From print media	1	6%
Other	0	0%
No Answer	0	0%
Temporary or permanent disabilities		
No Disability	15	83%
Mobility	0	0%
Cognitive	0	0%
Visual	0	0%
Auditory	0	0%
Learning	0	0%
Other	0	0%
No Answer	3	17%

Table 39. Exit survey: Demographic data.

	OMSI 2.1 Number of Survey Respondents (N=38)	%
Gender		
Male	19	50%
Female	19	50%
No Answer	0	0%
Age		
<18	3	8%
18-24	3	8%
25-34	8	21%
35-44	5	13%
45-54	10	26%
55-64	8	21%
65-74	1	3%
75-84	0	0%
85+	0	0%
No Answer	0	0%
Race/ethnicity (Check all that apply)		
African American	1	3%
American Indian/Alaskan Native	0	0%
Asian American	1	3%
Hispanic/Latino	1	3%
White, not of Hispanic origin	33	87%
Other	2	5%
No Answer	2	5%
Last visit to Museum		
Never	1	3%
Within the last three months	22	58%
3 - 6 months ago	3	8%
6 months to 1 year ago	5	13%
1 - 2 years ago	3	8%
2 - 5 years ago	1	3%
5 - 10 years ago	2	5%
More than 10 years ago	0	0%
Not sure	0	0%
No Answer	1	3%
To meet people, socialize	7	18%
Reasons you decided to attend (Check all that apply)		
Professional networking	9	24%
To learn about nanotechnology	33	87%
To learn about medical technology	15	39%
To hear others' perspectives	20	53%
To share my ideas with others	5	13%
To get involved at the Museum	2	5%
Sounds like fun	14	37%
Other	4	11%
No Answer	1	3%

The demographics of the people who came to the OMSI 2.1 forum were the same, in many ways, to the demographics of the audiences at the previous nanomedicine forums (MLS 2.1, SMM 2.1, Explo 2.1, and MOS 2.1). Many people who attended reported that their relationship to the topic was that they were personally interested (72%). In addition, no one had a disability (0%) and most survey respondents were between the ages of 35 and 64 (60%). Also similar to the previous nanomedicine forums, about half the survey respondents were men (50%) and half (50%) were women. The percentages of racial and ethnic minorities were also just as low as was seen at the other nanomedicine forums. Most of the survey respondents were White (87%) while only a few were African American (3%), Hispanic (3%), Asian American (3%), or other race/ethnicity (5%). Despite these similarities with other nanomedicine forum audiences, there were some ways that the OMSI 2.1 audience differed from these audiences. At the OMSI 2.1 forum, half of the attending registrants (50%) were either researchers/students in science or nanotechnology or worked in an occupation related to nanotechnology. At the other forums, many fewer attending registrants (5% - 21%) identified themselves as researchers/scientists or as people with an occupation related to nanotechnology. It is unknown why this percentage was higher than the percentage seen at other nanomedicine forums, but it might have to do with the people reached through marketing via the museum email and Science Pub lists or the fact that the forum was held on a college campus. (See Tables 38 & 39)

These data showed that the marketing methods that worked the best at attracting participants to the forums were those methods that involved direct correspondence from the museum, as with the museum email, or from a museum-related group, like Science Pub. These findings were similar to the findings at the other nanomedicine forums where it has been observed that marketing to people already familiar with the institution worked well likely because the potential participants already knew what kind of programming to expect, and they had already shown an interest in the type of programming that the institution provides. However, marketing in this way did not lead to new visitors or audiences who are underrepresented in STEM such as African Americans, Hispanics, or people with disabilities. Therefore, it was suggested that the NISE Net Forum Team members continue to test ways to market to these audiences if they are interested in attracting these audiences to forums.

2. What aspects of the program were valued by the key stakeholders and should therefore be included in future iterations of the forum?

The aspects of the forum that the stakeholders valued most were both learning about the topic and the small group discussion. This was similar to the "Risks, Benefits, and Who Decides?" forum and other nanomedicine forums (SMM 2.1, MOS 2.1, Explo 2.1, & MLS 2.1) where the expert presentations and the small group discussion were the most valued parts of the program. However, the data showed that the OMSI 2.1 participants did not mention the value of the experts as much as they mentioned the value of the learning itself.

Before the forum, many of the participants expressed that they hoped to learn about the technologies. Most of the survey respondents (87%) said that the key reason they decided to attend was to learn about nanotechnology, and other survey respondents (39%) said that a key reason they attended was to learn about medical technologies. The value participants placed on learning was supported by the open-ended question that asked them "What do you expect this experience will be like?" The most common response (20 of 38) given by the survey respondents was that they expected to learn. One participant said, "I hoped to learn about this topic so I can help others understand about this subject" (OMSI 2.1 Survey #14). Another participant said, "[I] hope to learn & listen" (OMSI 2.1 Survey #21). (See Tables 39 & 40)

Table 40. Exit survey: Participant expectations of the forum.

	OMSI 2.1 Number of Survey Respondents (N=38)	OMSI 2.1 Quotes
I will learn.	20	"Enlightening…" (OMSI 2.1 Survey #13)
It will be fun/interesting.	9	"Interesting, fascinating, incredible-- little things like that :)-nano nano!" (OMSI 2.1 Survey #25)
It will be intellectually stimulating.	6	"...motivating" (OMSI 2.1 Survey #13)
No Answer	5	--
It will have science content.	5	"…technical" (OMSI 2.1 Survey #1)
It will have a discussion.	5	"conversation and dialog re: nanotech, learn new info- chance to reflect" (OMSI 2.1 Survey #31)
Other	2	"...An opportunity to learn how the process works-- (roundtable discussion, etc.)" (OMSI 2.1 Survey #18)
I have no idea.	1	"?" (OMSI 2.1 Survey #24)
It will present me with ideas for the classroom.	1	"...I hoped to learn about this topic so I can help others understand about this subject." (OMSI 2.1 Survey #14)
I will hear others' opinions.	1	"an opportunity to hear diverse opinions and concerns" (OMSI 2.1 Survey #20)
It will be boring.	1	"Somewhat dull…" (OMSI 2.1 Survey #1)

Another large group of participants said before the event that they hoped to discuss nanotechnology issues during the forum. Over half of the OMSI 2.1 survey respondents (53%) said that a key reason they attended was to hear others' perspectives which implies that participants knew about and valued the small group discussion before the forum. This percentage was higher than the percentage of survey respondents who said a key reason they attended was to learn about medical technologies, and this was the only nanomedicine forum where more people rated hearing others' perspectives higher than learning about medical technologies. However, on the open-ended question, fewer survey respondents said that they expected a discussion (5 of 38) or a chance to hear others' opinions (1 of 38) than learning (20 of 38). Some of the comments did reflect that the survey respondents felt the importance of both learning and the discussion before the forum. One participant said, "[I expect an] informative discussion" (OMSI 2.1 Survey #7). Another participant said, "[I expect the forum to be] informative, hopefully full of discussion" (OMSI 2.1 Survey #35). This might indicate that more participants were aware of the fact that they would be participating in a discussion, and that they valued the idea of this discussion even before they participated in the forum. It might also show that participants appreciated the opportunity to be informed by multiple perspectives (including the perspectives of speakers) during the forum. Nevertheless, the number of people who expected and valued the discussion was still not as high as the number of people who expected and valued learning about nanotechnology. (See Tables 39 & 40)

After the forum, the value that the survey respondents found in learning and discussing did not change. However, more people valued the small group discussion after the forum than before the forum. When the OMSI 2.1 participants were asked "What did you value most about this experience?," the most common response was the discussion with others (16 of 38 survey respondents). One participant said, "[I valued] talking with people and hearing new

perspectives" (OMSI 2.1 Survey #21). Another group of survey respondents (11 of 38) said they valued the opportunity to learn. One participant, from this group, said, "[I valued] learning about issues surrounding nano" (OMSI 2.1 Survey #1). These findings are similar to the other nanomedicine forums where survey respondents found more value in the small group discussion than learning after they had participated in the event indicating that participation in a forum brings to light the value of discussing science issues with other members of the community. (See Table 41)

Table 41. Exit survey: Aspects of the forum participants valued most.

	OMSI 2.1 Number of Survey Respondents (N=38)	OMSI 2.1 Quotes
Discussing with others	16	"Great discussion" (OMSI 2.1 Survey #8)
Opportunity to learn/access to information	11	"...acquiring new information" (OMSI 2.1 Survey #9)
The topic of nanotechnology	6	"Interesting subject…" (OMSI 2.1 Survey #13)
No answer	4	--
Diverse range of viewpoints	4	"Hearing others fears and opinions" (OMSI 2.1 Survey #16)
Societal/ethical issues discussed	3	"Societies aspect on nanotechnology" (OMSI 2.1 Survey #23)
Other	3	"...being treated like an intelligent person" (OMSI 2.1 Survey #24)
Everything	2	"Everything! It was a very positive experience" (OMSI 2.1 Survey #4)
The Forum environment	2	"...a safe respectful environment." (OMSI 2.1 Survey #14)
Meeting other participants	1	"I enjoyed the people at our table…" (OMSI 2.1 Survey #26)
The discussion scenarios	1	"The opportunity to think through issues using concrete examples." (OMSI 2.1 Survey #18)
That it was free	1	"It was free…" (OMSI 2.1 Survey #12)
Seeing what a Forum is like	1	"...discussing deliberative democracy" (OMSI 2.1 Survey #19)
The food	1	"Cookies…" (OMSI 2.1 Survey #38)

The other stakeholders, including program developers and speakers, also found the most value in the discussion and presentations. One of the forum speakers talked about how important it was to impart information to the participants as well as have discussions with them. She said:

> *My work focuses on social and ethical issues associated with technology, and thus it is very important to interface with the public both to help them to learn about these issues, and to see what issues they bring themselves... The most valuable part [of my participation] was being able to participate in the discussion tables and hear what concerns people had, and how they perceived and made collaborative decisions about nanotechnology*. (OMSI 2.1 speaker follow-up)

The program developers also felt that the discussion and the presentations were important. They said during the debrief that indicators of the success of the forum were that "people were very engaged in roundtable discussions," and that "questions that people asked the speakers were

thoughtful" (OMSI 2.1 debrief). In this case, it seemed that the program developers and the speaker agreed that it was important to not only impart information about nanotechnology to the participants but also to have a two-way discussion between experts and the participants about the impact of technologies on the public.

3. What aspects of the program appeared to contribute to the program's ability to achieve its stated goals and should therefore be included in future iterations of the forum?

The presentations were important not only because the stakeholders valued them, but also because they contributed to the achievement of the forums' goals. One forum learning goal was that visitors would have increased knowledge of nanoscale science and technology. Before the forum, a higher percentage of OMSI 2.1 survey respondents (42%) than survey respondents at the previous nanomedicine forums (15% - 41%) agreed that they had a strong understanding of nanotechnology. The percentage of OMSI 2.1 survey respondents (29%) who agreed that they had a strong opinion about the release of medical nanotechnologies to the public was much lower, and more similar to the responses to this question seen at the other nanomedicine forums (MLS 2.1: 30%; SMM 2.1: 38%; Explo 2.1: 23%; MOS 2.1: 45%). The high percentage of people who had a strong understanding of nanotechnology and the more comparable percentage of people who had a strong opinion about the release of nanomedicine applications might have been a reflection of the participants' interests in that they were Science Pub participants or scientists/researchers. It was possible that these participants were already familiar with the concept of nanotechnology because of their interest and background, but they felt they did not know enough about nanomedicine to have a strong opinion about it. (See Table 42)

Table 42. Exit survey: Participant comfort with nanotechnology before the forum.[19]

	OMSI 2.1 Mean (N=38)	% of Survey Respondents Choosing "Agree" or "Strongly Agree" (N=38)
I have a strong understanding of nanotechnology.	2.2	42%
I feel comfortable expressing my opinions on nanotechnology.	2.6	61%
I have a strong opinion about releasing medical nanotechnologies to the public.[20]	2.3	29%

After the forum, the percentage of OMSI 2.1 survey respondents (76%) who agreed that they felt more informed about nanotechnology was at a level similar to that observed at the other nanomedicine forums (67% - 91%). In addition, most of the survey respondents (71%) agreed that they felt more informed about the risks and benefits of medical nanotechnologies after the forum. This percentage of survey respondents was also similar to the percentages seen at the other nanomedicine forums (57% - 85%). The data show that many of the OMSI 2.1 survey respondents had a good understanding of nanotechnology before the forum. However, after the forum, many of the survey respondents still said they felt better informed. (See Table 43)

[19] Participants were asked to rate these questions on a scale of 1 to 4 where 1 is "Strongly Disagree," 2 is "Disagree," 3 is "Agree," and 4 is "Strongly Agree."
[20] OMSI 2.1 Mean N=37

Table 43. Exit survey: Participant feelings after the forum.[21]

	OMSI 2.1 Mean (N=36)	% of Survey Respondents Choosing "Agree" or "Strongly Agree" (N=38)
I enjoyed the experience.[22]	3.3	95%
The experience matched my expectations.	2.9	74%
I felt comfortable expressing my opinions.[23]	3.5	97%
I feel more informed about nanotechnology.	3.0	76%
I feel more informed about the risks and benefits of medical nanotechnologies.	2.9	71%
It was clear what we were supposed to do during the forum.	3.3	92%
The presentations were easy to understand.[24]	3.4	97%
The discussion scenarios were easy to follow.	3.1	82%
We weighed the pros and cons of medical nanotechnologies during our discussion.[25]	3.2	92%
A diverse range of viewpoints were represented in our small group discussion.[26]	2.9	76%

Many of the respondents reported specific information that they learned from the OMSI 2.1 forum on the survey. The types of information that participants said they learned varied quite a bit, but some topics came up more than others. The most common response given to the open-ended question was that the respondents learned about the applications of nanotechnology (12 of 38 survey respondents). One survey respondent said, "[I learned about] applications currently being used in nano & possible uses of nano" (OMSI 2.1 Survey #1). Another survey respondent said, "[I learned about] multiple uses in [the] med[ical] field for nanotech" (OMSI 2.1 Survey #19). Fewer survey respondents (4 of 38) said they learned about the risks associated with nanotechnology. One survey respondent said, "I learned about several examples of risks involved in nanotechnology that I had not thought of before" (OMSI 2.1 Survey #4). Other survey respondents (4 of 38) said they learned a lot about nanotechnology from the forum. One participant said, "[I learned] basically everything!!! I knew very little before" (OMSI 2.1 Survey #14). (See Table 44)

[21] Participants were asked to rate these questions on a scale of 1 to 4 where 1 is "Strongly Disagree," 2 is "Disagree," 3 is "Agree," and 4 is "Strongly Agree."
[22] OMSI 2.1 Mean N=38
[23] OMSI 2.1 Mean N=37
[24] OMSI 2.1 Mean N=37
[25] OMSI 2.1 Mean N=37
[26] OMSI 2.1 Mean N=37

Table 44. Exit survey: Things participants reported learning from the forum.

	OMSI 2.1 Number of Survey Respondents (N=38)	OMSI 2.1 Quotes
Uses of nanotechnology	12	"The more detailed, varied uses of nanotech" (OMSI 2.1 Survey #11)
No answer	7	--
About the risks of nano	4	"Possible risks…" (OMSI 2.1 Survey #36)
Lots of information	4	"More information than I had before." (OMSI 2.1 Survey #8)
Significance of nanotechnology	3	"I didn't know about the extent of nano-sized things that are already present in the environment." (OMSI 2.1 Survey #18)
Regulations and policies of nanotechnology	3	"Regulatory issues- i.e. what is regulated and what is not" (OMSI 2.1 Survey #3)
Societal aspects of nano	2	"I didn't have a clue what nano (fill in the blank) was. Now I have a general idea of pro's and con's." (OMSI 2.1 Survey #27)
Other	2	"Not too much, but that's okay. It was still an interesting evening." (OMSI 2.1 Survey #25)
About civic discourse/public involvement	2	"The way in which the ethics debate can be structured" (OMSI 2.1 Survey #16)
That I didn't know much about nano before	2	"...I knew very little before." (OMSI 2.1 Survey #14)
The plural of Forum	2	"... The plural of forum!" (OMSI 2.1 Forum #9)
Misconceptions from the media	2	"...media leads me to believe that nanotechnology is all man-made." (OMSI 2.1 Survey #21)
About science/technology of nano	1	"Just basic info on nanotechnology" (OMSI 2.1 Survey #13)
Nothing	1	"not particularly" (OMSI 2.1 Survey #22)

Other goals for the forums were specifically intended to be addressed during the small group discussion, but some of these goals were harder to meet because of the composition of the audience. One goal was to increase participants' comfort discussing nanotechnology. Before the forum, over half the OMSI 2.1 survey respondents (61%) agreed that they felt comfortable expressing their opinions on nanotechnology. This percentage was higher than three of the other nanomedicine forums (MLS 2.1: 30%; SMM 2.1: 53%; Explo 2.1: 50%) but lower than what was seen at the MOS 2.1 forum (68%). After the forum, the percentage of survey respondents (97%) who agreed that they felt comfortable expressing their opinions included almost every survey respondent. However, because so many people were already comfortable expressing their opinions before the forum, steps taken to achieve this goal did not have as much of an impact on participants as steps taken to achieve other goals. (See Tables 42 & 43)

Another goal was that people would experience a diversity of opinions during the small group discussion. A lower percentage of survey respondents (76%) agreed that they heard diverse opinions during their small group discussion than the survey respondents of three other nanomedicine forums (MLS 2.1: 80%; SMM 2.1: 91%; Explo 2.1: 63%; MOS 2.1: 82%). One participant complained, "It was me and a family of four! ([And they] all pretty much [had the] same viewpoint)" (OMSI 2.1 Survey #35). A staff member at the event debrief agreed. She said, "There was one table with four members of one family and just one other person, too one-sided.

Mention at check-in that they should split up" (OMSI 2.1 debrief). However, it should be noted that this percentage was still high, so this finding indicated that there was only room for modest improvement related to this goal. (See Tables 43 & 45)

Table 45. Exit survey: Ways that participants said the forum could be improved.

	OMSI 2.1 Number of Survey Respondents (N=38)	OMSI 2.1 Quotes
Change the content/topic	9	"Talk about what nanotechnology is, I still don't really know..." (OMSI 2.1 Survey #28)
No Answer	5	--
Change the amount of time spent on different segments of the program	5	"Give a little more time for the small group discussion (maybe 5 more minutes)." (OMSI 2.1 Survey #4)
Change the overarching question	3	"The questions could be made more subtle…" (OMSI 2.1 Survey #1)
Change the food service	3	"Beer" (OMSI 2.1 Survey #11)
Don't change a thing	2	"It is fine as is." (OMSI 2.1 Survey #22)
Other	2	"More advertising…" (OMSI 2.1 Survey #23)
Provide information to the participants	2	"...Maybe in the future you could put together a sheet or 2 that had this kind of information…" (OMSI 2.1 Survey #26)
Change the moderated discussion	2	"Perhaps the small round table groups could be broken out with more diverse members...maybe seeing if one could get a member from Med, Tech, and Teaching in a group." (OMSI 2.1 Survey #34)
Present real world examples	2	"More examples of where nano technology is currently used…" (OMSI 2.1 Survey #27)
Improve the conditions of the room (lighting, etc.)	1	"a bit cooler-- room a little warm" (OMSI 2.1 Survey #36)
Make the program longer	1	"make it 2-3 hours longer" (OMSI 2.1 Survey #33)
Improve the audio-visuals	1	"Encourage speakers to move back and forth…so we can see the slides OR project onto higher surface." (OMSI 2.1 Survey #29)
Change small group discussion scenarios	1	"I'd go w/ two scenarios and distinguish between the use of technology and the social/ethical consequences." (OMSI 2.1 Survey #8)
Start on time	1	"begin on time" (OMSI 2.1 Survey #17)
I'm not sure what to change	1	"?" (OMSI 2.1 Survey #12)
Provide other programming on nano	1	"Do more of them. 80% know nothing about nanotech" (OMSI 2.1 Survey #16)

Another goal for the small group discussion was that visitors would discuss the societal implications of nanotechnology. Most of the survey respondents (92%) agreed that they weighed the pros and cons of medical nanotechnologies during the forum, and this level of agreement was similar to the level seen at the other nanomedicine forums (MLS 2.1: 95%; SMM 2.1: 100%; Explo 2.1: 80%; MOS 2.1: 84%). To further gauge the achievement of this goal, the participants were asked what issues raised during the small group discussion made them think differently

about medical nanotechnologies. A few OMSI 2.1 survey respondents (4 of 38) said that environmental issues like "toxicity issues" (OMSI 2.1 Survey #1) or the "impact [of nanoparticles] on the environment" (OMSI 2.1 Survey #23) made them think differently about medical nanotechnologies. Other survey respondents (4 of 38) said health care issues such as "using information for insurance purposes" (OMSI 2.1 Survey #36) impacted their thinking about nanotechnologies. Still others said medical issues like "use of nanotechnology in prostate cancer treatment and diagnosis currently available in Canada and Germany" (OMSI 2.1 Survey #20) and "benefits to [the] medically needy" (OMSI 2.1 Survey #19) made them think differently about medical nanotechnologies. These data indicated that participants did weigh the risks and benefits of nanotechnology during the forum, and that this weighing did cause a shift in opinion or thinking for some people. (See Tables 43 & 46)

Table 46. Exit survey: Topics participants said made them think differently about medical nanotechnologies.

	OMSI 2.1 Number of Survey Respondents (N=38)	OMSI Quotes
No Answer	17	--
Environmental concerns/issues/risks	4	"...their impact on the environment" (OMSI 2.1 Survey #23)
Health care issues	4	"Insurance issue…" (OMSI 2.1 Survey #1)
Medical concerns/issues/risks	4	"use of nanotechnology in prostate cancer treatment and diagnosis currently available in Canada and Germany" (OMSI 2.1 Survey #20)
Applications produced through nanotechnology	3	"...The things that are already on the market that use nanotechnology." (OMSI 2.1 Survey #14)
Regulation of nano	3	"Gov't regulation lacks science to make good regulatory decisions" (OMSI 2.1 Survey #3)
Other	2	"that there are fears about it" (OMSI Survey #20)
One of the scenarios	2	"Scenario #2 - Nano in non-invasive diagnosis" (OMSI 2.1 Survey #5)
Societal issues	1	"That the public need to be informed" (OMSI 2.1 Survey #12)
None	1	"none" (OMSI 2.1 Survey #28)
The acceptability of risk	1	"There is general agreement that life itself is a risk- and thus risks are acceptable." (OMSI 2.1 Survey #16)
Privacy concerns/issues/risks	1	"...identification…" (OMSI Survey #1)
Personal experiences/stories	1	"Personal experiences…" (OMSI 2.1 Survey #23)

The findings showed that the participants learned from the forum through both the expert presentations and small group discussion. However, it was found that certain factors might impact that learning. Participants might achieve fewer of the program goals if they already have a good understanding of nanotechnology or if they already feel comfortable expressing their opinions about nanotechnology. They also seemed to get less out of the event if the members of their small group discussion did not have a variety of viewpoints. However, the nature of the discussion still allowed the small groups to explore the pros and cons of the topic and caused the participants to explore their personal views while learning some things that they may not have known before.

4. How could the programmatic model be refined so that it better achieved the stated goals and objectives?

As with the previous nanomedicine forums, the percentage of OMSI 2.1 survey respondents (95%) who agreed that they enjoyed the event was high. However, two[27] of the forum stakeholders, the participants and program staff, agreed that there were some parts of the event that could be refined including the amount of time available for event segments, the expert presentations, and the small group discussion. Other parts of this forum which were troublesome for the stakeholders at other forums, worked much better for stakeholders of this forum. These parts of the forum included instructions for the discussion and the report-out. (See Table 43)

One of the issues for both the forum staff and the participants was the timing of the different segments of the event. The staff felt that with "two people doing registration [there was] too much of a bottleneck" (OMSI 2.1 debrief). They also felt that for future forums it would make sense to "begin registration from 6:30-7:00 [instead of at the forum start time] to encourage people to show up earlier" (OMSI 2.1 debrief). The participants did not mention the registration, but they did think that the length of other segments of the forum should be changed. Many of the survey respondents felt that the time with the speakers was too short. When asked about the time breakdown of the event, some attendees (10 of 35 survey respondents) expressed that the question and answer session should be longer. A few of them (3 of 38 survey respondents) even brought this up when asked how future forums could be improved. One participant said, "[I want] more time for Q & A with speakers" (OMSI 2.1 Survey #9). In response to the same time breakdown question, other OMSI 2.1 survey respondents (13 of 37) expressed that they wanted more time for the expert presentations. The program staff agreed that the time with speakers should be changed. They said, "[We should] extend [the forum] slightly, have Nano 101 [be] longer and [have] Q&A after each individual speaker" (OMSI 2.1 debrief). The stakeholders felt that the amount of time allowed for the other parts of the forum were fine. It was suggested that perhaps a few changes to the timing of the event would make the stakeholders happier. The registration should start early—about a half hour before the event. The amount of time for the forum should be left at two hours, but question and answers could be shortened to five minutes after each expert presentation. In addition, it was suggested that some time could be taken away from the discussion instructions or report-out to give the experts a longer time in which to present. (See Tables 45 & 47)

Table 47. Exit survey: Participant feelings about the time breakdown.

	OMSI 2.1 Number of Survey Respondents choosing "Too Short"	OMSI 2.1 Number of Survey Respondents choosing "Too Long"	OMSI 2.1 Number of Survey Respondents choosing "Just Right"
Welcome/Introduction (N=37)	0	8	29
The speaker presentations (N=37)	13	1	23
The small group discussion (N=37)	9	1	27
The question and answer period (N=35)	10	2	23
The large group discussion (N=32)	4	3	25

[27] Although a stakeholder, forum speakers did not give any suggestions as to how the program could be refined.

Another part of the forum that the stakeholders felt should be refined was the content of the expert presentations. As seen from the quote above, the OMSI 2.1 forum staff felt that there was a need for more basic nanotechnology information in the expert presentations. The survey respondents agreed that there needed to be a change in the content of the expert presentations even though almost all of them (97%) said that the presentations were easy to understand. The most common item that the survey respondents (9 of 38) said should be changed was the content/topic of the event. As with the forum staff, most often the survey respondents (7 of 9) felt that they wanted more background information about nanotechnology. One respondent said, "Talk about what nanotechnology is, I still don't really know, I just know now what it could do, and the ethics behind it" (OMSI 2.1 Survey #28). Another participant said, "[I] need more background for the questions" (OMSI 2.1 Survey #18). The data indicated that there was some information missing from the expert presentations that the participants needed. Even though a higher percentage of the OMSI 2.1 survey respondents than those observed at other forums felt informed about nanotechnology before the forum, a large percentage (64%) still did not agree that they felt informed about nanotechnology. Forum team members had discussed the importance of providing participants with some background information during the forum. However, even after the expert presentations, some of these participants felt that they needed more background information about the subject. Therefore, it was suggested that for future forums, it might be helpful to present the experts with a series of suggested content bullet points. (See Tables 43 & 45)

The last part of the forum that the stakeholders felt needed to be changed was the small group discussion. The OMSI 2.1 forum staff expressed that "people were very engaged in roundtable discussions" (OMSI 2.1 debrief), but that there were still some areas of the discussion that they felt could be made better. One issue that the staff felt the participants had with the small group discussion was the scenario voting. They said, "People wanted to edit voting, didn't like [their] choices" (OMSI 2.1 debrief). The participants agreed that they had concerns about the overarching statement and the voting process. A few of the survey respondents (3 of 38) said that the overarching statement should be changed. One participant said, "The questions could be made more subtle" (OMSI 2.1 Survey #1). Another participant said, "Adjust questions – 'before we understand the possible risks' is skewed and leading" (OMSI 2.1 Survey #7). Members of the videotaped small group discussion table agreed. They wanted the term "understand the possible risks" removed from the overarching statement because they felt that it was not needed and made the statement biased (OMSI 2.1 video). For these reasons, the data showed that the overarching statement still needed to be modified. It was suggested that there were three options for the use of the overarching statement during the discussion including the following:

- Change the statement to: "I think [the new nanotechnology application mentioned in the scenario] should be approved for use." Continue to hold the voting before the discussion and after each scenario.
- Change the overarching statement to the question: "Should new nanotechnology applications in medicine be approved for use?" Do not vote on this statement at any time during the forum. Use the question only as a way to frame the discussion and the evening.
- Remove the overarching statement altogether. Have no framing statement, and include no voting during the discussion.

(See Table 45)

Despite the need for refinement in some parts of the forum, other parts of the forum, which have been troublesome previously, seemed to work more successfully during the OMSI 2.1 forum. The parts of the forum were the small group discussion instructions and the report-out. The

OMSI 2.1 forum staff reported that the participants "respected the scenario and voting instructions" despite the fact that there was "some confusion about [what to do with] the second copy of the voting sheet" (OMSI 2.1 debrief). However, this perceived confusion did not seem to impact the participants because a higher percentage of OMSI 2.1 survey respondents (92%) than those at the other nanomedicine forums (70% - 88%) agreed that it was clear what they were supposed to do during the forum. Another part of the forum which seemed to work better during this iteration was the report-out. The program staff said that one of the indicators of the success of the forum was that "people responded to the wrap-up questions" (OMSI 2.1 debrief). The participants did not mention the report-out on their surveys, but observations of this segment of the forum showed that participants readily responded to the report-out questions and seemed to appreciate talking to the larger group (OMSI 2.1 observations). The successes of these two parts of the program indicated that there were lessons that can be learned from this forum about how to present these segments. The tactics which the OMSI 2.1 forum staff used could be recorded to help with the dissemination of this forum to other institutions. (See Tables 43 & 48)

Table 48. Ways participants voted for the overarching statement: "New nanotechnology applications in medicine should be made available for use before we understand the possible risks."

	OMSI 2.1 Number of Participants choosing "Strongly Disagree"	OMSI 2.1 Number of Participants choosing "Disagree"	OMSI 2.1 Number of Participants choosing "Agree"	OMSI 2.1 Number of Participants choosing "Strongly Agree"
Online Registration (N=18)	3	8	6	1
Before Discussion (N=23)	0	5	13	5
Scenario #1 (N=39)	0	8	28	3
Scenario #2 (N=39)	1	9	20	9
Scenario #3 (N=39)	1	3	20	15

5. What changes should be made to the program so that it becomes cheaper and easier for other museums to implement?

The OMSI 2.1 forum staff had a number of suggestions about how to make the forum cheaper and easier to implement. Some of these ideas were implemented by the OMSI 2.1 forum team and found to work well. Other changes were suggested based on what the OMSI 2.1 team experienced in order to make the implementation of the forum easier for other institutions in the future.

The OMSI 2.1 forum staff found that a number of things they did to prepare for the forum worked well and should be implemented again. One of the things that they found worked well was preparing the speakers thoroughly before the forum. The OMSI 2.1 staff said they had the "speakers talk to each other before hand … and it was a good thing" (OMSI 2.1 debrief). They also found it beneficial to give "scenarios to speakers in advance" (OMSI 2.1 debrief). The speaker agreed that all this advanced preparation was helpful. She said, "[The organizer] was very helpful in letting me know the format and providing me with the relevant materials. I think that it went very well" (OMSI 2.1 speaker follow-up). Another thing that the staff did before the forum that the speakers found helpful was to "review and update scenario content [and] vet current science" (OMSI 2.1 speaker follow-up). By doing this, they made sure the scenario

content was correct and up-to-date. Because of the success of these tactics, the team felt that these preparation techniques should be continued.

Other suggestions were made based on challenges the OMSI 2.1 team faced during their forum. The staff felt that if other people make these changes the forum implementation would go more smoothly. One of the biggest changes that the OMSI 2.1 team suggested was holding the forum on-site. Some forum institutions, like SMM, felt that holding the forum off-site could make the program cheaper. However, OMSI found just the opposite. They said that holding the program off-site meant that they "had to pay for the room and logistics were more difficult" (OMSI 2.1 debrief). They suggested that it would be easier to hold the forum on-site in the future. Another issue that the OMSI 2.1 team found difficult to deal with was the amount of materials and paper needed for the participants. They said, "There is too much paper, is there a way to consolidate?" (OMSI 2.1 debrief). The team felt that there must be some way to cut down on all the materials being provided to visitors, and that cutting down on these supplies would make the implementation process easier on future program staff.

6. How could the program be improved so that it better meets the needs of the key program stakeholders (including adult learners, museum educators, and nano-researchers)?

Data gathered from the stakeholders indicated that the parts of the forum that were the most in need of work were the marketing of the event, the content of the expert presentations, and the overarching statement for the discussion scenarios. As with the other nanomedicine forums, the participants attracted to the OMSI 2.1 forum were not very diverse. The marketing methods reached out not just to people who were museum members but also to people who were active in the community or participated in programs similar to forums. Nonetheless, the only big difference between this audience and the audiences seen at the other forums was that in this case there were almost no museum members represented in the audience. The people who came to the event were still those who are highly familiar with OMSI and highly represented in STEM careers. The data illustrated once again that if a goal of the forum team was to reach out to audiences either under-represented in STEM or under-represented at the forum institutions, then special efforts will have to be made to attract these audiences. It was suggested that one option might be to invite leaders of the communities that the team wishes to attract to be a part of the forum creation process so that forums can be tailored to fit the needs of their communities. It was also suggested that another option might be to present the forums in the communities that the team hoped to attract. In that way, the audience might not have to travel as far to the forums or feel intimidated by the venue.

Another area in need of change was the content of the expert presentations. Despite the use of speakers that the audiences found understandable, the stakeholders still felt that some content was missing. At the OMSI 2.1 forum, both the program staff and participants felt there needed to be more basic nanotechnology information included in program. In order to alleviate this problem, it was suggested that the speakers be provided with knowledge about the level of understanding of the participants. In addition, it was suggested that a series of content bullet points should be created so that the speakers can incorporate them into their presentations to make sure that basic information was being presented. Finally, it was suggested that the program staff needed to make sure that they saw the experts' presentations ahead of time, and that they needed to mention to the speakers if they felt any content was missing.

The final area in need of change was the discussion scenarios—most notably the overarching statement. Despite many attempts at making the overarching statement better, it was still frustrating to participants. The sticking point for the participants seemed to be the phrase “before we understand the possible risks.” Because of this issue, it was suggested there were a number of possible changes that could be made to the scenarios. The first option was to modify the statement by removing the phrase “before we understand the possible risks.” Then the voting could proceed as it has during the previous forums. The next option was to remove the voting and the statement completely from the small group discussion. It was suggested that if the forum team felt that there still needed to be some kind of overarching statement/question to tie the event together even if there was not going to be any voting, then the question “Should new nanotechnology applications in medicine be made available for use?” could be used. Based on the continual troubles that the overarching statement has caused for forum participants, it was suggested that it made the most sense to see what happens when the statement and the voting were removed from a forum. If this did not work, then one of the other options could be implemented.

VII. Museum of Science 2.2 Nanomedicine Forums Formative Evaluation Memo

The following summary provides an overview of the findings from the formative evaluation of the NISE Net nanomedicine forum, "Nanomedicine: Nanotechnology in Health and Healing," presented at the Museum of Science, Boston on September 24, 2007 (identified as MOS 2.2). Unlike many of the previous nanomedicine forums, the purpose of this forum was to attempt to attract an underserved audience to MOS. In this case, that audience was people with disabilities – specifically those who are blind or Deaf. In order to accommodate this audience, an American Sign Language (ASL) interpreter was available for those participants who were Deaf. The forum marked the sixth attempt at presenting the nanomedicine forum which at this point had been presented at all five forum institutions (Exploratorium, MLS, MOS, OMSI, and SMM) at least once.

The format of the event was similar to the nanomedicine forums that took place at the other NISE Net Forum Team institutions. The two-hour event involved two speakers, questions and answers with the audience, a small group discussion, and a report-out. The time breakdown of the event, as presented on the agenda, was as follows:

- 5 minutes for an introduction to forum,
- 50 minutes for speaker presentations and questions and answers,
- 5 minutes for directions for the small group discussion,
- 45 minutes for the small group discussion, and
- 15 minutes for the report-out.

The content covered in the forum was similar to the content seen in the other nanomedicine forums. The two speakers covered information about nanotechnology 101 and societal/ethical impacts surrounding the topic of nanotechnology. The first speaker, an associate professor for the Divisions of Engineering and Orthopaedics at Brown University, discussed the history of nanotechnology, some nanomedicine applications that have already been approved for use, and some future nanomedicine applications including a cancer drug that his lab is working on. The second speaker, an assistant professor of philosophy at Northeastern University, discussed a study of Americans which found that they hope nanotechnology will lead to medical cures. He also discussed some societal and ethical issues surrounding nanotechnology including privacy, access, and informed consent, and described the societal and ethical issues surrounding other technologies including stem cells and genetic modification to place the nanotechnology issues in context. Following the two presentations, the audience was able to ask the experts clarifying questions. Then, the audience discussed two scenarios meant to cause them to consider the overarching question: *Under what conditions should nanotechnology applications in personal and medical products be made available to the public?* The scenarios were modified versions of the ones used at the OMSI 2.1 forum in July 2007. The biggest changes to the discussion were that the second scenario was removed, and the participants were not asked to vote on the overarching question after each scenario. However, the overall content of the remaining scenarios was the same. The two scenarios increased in potential risk from topical use in sunscreen and other personal care products to use in the human body as a treatment for cancer and to enhance medical imaging. Though audience members were not asked to vote on the overarching statement after each scenario, they did discuss some of their thoughts as a large group during the report-out.

1. What marketing methods were effective at attracting attendees to the program?

The MOS 2.2 forum was marketed through many sources including disability organizations, community groups, college clubs, and Museum of Science email lists. The data indicated that two marketing methods worked best: the museum email list and marketing to outside groups. The most common response that participants gave regarding where they heard about the forum was a museum email (28%). Many of these attending registrants (4 of 7) were museum members or frequent forum attendees. It was unknown whether the other attending registrants who said they heard about the forum from a museum email received the email directly from MOS or were forwarded the email from one of the 134 organizations included in the MOS marketing efforts. However, the data show that marketing to outside organizations did attract some people to the forum. Some attending registrants (16%) said they heard about the event from a club/organization, and many others (24%) said they heard about the forum through an "other" source. In most cases (5 of 6 attending registrants), this "other" source was a Northeastern University ASL professor. These data indicated that hearing about the forum from a familiar and trusted source, such as the museum or a college professor, could attract people to the event. Still, it is important to consider whether the time and effort it took to market to 134 outside organizations was worth it when, in this case, less than half of the attending registrants who came to the forum were attracted through this method. Instead, targeted marketing to sources who have formed close relationships with the museum may be more effective. (See Table 49)

The Museum of Science was most successful at attracting people to the forum who were frequent visitors; however, most of them were not museum members. At the other nanomedicine forums, most of the survey respondents (78%) were frequent visitors who had been to the institution within the last year. The MOS 2.2 survey respondents were also frequent visitors. Over half (54%) had visited MOS within the last six months, and over three-quarters (78%) had been to MOS in the last year. However, few attending registrants (16%) were museum members. One possible reason for this discrepancy might have been that people attracted to the event's incorporation of ASL interpretation (whether they were ASL students, people who are Deaf, and/or friends/family of people who are Deaf) were frequent museum visitors but not members. Another possible reason for the discrepancy might have been that drop-in participants, who did not answer the membership question on the registration survey, were frequent visitors and also members. However, this cannot be verified. (See Table 50)

Table 49. Registration survey: Demographic data.

	MOS 2.2 Number of Registrants (N=25)	%
Relationship to forum topic		
Museum member	4	16%
Museum volunteer/staff	0	0%
Educator/Teacher	1	4%
Personally interested	9	36%
Researcher/Student studying nano or a related topic	1	4%
Researcher/Student studying science	2	8%
Community/Advocacy interest group member	0	0%
NISE Network Affiliate	0	0%
Other	9	36%
No Answer	3	12%
How heard about the program		
From the museum website	2	8%
From Craigs List	0	0%
From another website	0	0%
From a museum email	7	28%
From another email	3	12%
From a club/organization	4	16%
Through a friend/family member	4	16%
From a paper mailing	0	0%
Through my work	0	0%
Through my college/university	--	--
From Science Pub	--	--
From print media	0	0%
Other	6	24%
No Answer	3	12%
Temporary or permanent disabilities		
No Disability	23	92%
Mobility	0	0%
Cognitive	0	0%
Visual	0	0%
Auditory	2	8%
Learning	0	0%
Other	0	0%
No Answer	0	0%

Table 50. Exit survey: Demographic data.

	MOS 2.2 Number of Survey Respondents (N=33)	%
Gender		
Male	12	36%
Female	20	61%
No Answer	1	3%
Age		
<18	1	3%
18-24	11	33%
25-34	7	21%
35-44	1	3%
45-54	2	6%
55-64	8	24%
65-74	3	9%
75-84	0	0%
85+	0	0%
No Answer	0	0%
Race/ethnicity (Check all that apply)		
African American	1	3%
American Indian/Alaskan Native	0	0%
Asian American	2	6%
Hispanic/Latino	3	9%
White, not of Hispanic origin	28	85%
Other	1	3%
No Answer	0	0%
Last visit to Museum		
Never	2	6%
Within the last three months	14	42%
3 - 6 months ago	4	12%
6 months to 1 year ago	8	24%
1 - 2 years ago	1	3%
2 - 5 years ago	2	6%
5 - 10 years ago	2	6%
More than 10 years ago	0	0%
Not sure	0	0%
No Answer	0	0%
Key reasons you decided to attend (Check all that apply)		
To meet people, socialize	3	9%
Professional networking	3	9%
To learn about nanotechnology	25	76%
To learn about medical technology	10	30%
To hear others' perspectives	11	33%
To share my ideas with others	4	12%
To get involved at the Museum	5	15%
Sounds like fun	4	12%
Other	8	24%
No Answer	0	0%

The demographics of the people who came to this forum were different in many ways from the demographics of the participants at other forums. The only way in which this audience was similar to previous nanomedicine forum audiences was that most survey respondents were White (85%) while only a few were Hispanic (9%), Asian American (6%), African American (3%), American Indian/Alaskan Native (3%), or other race/ethnicity (3%). All other demographic characteristics of this audience were different. One difference was that there were more females (61%) than males (36%) at this forum. Interestingly, the other Museum of Science nanomedicine forum (MOS 2.1) also had more females (59%) than males (36%). At other nanomedicine forums (MLS 2.1, Explo 2.1, SMM 2.1, and OMSI 2.1), the audiences were split almost half and half between the genders (males: 47%; females: 51%). Another way that the demographics were different was that this audience was younger. At this forum, many more people were 18-24 years old (33%) compared to the previous nanomedicine forums (8%). Additionally, over half the survey respondents (57%) were less than 34 years old while there were many fewer survey respondents (28%) in this age range at the other nanomedicine forums. A final difference between this audience and other nanomedicine forum audiences was that there appear to have been more participants with disabilities at this forum. The MOS 2.2 registration data (94% no disability) shows disability levels similar to the registration data at the other nanomedicine forums (92% no disability). However, the survey data (76% no disability) indicated that the percentage of survey respondents without a disability was actually much lower. The reason for this discrepancy might have been that people did not report their disability on the registration unless they needed some kind of accommodation to participate. It was also possible that participants were more apt to report their disabilities on the exit survey than the registration survey or that participants with disabilities chose to attend without previously registering for the forum. These data might indicate that disability rates reported on the registration survey are artificially low. (See Tables 49-51)

Table 51. Exit survey: Disability data.

	MOS 2.2 Number of Survey Respondents (N=33)	%
Temporary or permanent disabilities		
No Disability	25	76%
Mobility	1	3%
Cognitive	1	3%
Visual	2	6%
Auditory	1	3%
Learning	1	3%
Other	2	6%
No Answer	1	3%

Another big difference between this forum audience and other nanomedicine forum audiences was their relationship to the topic. In previous nanomedicine forums, over half of the attending registrants (58%) said their relationship was that they were personally interested in the topic, but the percentage of attending registrants (36%) from this forum who chose this option was much lower. Instead, many attending registrants chose the "other" option (36%) as their relationship. In looking at the "other" option, it was discovered that most of these respondents (6 of 9) indicated their relationship to the topic was the ASL interpretation. Interestingly, when looking at the differences between this forum audience and other forum audiences, the reason

for all the variation was the presence of the ASL interpreter because he attracted Deaf participants and college-aged ASL students to the forum. (See Table 49)

These data indicated that two marketing methods were the best at attracting participants to the forum – museum correspondence and hearing about the forum from a trusted source such as a college professor or club/organization. These findings were similar to findings from other nanomedicine forums. However, by attracting visitors through the addition of an ASL interpreter an interesting change took place: the makeup of the audience was greatly altered. These data showed that a small change can make a large difference in the forum audience. It was suggested that if the NISE Net Forum Team is interested in attracting populations under-represented in STEM to the forums, they can use this information to think about other small changes which might have a large impact on the demographics of their audiences.

2. What aspects of the program were valued by the key stakeholders and should therefore be included in future iterations of the forum?

Similar to other nanomedicine forums, aspects of the program that the stakeholders valued most were the expert presentations and the small group discussion. However, while many stakeholders felt the experts were important, they felt that learning about nanotechnology was more important. Additionally, in contrast to many previous nanomedicine forums, many stakeholders felt that learning about nanotechnology was more important than the small group discussion.

Before the forum, many of the participants expressed that they hoped to learn. On the survey, over three-quarters of the survey respondents (78%) said that the key reason they attended was to learn about nanotechnology, and other survey respondents (30%) said that the key reason that they attended was to learn about medical technologies. The importance that the audience placed on learning was also seen in their answers to the question of what they expected from the forum. The most common response given on the survey was that the survey respondents expected to learn (13 of 33), and the second most common response was that they expected science content (8 of 33). One participant summed the importance participants placed on learning about nanotechnology before the forum when she said, "[I expect the forum] to enlighten my understanding on nanotechnology" (MOS 2.2 Survey #26). (See Tables 50 & 52)

Table 52. Exit survey: Participant expectations of the forum.

	MOS 2.2 Number of Survey Respondents (N=33)	MOS 2.2 Quotes
I will learn.	13	"Educational; however, not knowing the level or depth of the forum may show that I don't have the proper pre-requisite understanding of the current technology." (MOS 2.2 Survey #32)
It will have science content.	8	"...I want to learn about the new discoveries and their ethical boundaries" (MOS 2.2 Survey #21)
No Answer	7	--
It will be fun/interesting.	7	"I expect it would be interesting and enjoyable" (MOS 2.2 Survey #20)
Other	4	"I expected an older crowd with more business & technology background. The number of NU interpretive students is a surprise." (MOS 2.2 Survey #1)
I have no idea.	3	"Not sure" (MOS 2.2 Survey #3)
It will have a discussion.	2	"Idea sharing…" (MOS 2.2 Survey #6)
It will have societal impact content.	2	"...new discoveries and their ethical boundaries" (MOS 2.2 Survey #21)
It will have a presentation.	1	"Get some perspectives...about nanotechnology…" (MOS 2.2 Survey #10)
It will have a presentation and discussion.	1	"I expect to learn about nanotechnology from lectures and discussions with others" (MOS 2.2 Survey #16)
It will be challenging/ confusing.	1	"challenging" (MOS 2.2 Survey #7)
I will hear others' opinions.	1	"...opinions about nanotechnology research and its practical applications" (MOS 2.2 Survey #10)

Two other aspects of the forum that were important to participants before their experience, but to a lesser degree, were the small group discussion and the ASL interpretation. Many survey respondents (33%) said that a key reason they attended was to hear others' perspectives. This was a higher percentage of the MOS 2.2 survey respondents than those who said a key reason they attended was to learn about medical technologies. Another group of survey respondents said that the key reason they attended was an "other" reason. When looking at these responses more closely, it was found that many of these survey respondents (5 of 8) came in order to observe the ASL interpreter. One participant said, "[A key reason I attended was to] learn how to better interpret for our field" (MOS 2.2 Survey #24). (See Table 50)

These data indicated that, before the forum, participants were most interested in learning about nanotechnology and that the medical focus of the forum was not as important to the participants as the larger topic of nanotechnology. Another aspect driving some participants to the forum was the chance to hear others' perspectives. This might indicate that the participants were interested in the discussion, but it might also indicate an interest in hearing from various nanotechnology experts. Finally, the opportunity to watch the ASL interpreter was important to a large number of participants, .

After the forum, the aspects of the program that were valued most by the stakeholders were still the small group discussion and the opportunity to learn. When asked what they valued most about the forum, the participants gave a number of responses. However, the top three responses

that they gave all had to do with learning about nanotechnology: access to information (10 of 33 survey respondents), the nanotechnology topic (9 of 33 survey respondents), and access to the experts (7 of 33 survey respondents). One participant said, "[I valued] the opportunity to learn more about nano-technology" (MOS 2.2 Survey #27). Another participant explained, "The presentation by [the speaker] greatly broadened my thinking about the range of topics implicated in any health discussion or technology developments" (MOS 2.2 Survey #6). Other participants said they most valued the small group discussion. They valued the discussion because it provided the opportunity to hear a diverse range of opinions (6 of 33 survey respondents) and to discuss with others (5 of 33 survey respondents). One participant said, "[I valued] interaction with others from the community with different viewpoints" (MOS 2.2 Survey #4). (See Table 53)

Table 53. Exit survey: Aspects of the forum participants valued most.

	MOS 2.2 Number of Survey Respondents (N=33)	MOS 2.2 Quotes
Opportunity to learn/access to information	10	"the opportunity to learn more about nano-technology" (MOS 2.2 Survey #27)
The topic of nanotechnology	9	"...nanotechnology impact on environmental" (MOS 2.2 Survey #3)
Listening/access to experts	7	"The presentation by Dr. Sandler greatly broadened my thinking about the range of topics implicated in any health discussion or technology developments." (MOS 2.2 Survey #6)
Diverse range of viewpoints	6	"Hearing about others' fear of potential negative consequences of nanomedicine" (MOS 2.2 Survey #17)
Discussing with others	5	"Interexchange of ideas from professionals" (MOS 2.2 Survey #9)
No answer	4	--
Other	3	"helped me weigh the pros & cons" (MOS 2.2 Survey #13)
Societal/ethical issues discussed	2	"...the human related portion of forum" (MOS 2.2 Survey #30)
Meeting other participants	1	"Interaction w/ others from the community…" (MOS 2.2 Survey #4)

The other stakeholders agreed with the participants that the most valuable aspects of the forum were the presentations and the discussion with the public. Both of the speakers mentioned the importance to engage and teach the public about the topic of nanotechnology. One speaker said, "[It is important for me to participate because] I believe that people in academia should engage in public scholarship when they have the opportunity" (MOS 2.2 speaker follow-up). The speakers also agreed that it was valuable to hear the views of the public and get their feedback through discourse. One speaker said, "[I valued] the questions from the participants which allowed me to think about my research (and the field) from a different perspective" (MOS 2.2 speaker follow-up). These comments showed that these two speakers felt that it was important to have two-way discussions between academics and the public. While the speakers felt their contact with the public was important, the program developer emphasized the importance of the small group discussion. She said, "[One indicator of the success of the forum was that] engagement seemed high, and I didn't get any sense of confusion" (MOS 2.2 debrief). The

information collected indicated the importance the stakeholders place on both the discussion and nanotechnology learning.

3. What aspects of the program appeared to contribute to the program's ability to achieve its stated goals and should therefore be included in future iterations of the forum?

The presentations and discussion were important not only because the stakeholders valued them but also because they contributed to the achievement of the forums' goals. One forum learning goal was that visitors have increased knowledge of nanoscale science and technology. Before the forum, less than a quarter of the survey respondents (21%) agreed that they had a strong understanding of nanotechnology, and the percentage of people who agreed they had a strong opinion about the release of medical nanotechnologies (18%) was even lower. Both these percentages were low compared to what was seen overall at the other nanomedicine forums (33% and 35%, respectively). One possible explanation for this difference was that the people who came because of the ASL interpretation did not have much prior knowledge of nanotechnology. Despite the fact that many of the survey respondents did not have a strong understanding of nanotechnology before the forum, most of them (82%) expressed that they felt more informed about nanotechnology after the forum. This percentage was in line with the overall percentage for the other nanomedicine forums (79%). The data indicated that many of the participants did not come to the forum with a strong understanding of nanotechnology, but after the forum almost all of the participants agreed that they were more informed about the topic. (See Tables 54 & 55)

Table 54. Exit survey: Participant comfort with nanotechnology before the forum.[28]

	MOS 2.2 Mean (N=32)	% of Survey Respondents Choosing "Agree" or "Strongly Agree" (N=33)
I have a strong understanding of nanotechnology.	2.0	21%
I feel comfortable expressing my opinions on nanotechnology.	2.2	36%
I have a strong opinion about releasing medical nanotechnologies to the public.[29]	2.1	18%

[28] Participants were asked to rate these questions on a scale of 1 to 4 where 1 is "Strongly Disagree," 2 is "Disagree," 3 is "Agree," and 4 is "Strongly Agree."
[29] MOS 2.2 N=31

Table 55. Exit survey: Participant feelings after the forum.[30]

	MOS 2.2 Mean (N=32)	% of Survey Respondents Choosing "Agree" or "Strongly Agree" (N=33)
I enjoyed the experience.	3.5	97%
The experience matched my expectations.	3.2	85%
I felt comfortable expressing my opinions.[31]	3.1	70%
I feel more informed about nanotechnology.[32]	3.2	82%
I feel more informed about the risks and benefits of medical nanotechnologies.	2.9	70%
It was clear what we were supposed to do during the forum.[33]	3.1	76%
The presentations were easy to understand.	3.4	91%
The discussion scenarios were easy to follow.	3.2	85%
We weighed the pros and cons of medical nanotechnologies during our discussion.	3.2	88%
A diverse range of viewpoints were represented in our small group discussion.	3.1	76%

On an open-ended question, most of the survey respondents discussed the specific learning they gained about nanotechnology. The most common response that the survey respondents (8 of 33) gave was that they learned a lot of things about nanotechnology. One participant said, "[I learned] everything about nanotechnology" (MOS 2.2 Survey #18). Other survey respondents said they learned about nanotechnology applications (6 of 33 survey respondents) or the science and technology of nano (4 of 33 survey respondents). One participant said, "[I learned] how nano is being used in cancer treatment" (MOS 2.2 Survey #9). Another participant said, "[I learned about] the possibility of making cancer cells die from nanotechnology" (MOS 2.2 Survey #26). These data show that many participants did learn content about nanotechnology from the expert presentations and the discussion scenarios. (See Table 56)

[30] Participants were asked to rate these questions on a scale of 1 to 4 where 1 is "Strongly Disagree," 2 is "Disagree," 3 is "Agree," and 4 is "Strongly Agree."
[31] MOS 2.2 Mean N=30
[32] MOS 2.2 Mean N=30
[33] MOS 2.2 Mean N=31

Table 56. Exit survey: Things participants reported learning from the forum.

	MOS 2.2 Number of Survey Respondents (N=33)	MOS 2.2 Quotes
Lots of information	8	"everything about nanotechnology" (MOS 2.2 Survey #18)
Societal aspects of nano	7	"I did not really figure the social implications" (MOS 2.2 Survey #21)
Uses of nanotechnology	6	"Applications of nanomedicine in cancer diagnosis and treatment" (MOS 2.2 Survey #19)
No answer	5	--
About science/technology of nano	4	"how nanotech can combat cancer" (MOS 2.2 Survey #15)
About the risks of nano	2	"Pros and cons of nanotechnology. Some benefits and fears." (MOS 2.2 Survey #3)
Significance of nanotechnology	1	"...how much people are trying to anticipate the issues before they have life-changing consequences." (MOS 2.2 Survey #6)
What others are thinking	1	"The voice of the people about nanotechnology (More health oriented than what I thought)" (MOS 2.2 Survey #10)
Other	1	"Don't have enough info to determine if I am pro or con" (MOS 2.2 Survey #13)
Regulations and policies of nanotechnology	1	"All the concerns about what the FDA is not doing" (MOS 2.2 Survey #23)
That I didn't know much about nano before	1	"Didn't know anything about nanotechnology before" (MOS 2.2 Survey #12)
Future directions of nano	1	"...how nanotechnology may be used to treat cancer in the future." (MOS 2.2 Survey #30)
Very little	1	"not very much" (MOS 2.2 Survey #17)

Other goals for the forum were intended to be addressed during the small group discussion. One goal was to increase participants' comfort discussing nanotechnology. Before the forum, less than a quarter of the survey respondents (21%) agreed that they feel comfortable expressing their opinions about nanotechnology. This percentage was lower than the overall percentage for the other nanomedicine forums (33%). One possible explanation for this difference was that because the survey respondents were less familiar with nanotechnology they felt less comfortable about the idea of discussing nanotechnology than the audiences at the previous nanomedicine forums. It was also possible that the college-age participants felt intimidated by the discussion format. However, after the forum, the percentage of people who agreed that they felt comfortable expressing their opinions (70%) increased to well over half of the survey respondents and was much greater than the percentage of survey respondents who felt comfortable expressing their opinion about nanotechnology before the forum. Though this percentage was smaller than the overall percentage for the other nanomedicine forums (86%), it still indicated that this forum provided an environment where most of the participants felt comfortable discussing their opinions. (See Tables 54 & 55)

Another forum goal was that people experience a diversity of opinions during the small group discussion. At this forum, over three-quarters of the survey respondents (76%) agreed that there was a diverse range of opinions at their small group discussion table. At the previous communal

nanomedicine forums, the overall percentage of survey respondents (79%) who agreed that there was a diverse range of viewpoints represented in their small group discussion was similarly high. Not only did many of the survey respondents agree that there were a diverse range of viewpoints at their table, many of them also valued this aspect of the forum. When the participants were asked what they valued most, the fourth most common response given by survey respondents (6 of 33) was that they valued the diverse opinions at their table. One participant said, "[I valued] hearing about others' fear of potential negative consequences of nanomedicine" (MOS 2.2 Survey #27). The program developer also discussed that she heard from some of the participants about their enjoyment of their small groups. She said, "I talked to people that liked the makeup of their table" (MOS 2.2 debrief). These data indicate that not only did many participants feel they heard a diversity of opinions, but also that they valued the opportunity to hear differing ideas and viewpoints. (See Tables 55 & 56)

Another goal for the small group discussion was that visitors discuss and weigh the societal and ethical implications of nanotechnology. Most of the survey respondents (88%) agreed that they weighed the pros and cons of medical nanotechnologies during their small group placing them in line with the survey respondents at the other nanomedicine forums overall (89%). Additionally, many of the survey respondents (7 of 33) reported that what they learned from the forum was the societal aspects of the topic. In fact, the societal aspects were the second most mentioned answer to this question. One participant said, "I did not really figure [on] the social implications" (MOS 2.2 Survey #21). Another participant said, "I learned about the possible applications of nanotechnology and also the societal and ethical implications" (MOS 2.2 Survey #25). (See Tables 55 & 56)

In addition to reporting that they learned about the societal and ethical implications during the forum, many participants also answered the question about which of these issues made them think differently about medical nanotechnologies. The most common response that survey respondents (6 of 33) gave was that the risks and benefits of nanotechnology made them think differently about the topic. One participant explained, "Long-term side effects [made me think differently about nanotechnology]" (MOS 2.2 Survey #13). Other survey respondents (5 of 33) felt that the societal issues made them think differently about medical nanotechnologies. One participant said, "[I felt differently about nanotechnology when I considered the question] When do benefits outweigh the possible negative implications?" (MOS 2.2 Survey #25). Other survey respondents (4 of 33) explained that medical issues and concerns made them think differently about medical nanotechnologies. One participant said, "[The idea of] testing nanotechnology on animals and in the future humans [made me think differently]" (MOS 2.2 Survey #30). These data indicated that most participants did consider the societal and ethical implications of nanotechnology as a result of the expert presentations or small group discussion. (See Table 57)

Table 57. Exit survey: Topics participants said made them think differently about medical nanotechnologies.

	MOS 2.2 Number of Survey Respondents (N=33)	MOS 2.2 Quotes
No Answer	13	--
Risks and benefits in general	6	"Long-term side effects" (MOS 2.2 Survey #13)
Societal issues	5	"the long term effects, we don't know any of them" (MOS 2.2 Survey #26)
Medical concerns/issues/risks	4	"the idea that it has potential to possibly cure cancer" (MOS 2.2 Survey #27)
Regulation of nano	2	"FDA balancing cost/benefits" (MOS 2.2 Survey #4)
Other	2	"We didn't really come to any conclusions" (MOS 2.2 Survey #19)
One of the scenarios	2	"The sunscreen topics made me think differently about nanotechnology" (MOS 2.2 Survey #20)
Environmental concerns/issues/risks	1	"The unknown potential environmental consequences involved in the use of nanotechnology" (MOS 2.2 Survey #16)
Not sure	1	"?" (MOS 2.2 Survey #7)

The data in this section indicated that multiple aspects of the forum worked together to allow the forum to achieve its goals. The atmosphere of the event allowed many people to feel comfortable and express their opinions. The expert presentations led many of the participants to feel more informed about nanotechnology and the potential societal and ethical implications. The small group discussion allowed the participants to consider the societal and ethical issues and hear a diversity of opinions.

4. How could the programmatic model be refined so that it better achieves the stated goals and objectives?

As with the previous nanomedicine forums, the percentage of survey respondents (97%) who agreed that they enjoyed the event was high. However, there were still some aspects of the programmatic model that the stakeholders felt needed to be refined including the timing of the event segments, the content presented, and the report-out. Other parts of this forum which were troublesome for the stakeholders at other forums worked much better for the stakeholders of the MOS 2.2 forum. These parts of the forum included the speaker presentations and the small group discussion scenarios. (See Table 55)

The program developer, speakers, and participants all felt the timing of the event needed to be refined though each group had different ideas about what changes need to be made. The program developer was concerned that the question and answer session went too long and that the event felt rushed.

> *The Q and A went a little long… [I gave] five minutes for each speaker but it went long and this squeezed the discussion time… If I could change anything, I would make the program another ½ an hour longer… The way it currently is, it feels rushed.* (MOS 2.2 debrief)

One of the speakers agreed that the event should be lengthened. He said, "The only comment I heard from attendees was to make the sessions longer. Thus, perhaps a Saturday afternoon would be better than a week night" (MOS 2.2 speaker follow-up). While the speaker and program developer were concerned about the overall length of the forum, the participants were most concerned about the amount of time they had with the experts. When the participants were asked how they feel about the time breakdown of the different programmatic segments, they were content with the length of all the segments except the question and answer period (12 of 29 survey respondents) and the expert presentations (13 of 29 survey respondents) which they felt were too short. This concern about the time with the experts also came up when the participants were asked what could be done to improve the forum. The most common response given to this question was to change the timing of the event (5 of 33 survey respondents), and most of these comments (4 of 5) referred to the amount of time given to the experts. One participant said, "I would have liked to hear from the presenters for a bit longer…" (MOS 2.2 Survey #25). (See Tables 58 & 59)

Table 58. Exit survey: Participant feelings about the time breakdown.

	MOS 2.2 Number of Survey Respondents choosing "Too Short"	MOS 2.2 Number of Survey Respondents choosing "Too Long"	MOS 2.2 Number of Survey Respondents choosing "Just Right"
Welcome/Introduction (N=31)	0	2	29
The speaker presentations (N=29)	12	2	15
The small group discussion (N=31)	0	4	27
The question and answer period (N=31)	13	0	18
The large group discussion (N=28)	3	3	22

The participants' need for information about nanotechnology was another reason why they wanted the speakers' times expanded. The other most common response that participants gave about what could be improved about the forum was the content (5 of 33 survey respondents). Looking at the responses that the participants gave, it became clear that the change in content they wanted was more nanotechnology information. One participant said, "[To improve the forum, add] more expanded information on Rice University studies" (MOS 2.2 Survey #3). Another participant said, "[To improve the forum add a] general view related to environmental history" (MOS 2.2 Survey #22).

These data emphasized the difference in the priorities of stakeholders. The participants were most interested in learning about nanotechnology and hearing from the experts. Therefore, they wanted more time with them. The program developer was most concerned about having enough time for the small group discussion. Therefore, she wanted to shorten the time for questions and answers. Because of these concerns, it was suggested that the NISE Net Forum Team consider whether the participants were getting what they needed out of the expert presentations and what needed to be changed in order to make the participants feel content with their learning. As the program developer expressed, it was suggested that one option might be to lengthen the expert presentations and the length of the event. Another option might be to more tightly control the content of the presentations. (See Table 59)

Table 59. Exit survey: Ways that participants say the forum could be improved.

	MOS 2.2 Number of Survey Respondents (N=33)	MOS 2.2 Quotes
No Answer	12	--
Change the amount of time spent on different segments of the program	5	"I would have liked to hear from the presenters for a bit longer, but overall I enjoyed this experience and learning at least the general topics involved in this field." (MOS 2.2 Survey #25)
Change the content/topic	5	"A movie explaining a little bit more about nanotechnology" (MOS 2.2 Survey #20)
Change the food service	2	"FOOD" (MOS 2.2 Survey #28)
Other	2	"Please continue providing ASL interp." (MOS 2.2 Survey #14)
Change the moderated discussion	2	"Many points in our small discussion were not aired in the larger forum so they remain unknown to the panel. I believe a secretary should sit (or recorder) @ each table & those topics turned into the panel…" (MOS 2.2 Survey #8)
Provide a way for follow-up	2	"An ongoing exchange opportunity i.e.- newsgroup or email group discussion possibility" (MOS 2.2 Survey #9)
Don't change a thing	1	"It was great." (MOS 2.2 Survey #16)
Improve the audio-visuals	1	"...microphones slow discourse and not always necessary" (MOS 2.2 Survey #1)
Improve the connection between the presentations and discussion	1	"The scenarios to the speakers talks" (MOS 2.2 Survey #4)
Provide more organizational structure	1	"Have a better guideline for the reflexion (that went a bit more general)" (MOS 2.2 Survey #21)
Change the format	1	"...Ask people to write their questions/comments and select some of them to be discussed (1 set/table)" (MOS 2.2 Survey #10)
I'm not sure what to change	1	"?" (MOS 2.2 Survey #7)

Another concern that the program developer had about the forum was the report-out. The program developer thought that this part of the forum did not create a satisfactory end to the discussion and that it could be improved.

> *I would structure the report-out more. I soft sold assignments. I also think it was unclear what [the participants] were supposed to do with the overarching question. [I think we need to] say we are not asking you to answer it. [We also need to] make sure that the participants know that we expect to hear from each table so they have someone to take notes and report out.* (MOS 2.2 debrief)

She also said that she feels that because of the way the report-out was structured the participants missed out on hearing what happened in discussions other than their own. She said, "They each got only their experience with six to eight people and didn't get to hear what the rest

of the room was talking about." Instead, the report-out "turned into a Q and A" (MOS 2.2 debrief). To improve the report-out, it was suggested that the NISE Net Forum Team figure out how to better integrate the overarching question into the discussion. It was thought that one option might be to have each small group write a reaction statement to the question at the end of their discussion (something that OMSI and the Exploratorium tried after the completion of this forum). Another option might be to remove the overarching question altogether. It was suggested that the NISE Net Forum Team also think about how the information generated in the small group discussion should be disseminated to the larger group. It was thought that one option might be to have one member from each table talk about their reaction to the overarching question or discuss the content of their small group discussion. Another option might be to create a script of questions for the participants whose purpose is to generate discussion with the larger group.

Even with the issues stakeholders had with some parts of the forum, other parts of the forum seemed to work especially well, particularly the expert presentations and the discussion scenarios. Despite wanting more information, the stakeholders appeared happy with the expert presentations. Almost all the survey respondents (91%) agreed that the expert presentations were easy to understand. This percentage that was higher than the overall percentage (84%) seen for the other nanomedicine forums. The ease that participants had understanding the presentations could at least partially be explained by way the program developer prepared the experts for their talks. She said, "The speakers worked well. I worked with the speakers and went over the entire presentation with them. With one of the speakers, I helped him to change the content" (MOS 2.2 debrief). The speakers agreed that this helped them to create good presentations. One speaker said, "[The program developer] looked over my slides and gave me very helpful suggestions. I think we went through three or four drafts which was excellent. She also visited me on campus to meet in person to discuss various suggestions, which was also helpful" (MOS 2.2 speaker follow-up). By working with the speakers to create their presentations, the program developer ensured that the experts presented appropriate content at the right content level. It was suggested that the team consider continuing this work with the expert presenters to ensure the quality of expert presentations. (See Table 55)

The participants also seemed to think that the discussion scenarios worked particularly well. Most of the survey respondents (85%) agreed that the scenarios were easy to follow. This percentage was higher than the percentage given by survey respondents at the other nanomedicine forums (76%). In addition, when participants were asked what could be improved about the forum, no one suggested changing the overarching question or the scenarios. This was a change from previous nanomedicine forums where the most common answer that survey respondents (24 of 176) gave in response to the question of what could be improved about the forum was the overarching question/statement. The data from this forum showed that the scenarios and overarching question worked much better than at previous forums. Therefore, it was suggested that though the integration of the overarching question still needed to be reconsidered, the data indicated that the content and presentation of the overarching question and scenarios should stay basically the same. (See Table 55 & 59)

5. What changes should be made to the program so that it becomes cheaper and easier for other museums to implement?

The program developer could not think of many changes that could make the forum cheaper and easier to implement. However, she did suggest creating a nanotechnology 101 video. The program developer felt that creating this video would be a good idea because we "need to guarantee certain things" are presented (MOS 2.2 debrief). She also felt that creating the video is

important because "if we could show a short nano 101 video that is common across forums this would make producing a forum easier" (MOS 2.2 debrief). It was suggested that in order to ensure that certain information about nanotechnology was passed onto the participants, the team should consider producing video that contains basic nanotechnology information for future iterations of the forum.

The program developer also discussed an aspect of the forum that she would like to add back into the forum as long as money is not an issue: refreshments.

> *We only gave out water…. It is nice to have coffee and tea, but the catering here is expensive. I would do it without [the catering company] if I could. If there weren't the current catering rules, I would add food.* (MOS 2.2 debrief)

A few of the participants agreed. When asked what about the forum could be improved, a couple of the survey respondents (2 or 33) said that the food service should be changed. One participant said, "[The forum would be improved with] FOOD" (MOS 2.2 Survey #28). The other participant said, "[The Forum would be improved with] snacks" (MOS 2.2 Survey #26). Because of these continuing concerns about food, it was suggested that the NISE Net Forum Team should consider providing light snacks to participants or changing the time of day that the forum was presented so that it does not coincide with mealtimes. (See Table 59)

6. How could the program be improved so that it better meets the needs of the key program stakeholders (including adult learners, museum educators, and nano-researchers)?

Data gathered from the stakeholders indicated that the parts of the forum that were the most in need of work were marketing, timing of the event, and the report-out. Unlike previous nanomedicine forums, the participants at this forum were more diverse because the forum reached some people with disabilities and people interested in ASL. This meant that this forum did a better job at reaching some people underrepresented in STEM. However, it was felt that more work still needed to be done to figure out how to effectively market to these audiences. In this case, 134 community groups were marketed to including many disability-related groups. However, it appeared that the participants who were attracted as a result of marketing to these groups came from only a few of the organizations. Therefore, it was suggested that the NISE Net Forum Team should think about whether marketing to large numbers of groups was worth the effort. Instead, it might be more effective to attract participants underrepresented in STEM by creating partnerships with related community organizations or by creating forums with certain organizations. Another issue with the marketing of this event was that it attracted predominantly those who are frequent visitors to MOS. This showed the difficulty of attracting those unfamiliar with the NISE Net institutions to the forums. It was suggested that it might be necessary to take forums to new locations in order to attract participants unfamiliar with our institutions.

Another aspect of the forum that needed to be reconsidered was the timing of the event. The participants wanted more time with the experts, and a speaker and the program developer both commented that the forum felt rushed. Therefore, it was suggested that the NISE Net Forum Team consider whether it was necessary to lengthen the event. The forum could be lengthened by a half hour to give the experts more time for presentations, give the participants more time for questions and answers, and give the small groups more time for discussion. It was suggested that if the team did not want to lengthen the event, another option was more closely controlling

the content of the presentations to ensure that the participants were getting the information that they needed in order to comfortably discuss the societal and ethical implications of nanotechnology. It was felt that whatever the team decided to do, they needed to recognize that this finding illuminated the conflict between the participants' desire to learn from the experts and the other stakeholders' desire to promote discussion of the societal and ethical implications of nanotechnology.

A final aspect of the forum that needed to be modified was the report-out. The program developer felt that this forum's report-out was more of a final Q and A than a chance for the participants to talk about their small group discussions. This problem illustrated the importance of creating goals for the report-out and creating the programming needed to achieve those goals. It was suggested that the first step the team needed to take was to decide what they wanted the participants to get out of the report-out. One possible goal might be that the large group hears what happened in the small groups. Another goal might be that the participants get a chance to talk about their individual experiences. It was suggested that after this decision was made then the team needed to decide the best way to reach those goals. One way to help the participants debrief as a larger group might be to ask each group to create a reaction statement to the overarching question and read this statement to the larger group. Another way to help the participants report-out about their small group might be to create a series of questions that cause the larger group to discuss what happened in the smaller group. It was suggested that before the NISE Net Forum Team disseminated the nanomedicine forum, they should solidify the report-out process.

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Appendix A: Other Information about the Forums

Table A1. Dates and locations of the forums included in this evaluation.

Forum	Location Where the Forum Took Place	Date
MLS 2.1	Museum of Life and Science	3/27/2007
SMM 2.1	Science Museum of Minnesota	4/26/2007
Explo 2.1	Exploratorium	6/5/2007
MOS 2.1	Museum of Science	6/18/2007
OMSI 2.1	Oregon Health & Science University[34]	7/16/2007
MOS 2.2	Museum of Science	9/24/2007

Table A2. Data collection instruments used at each of the study forums.

Forum	Registration Surveys	Pre/Post Exit Surveys	Observations	Evaluator Discussion Debriefs	Educator Debriefs	Speaker Follow-up Email
MLS 2.1	X	X	X	X	X	X
SMM 2.1	X	X	X	X	X	X
Explo 2.1	X	X		X	X	X
MOS 2.1	X	X		X	X	
OMSI 2.1	X	X	X		X	X
MOS 2.2	X	X			X	X

[34] Oregon Health & Science University is located in Portland, OR.