Full STEAM Ahead Teen Art-Science Workshop Series

Formative Evaluation

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Executive Summary

The Full STEAM Ahead Teen Art-Science Workshop series, jointly conducted by National Museum of Natural History and ARTLAB+ at the Hirshhorn Museum and Sculpture Garden, provides workshop opportunities for local youth to find new ways of exploring their world by integrating art and science design thinking skills with innovative technology.

This report summarizes findings from a dual-focused formative evaluation designed to generate information that would help staff strengthen programming in the coming year by meeting two challenges the program has faced in integrating arts and science: (1) to broaden strategies for attracting teens to mixed-discipline programs; and (2) to improve strategies for integrating arts-thinking into science and science-thinking into the arts. Thus the evaluation focused on understanding: (1) how teens who associate their interests with either arts or sciences relate to art and science programming, and (2) understanding how the *Amplify* workshop, as an example of the STEAM partnership, influenced participants' understanding and attitudes toward both science and art.

The results presented below that address the first focus area derive from questionnaire responses from 200 anonymous teens, obtained through and online (Qualtrics) sampling service responding to an online questionnaire. Results that address the second focus area derive from a similar questionnaire given to workshop participants before and after their five-day Amplify experience.

Overall Findings and Recommendations

- Overall, it appears that arts-oriented teens are interested in learning science and can gain access through artistic avenues that relate to their artistic interests—whether performance, visual, musical, literary, etc.. More challenging is to increase science-oriented students' interest in the integrated experience of how creative thinking and processing enhances scientific investigation and how exposure to the arts enhances this creative ability. **Recommendations:** (1) **continue engaging arts-oriented students in STEM through arts-based activities and (2) explore ways of communicating the utility/necessity of creative thinking in the sciences.**

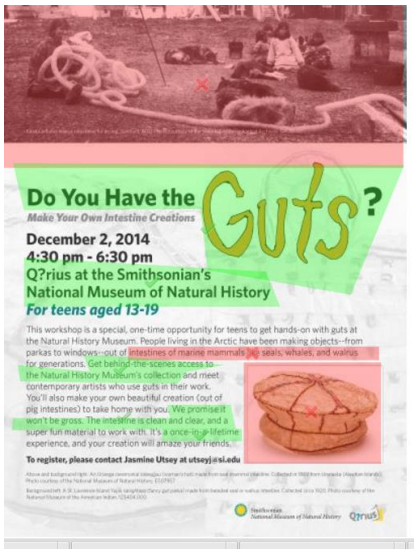
One arts-oriented participant's comment about using a microscope to "study the world closely" implied an integration of science as a way of seeing.

- Arts-oriented students tended to be more concerned about feeling incompetent than did science students –in both arts-based and science-based activities. **Recommendation: Include in outreach to arts-oriented teens reassurances that the environment will be one that helps learners draw from their own experience and abilities.**

- Many science-oriented teens identified "boredom" as a reason to avoid arts-related activities. **Recommendation: Include in outreach to science-oriented teens rationale for how creative arts-like thinking enhances scientific ability.**
- Evidence of seeing arts and science as two separate cultures was stronger among teens in the general population than among teens who selected to participate in a STEAM workshop. Among participants after the workshop, the separation blurred even further—a sign of workshop success. **Recommendation: in future summative evaluations, include measures of "cultural" (science-art) integration.**
- Workshop participants increased their appreciation for and interest in how involvement with the arts benefits scientists and how involvement with science benefits artists.
- The workshop enhanced participants' enthusiasm for both the Hirshhorn and NMNH. However, The *Q?rius* logo was the only aspect of the *Amplify* ad to dampen enthusiasm among respondents (although this effect occurred only among 20%). Also, workshop participants' enthusiasm for the phrase "Q?rius at NMNH" dampened over the course of the workshop. **Recommendation: Taken together these findings suggest that staff should reevaluate the desired intention and effect of the logo and adjust accordingly**
- Future study of more workshops (and therefore greater sample size) will lead to more detail about how arts-oriented and science-oriented teens differently benefit from the experiences.

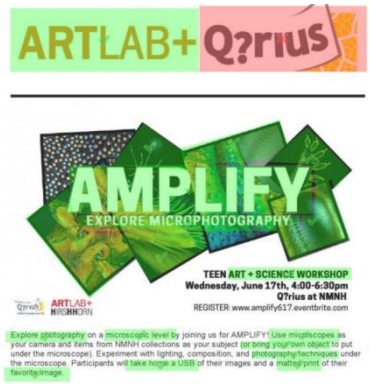
Focus Area 1. Findings related to how science-oriented and arts-oriented teens relate to science and arts-oriented programming.

The following results emerged from an online survey of 200 13-18 year-old volunteer participants, all of whom identified as being arts-oriented, science-oriented, or both; and half of whom identified as affiliated with a minority ethnic or racial group.



Response to Advertisements

Using a "hot spot" feature of the online questionnaire, respondents identified each phrase or image of two advertisements as a "perk" to their enthusiasm to attend (green), a damper (red), or no effect (no color). In general, respondents had a more positive response to the "*Amplify*" advertisement than the one for "*Do you have the Guts?*" Negative responses to the *Guts* ad primarily focused on references to intestines and the lack of attractiveness of the photos. Responders of both arts and science orientations were equally as turned off by the phrases related to intestines although



they also all liked the title "*Do you have the guts?*" Respondents also showed enthusiasm for NMNH;combining art and science; using microscopes; and exploring microphotography.

The *Q?rius* logo was the only aspect of the *Amplify* ad to dampen enthusiasm among respondents (although this effect occurred only among 20%). It is possible that the curiosity meant to be engendered by the odd spelling may feel too challenging to some teens. **Recommendation:** Staff should reevaluate the desired intention and effect of the logo and adjust either the logo or its use accordingly.

Arts-oriented teens reacted to both advertisements more strongly than did science-oriented teens. They also showed greater interest in science than did science-oriented teens show interest in the arts.

Reasons to attend or not attend arts or science activities

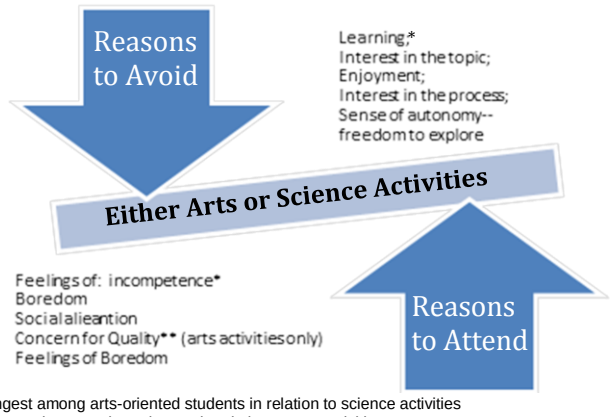
Respondents answered four questionnaire items that each asked for three words or phrases describing why the respondent would or would not attend a science or an art learning activity such as a workshop or lecture. Thematic analyses and frequencies revealed the following:

Teens' reasons for attending or avoiding activities were similar across disciplines—thus making the challenge of attracting teens to STEAM workshops a bit easier.

Reasons for attending either type of activity included: learning; interest in the topic (or in the case of the arts, interest in a specific medium or genre); enjoyment; self-expression, and interest generally in the artistic or scientific process.

Reasons for *not* attending either kinds of activities included avoiding feelings of incompetence; feelings of boredom or disinterest; or feelings of feeling socially out place. In addition, concern for quality (e.g. *not professional*; *too out there*; *disapporinting*) emerged as a consideration related to arts (but not science) events.

Some differences between arts-oriented and science-oriented teens did occur. Not surprisingly, arts-oriented teens had less *general interest* in **attending science-related** activities and were more concerned with *experiencing difficulty with the content*. On the other hand, arts-oriented teens more frequently listed *learning* as a reason to attend a science-oriented event.



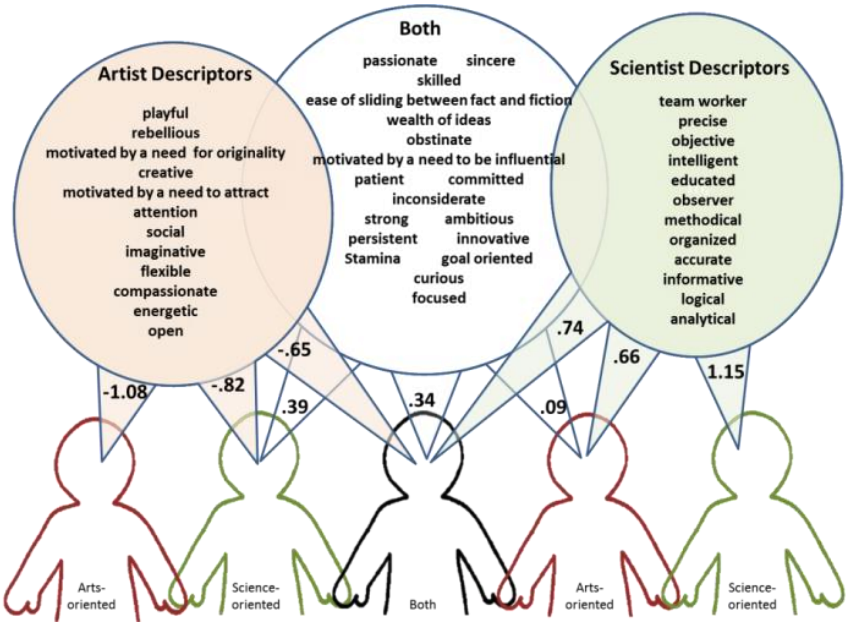
* strongest among arts-oriented students in relation to science activities
** among science –oriented teens in relation to arts activities

Arts-oriented teens also expressed more concern than did science-oriented teens about *experiencing difficulty* in an **arts-related activity**. Science-oriented teens expressed more concern about *not wanting to feel bored* by an arts activity than did arts-

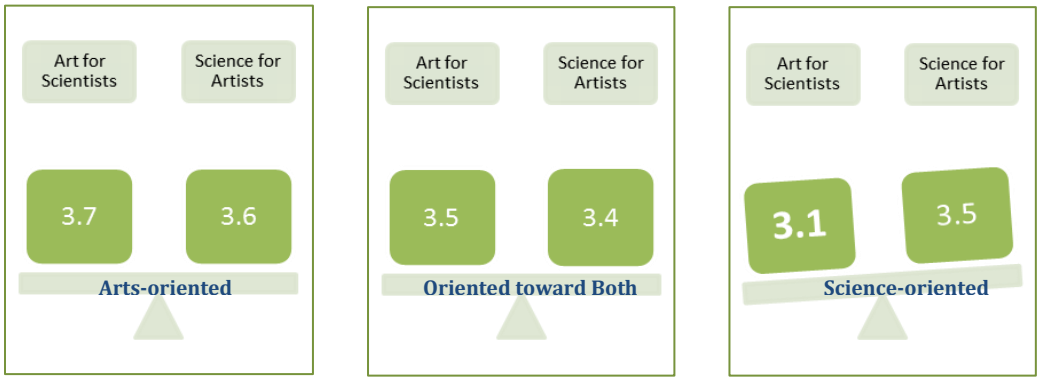
oriented teens. They also expressed more concern about *socializing with peer artists (e.g.,"weird people"* or "*airheads")*.

Descriptions of Artists and Scientists by Arts-Oriented and Science-Oriented Teens

Teens were provided with a list of 40 descriptive words and asked to rate them on a scale ranging from "described artists totally" (-3) through "describes both equally" (0) to "describes scientists totally" (3). In general, both arts-oriented and science-oriented teens used certain words to describe artists and others to describe scientists, and some to describe both. Arts-oriented teens identified words associated with artists more strongly than did science-oriented teens. Science-oriented teens identified words associated with scientists more strongly than did arts-oriented teens. In other words, teens of one "culture" recognized the words usually applying to the "other" culture as also applying to themselves. Teens oriented to both arts and sciences used more words to describe both cultures. This finding provides reason to believe that change toward the middle would indicate successful STEAM programming such that participants are recognizing that while the products differ, the thought processes draw from and inform both cultures.



Descriptions of the Utility of Interdisciplinary Learning



Respondents reflected on two questionnaire items that provided statements about the utility of scientists studying the arts and Artists studying science. Averaged Likert-scale responses (five points ranging from strongly agree to strongly disagree) revealed that science-oriented teens recognize less utility of the arts for scientists than do teens of arts or both arts and science

orientation. Thus, appealing to science-oriented students should recognize the need to additionally inform them of potential benefits of integrating artistic processes and creativity into science.

Part 2. Findings Related to Workshop Effect

Results presented in this section are based on online pre and post workshop questionnaire responses from 14 of the 18 Amplify workshop participants. Fourteen provided pretest data; 11 responded to the post test and 7-9 participants (depending on the question) provided responses at both data collection times.

Comparisons to the General Sample

Prior to the workshop, participants' responses reflected the general population's—with some exceptions. Workshop participants:

- showed greater appreciation for where the arts and sciences meet.
- more highly valued the utility of interdisciplinary learning.
- had more discerning reasons for wanting to attend an arts-related workshop.
- more strongly used words to describe both artists and scientists rather than just one or the other.

Workshop Effect on Identity, Interest, and Motivation

The workshop **achieved a balance between stimulating participants' interest in both the arts and science.** On the one hand, the workshop respondents (most of whom were arts-oriented) experienced increased interest in science such that it would affect their choice making about what they would choose to read, how they would choose activities, and how they would choose topics for school projects. On the other hand, participants showed greater intention toward using arts-related resources (including museum exhibits) for satisfying their curiosity.

The two science-oriented workshop respondents demonstrated **increased awareness of the importance of the artistic process to their scientific inquiry** with comments such as *work that encourages you to be self-guided and curious is important* and *I want room to explore*.

Workshop respondents **increased their enthusiasm for the program sponsors** – perhaps contributing to the programs' short term goal of increasing "curiosity in museums, their collections, and their educational programs."

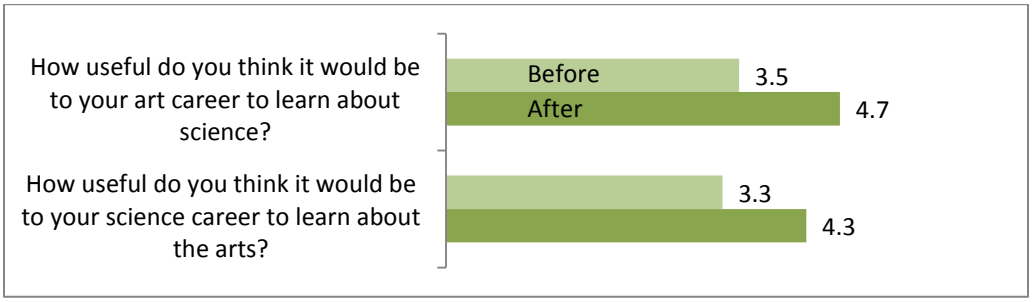
Workshop Effect on Perceptions of Connections between Art and Science

Workshop participants gained appreciation for the utility of artists knowing about science and of scientists knowing about art. While most of these changes reflected a more simple side-by-side understanding of the relationship, some reflected a deeper interdisciplinary integration.

After the workshop, **participants adjusted their word use toward applying to both artists and scientists.** They came to understand scientists as sharing with artists the traits of *rebellious* and *sliding easily between fact and fiction*—both of which are essential to thought processes that lead to innovation. They also came to understand artists as being able to be described more often with words such as *accurate*, *organized*, *team workers,* and *objective.* Word attribute shifts specific to orientation are additionally listed in the figure below.

Workshop participants also came to understand artists as requiring science-oriented skills and thought processes for their work, such as "*using experimental/analytical approaches when in an artistic/creative way*" or "*there's a whole new world when you view it in both places at once*" —a realization that may help explain why the arts-oriented participants became more interested in engaging with science.

These findings of workshop participants' increased awareness of the nexus between the arts and sciences were further strengthened by the finding that participants' ratings of utility of arts to a science career and science to an arts career (five-point Likert-type scale ranging from 1=useless to 5 = useful) both improved significantly. Moreover, among these mostly arts-oriented respondents, the recognition of the utility of science to an arts-career was even greater than vice versa. On the other hand this finding underscores the challenge of communicating the very important role of creativity and the arts to a successful science career.



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Introduction

The Full STEAM Ahead Teen Art-Science Workshop series, jointly conducted by National Museum of Natural History and the Hirshhorn Museum and Sculpture Garden ARTLAB+, provides workshop opportunities for local youth to find new ways of exploring their world by integrating art and science design thinking skills with innovative technology. Targeting both arts-oriented and science-oriented youth, the program's intended long-term youth-directed outcomes involve integration of both artistic and scientific thinking into careers, career choice, and 20th century skills. As outlined in the program's logic model, one of these outcomes is to increase in the number of teens utilizing art and design thinking and skills in science and science-related careers, and scientific thinking and skills in art and design careers. To achieve this outcome, workshops offer teens programming that combines art, science, and technology with activities such as learning directly from experts in science, using cutting edge technology, and exploring art and design. In addition to outcomes for youth, the program also seeks to meet institutional goals involving understanding how to coordinate Smithsonian Institute resources and staff expertise for youth audiences. Program administrators are seeking formative evaluation that helps staff more effectively attract teens to the program and to meet program goals in the coming year.

In order to strengthen programming for the coming year in ways that would more effectively achieve these intended outcomes, program staff sought to meet two challenges. First they wanted to broaden strategies for attracting teens to mixed-discipline programs and particularly avoid alienating arts-oriented teens with science topics and language or science-oriented teens with arts topics and language. They also wanted to improve strategies for integrating arts-thinking into science and science-thinking into the arts. Thus, they wanted know how a single individual workshop affected the way participating teens understood or responded to arts and sciences, particularly from the perspective of one or the other.

To meet these challenges, the STEAM project sponsor (NMNH) contracted with the Lifelong Learning Group to conduct a formative evaluation as part of the 2015 programming year which included one remaining workshop, titled *Amplify: Explore Microphotography*. Based on experience and expertise in conducting evaluations for museum-based youth-development programming and on discussions with staff about project needs and available resources, the evaluators conducted a formative evaluation that occurred during the summer of 2015. This report describes the focus, methods, and results of the evaluation.

Focus

The evaluation had a dual focus on understanding (1) how teens who associate their interests with arts vs. sciences relate to art and science programming, and (2) understanding how the *Amplify* workshop, as an example of the Full Steam Ahead project, influenced participants' understanding and attitudes toward both science and art.

It is important to note here that, for this study, evaluators brought an understanding of this integration as first of all, valuable and secondly, as occurring at varying levels of sophistication. Integration would occur on a conceptual scale that would range from "siloed" to fully integrated. The evaluators supported these assumptions and further understood them with research literature that helped provide language and theory for understanding both value (Eger, 2011; Root-Bernstein & Root-Bernstein, 2001) and integration (Simon, 1996; Snow, 1961; Zeki, 2001) These sources revealed that integration can range from simple to complex (Radziwell, Benton, & Moellers, 2015;

Wilson, 2002): the simplest relationship involves understanding the arts and sciences as complementary, working well alongside each other. Examples include scientist's use of science illustration and graphic design to communicate their findings or artists understanding the science behind their art materials. More complex integration occurs as the silos begin to disappear, say when the scientist uses design skills and even the creative process to "intuit" hypotheses or research design. Ultimately the arts and sciences may be integrated at a neurological level as described by Samir Zeki, the neurologist who identified the three visual centers of the brain and has shown that in many ways, artists function as neurologists (Zeki, 2001). These findings support Simon's (1996) contention that "the aesthetics of natural science and mathematics is at one with the aesthetics of music and painting both inhere in the discovery of a partially concealed pattern." Moreover, the Root-Bernsteins (2001) demonstrated 13 "thinking tools" commonly used by both artists and scientists.

Evaluation Questions

Thus, focused on the two objectives described above and using nuanced understanding of art-science integration, the formative evaluation study addressed two guiding evaluation questions:

1. How well is the promotion of this art/science workshop appealing to teens and in what ways can the program appeal to both arts-oriented and science-oriented teens more effectively?

   Sub-questions included:
   - How does each group (including groups that might relate to both discipline types) relate differently to the flyer(s) the program has produced?
   - How willing are science-oriented teens to go to an arts event?
   - How willing are arts-oriented teens to go to a science event?
   - What motivates teens to attend both science and arts events; how do these motivations differ between science-oriented and arts-oriented teens?
   - How do teens within each group describe themselves and professionals in relation to their identified science or art interest?[1]
   - How do teens within each group and describe teens and professionals in the "other" group?
   - How do the above descriptions of "self" and "other" differ between groups?
   - What words or phrases used by teens to describe people interested in arts and sciences might be useful for promoting STEAM program activities?

2. What were some of the attitude outcomes from this workshop?

   Sub-questions included:
   - What effect did this workshop have on teens identifying themselves as only "arts" vs. only "science";

[1] Due to available resources and the richness of the data, we have not yet analyzed data from responses to questionnaire items requesting 5 words to describe professionals and peers interested in sciences and arts

- What effect did the workshop have on participants' perceptions of the connections between art and science?
- How did teens' experience of the workshop compare with their expectations?
- Does depth/amount of change in self-perception differ for art vs. science oriented teens?
- How did this experience affect participants' future interest/motivation for participating in art/science/combined activities?
- What did participants feel they received from this combined art/science workshop that wouldn't have received from a workshop focused on just one or the other?

Methods

The evaluation took place from June to August 2015. The evaluation questions were answered using two types of mixed-qualitative/quantitative method surveys—one of a group of respondents provided by the Qualtrics software company and another of teens who participated in the *Amplify* workshop. Each survey addressed one of the two evaluation questions.

Methodology for Answering Evaluation Question #1:

Answers to the first evaluation question and sub-questions resulted from quantitative and qualitative analysis of survey responses from arts-oriented and science-oriented teens. An online survey questionnaire (see Appendix A) probed ways science-oriented and arts-oriented teens understand and describe:

- themselves and others as artists and scientists;
- their interest/attraction to art and science; and
- motivations and deterrents for attending arts vs. science activities.

A sample was obtained through the Qualtrics panel service which accesses teens through their parents' interaction with online opportunities to participate in surveys. Qualtrics sampling is in compliance with ESOMAR (marketing research) standards and COPPA (Children's online privacy protection act) requirements, (Qualtrics, 2014). Teens were screened in order to obtain a sample of 200 13-18 year olds with an interest in either art activities, science activities or both and to make sure the sample included at least 50% minority responders and at least 33% of the sample in each of the three arts-science orientation categories. As incentive for responding, depending on their arrangement with Qualtrics' marketing partners, teens' parents received incentives in the form of points, gift cards, coupons, etc. Analysis involved within and between group comparisons for groups divided into teens who were arts-oriented or science-oriented, and teens oriented toward both arts and sciences.

The survey questionnaire was comprised of six sections. Each is listed as a column heading in Table 1 and marked with a ✔ to identify the evaluation question(s) it addressed. Description of the relevant questionnaire section introduces each of the Survey Results subsections in this report which is organized by evaluation sub-questions (Column 1 in Table 1) .

Test groups were established first by screening respondents by asking if they considered themselves: a) mostly interested in science; b) mostly interested in art c) interested in both art and science; and d) neither interested in art or science. Teens interested in neither were not included in

the study. Once screened, respondents used a five-point scale (-2= "A LOT more toward the ARTS than science" through 0 = "equally toward both" to 2= "A LOT more toward SCIENCE than art") to responded to four statements about (1) what they choose to read; (2) how they choose to spend their time; (3) how they choose activities; and how they choose topics for projects at school. Responses were then combined to create an average orientation score. Scores between .5 and -.5 were considered to be oriented toward both arts and sciences.

Table 1. Questionnaire sections for answering the question, How well is the promotion of this art/science workshop appealing to teens and in what ways can the program appeal to both arts-oriented and science-oriented teens more effectively?

Sub Questions	Identity	Advertisements	Reasons to Attend	Word interpretations	Utility	Descriptive Words
To which identity orientation group does the respondent belong?	✔ *					
When grouped by orientation, how did teens relate differently to the flyer(s) the program produced?		✔				
What motivates teens to attend both science and arts events?			✔			
How do motivations to attend or not attend *Arts* events differ between science-oriented and arts-oriented teens?			✔			
How do motivations to attend or not attend *Arts* events differ between science-oriented and arts-oriented teens?			✔			
What motivates teens to attend both science and arts events; how do these motivations differ between science-oriented and arts-oriented teens?			✔			
How did teens within each group perceive the interdisciplinary utility?					✔	
How did teens within each group describe themselves and professionals in relation to their identified science or art interest?				✔		✔ **
What words or phrases used by teens to describe people interested in arts and sciences might be useful for promoting STEAM program activities?				✔		✔ **

Methodology for Answering Evaluation Question #2: Workshop Outcomes.

Answers to the second question and sub-questions resulted from quantitative and qualitative analysis of survey responses from workshop participant responses to pre and post-workshop questionnaires (see Appendix A). Workshop participants were asked to complete the pre-test questionnaire either prior to the workshop or during the first hour of the workshop just prior to orientation. They completed the post-test questionnaire on final day of the workshop.

Responses to the online questionnaires reflected changes that could be attributed to the workshop experience and addressed changes in:

(1) Perception of self in relation to art and science;
(2) Expectations from both art and science activities and personal response to each;
(3) Perception of artists and scientists;
(4) Perception of the relationship between art and science; changes in perceptions from pre-test to post-test;
(5) Perceived value of participating in a combined art/science program.
(6) Level of art and science curiosity;

The pre-post survey questionnaires (Appendix A) were comprised of eight sections. Each is listed as a column heading in Table 2 and marked with a ✔ to identify the evaluation question(s) it addressed. In addition to the six sections that comprised the general population survey, the workshop questionnaire included a section on intentions for satisfying curiosity and another on participants' perceptions of the benefits of attending a combined art-science workshop. The posttest survey utilized the Qualtrics embedded data function to provide respondents with their pre-test responses for reflection. Many of the post- test items were therefore worded, "before the workshop, you said you . . . . Now that you've completed the workshop [how would you respond differently?]" As with the first half of this report, more detailed description of the relevant questionnaire items introduce each of the Results subsections in the second half.

Workshop respondents were divided into orientation group with the same measure used for the general population (see methodology for Evaluation Question #1 above).

Table 2. Questionnaire sections for answering the questions, *How did the workshop affect participants' attitudes (identity, interest, and motivation) toward the arts and sciences*I

Sub Questions	Identity	Advertisements	Reasons to Attend	Word interpretations	Utility	Descriptive Words	Satisfying curiosity	Perceived benefit of combined art-science workshop
How did workshop participants compare to arts and science oriented teens in the general population		✔	✔	✔	✔			
What effect did the Amplify workshop have on teens' propensity toward involvement with the arts or sciences?	✔	✔	✔				✔ **	✔
What effect did the workshop have on participants' perceptions of the connections between art and science?				✔	✔		✔ **	
How did teens experience the workshop compared to their expectations?						✔		

Survey Results for Answering Evaluation Question #1:

How well is the promotion of this art/science workshop appealing to teens and in what ways can the program appeal to both arts-oriented and science-oriented teens more effectively?

The Sample

The final dataset was comprised of 199 respondents, 96 (48%) of whom were arts oriented, 81 (41%) science oriented and 22 oriented to both arts and science (11%). Fifty-eight female respondents comprised 54% of the group; 85 male respondents comprised 43%; with seven respondents (4%) identifying as transgender. As shown in Table 3, more females were arts oriented or both arts and science oriented than males and more males were science-oriented than females. All transgender responders were oriented toward the arts or both arts and science.

Table 3. Description of sample by gender and orientation.

	Male		Female		Transgender		Total
Orientation	**n**	**%**	**n**	**%**	**n**	**%**	**n**
Arts	31	32%	58	60%	6	7%	96
Both	7	32%	15	68%	1	0%	22
Science	47	58%	34	42%	0	0%	81
Total	85	43%	107	54%	7	4%	199

Respondents who identified as "a member of a racial or ethnic minority population" comprised 48% of the sample with 43% being arts-oriented; 40% science oriented; and the remainder oriented to both arts and science. Further breakdown by type of minority identification can be found in Table 4 with more specific coding in Appendix B. Data Detail, Table 15. More African-Americans were arts-oriented than Asian-Americans (41% and 15% respectively), and more Asian-ameircans were science-oriented than arts-oriented (42% and 18% respectively).

Table 4. Description of sample by ethnic identity and Arts/Science orientation

	African-American		Asian-American		Hispanic		Other*		Unknown		Total	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Art	17	41%	6	15%	8	20%	3	7%	7	17%	41	100.0%
Both	3	19%	3	19%	4	25%	4	25%	2	13%	16	100.0%
Science	7	18%	16	42%	7	18%	4	11%	4	11%	38	100.0%
Total	27	28%	25	26%	19	20%	11	12%	13	14%	95	100.0%

*Other includes Muslim(1); Native American (2); Bi-racial (4); and Caucasian (4)

Response to Workshop Advertisements:
When grouped by orientation, how did teens relate differently to the flyer(s) the program produced?

What We Learned

In general, respondents had a more positive response to the *Amplify* advertisement than the one for *Do you have the Guts?* primarily because of the reference to intestines and the lack of attractiveness of the photos. Responders of both orientations were equally as turned off by the phrases related to intestines although they also all liked the title *Do you have the guts?* All respondents also showed enthusiasm for combining art and science, using microscopes and exploring microphotography.

The *Q?rius* logo was the only aspect of the *Amplify* ad to dampen enthusiasm among respondents was the only aspect of the *Amplify* ad to dampen enthusiasm among respondents, (although this effect occurred only among 20%). It is possible that the curiosity meant to be engendered by the odd spelling may feel too challenging to some teens.

Toward both ads, arts-oriented responding teens reacted more strongly than did science-oriented respondents. Equally-oriented teens generally responded more like the science-oriented teens. Not surprisingly, arts-oriented teens showed greater enthusiasm for arts-related aspects of the ads and science-oriented responders for science-related aspects. However arts-oriented teens additionally indicated enthusiasm for science.

How We Know

The questionnaire presented respondents with two advertisements previously employed by the joint NMNH-ARTLAB+ STEAM workshops (Figure 1 and Figure 2). Utilizing the Qualtrics "hot spot" feature, respondents were able to click on a portion of the ad once to turn it green indicating that the part "perked their interest in attending the workshop;" twice to turn it red, indicating "the ones that dampen your interest;" and three times to clear the shape back to neutral.

Overall, the *Amplify* ad was more inviting to respondents than the *Guts* ad. Of the 28 items ranked, 19 (68%) were ranked with more than 33% "perked my interest" responses. This number compared to 5 (29%) of the 17 *Guts* items. Likewise, more than 20% of the respondents ranked 3 (18%) of the *Guts* items as "dampened my interest" compared to 1 (4%) of the items in the *Amplify* ad (Figure 3).

The only damper to the Amplify ad was the Q?rius title logo. Just over 20% (40 respondents) marked the logo as dampening their interest. More (25% or 49 respondents) expressed that the logo perked their interest, but this count compared to 36% (70 respondents) who expressed that the ARTLAB+ logo perked their interest.

Figure 1. More than 30% of tends found 19 areas of the "Amplify" ad to be enthusiasm perks (green) and mare than 20% of teens found only one area to be a damper (red).

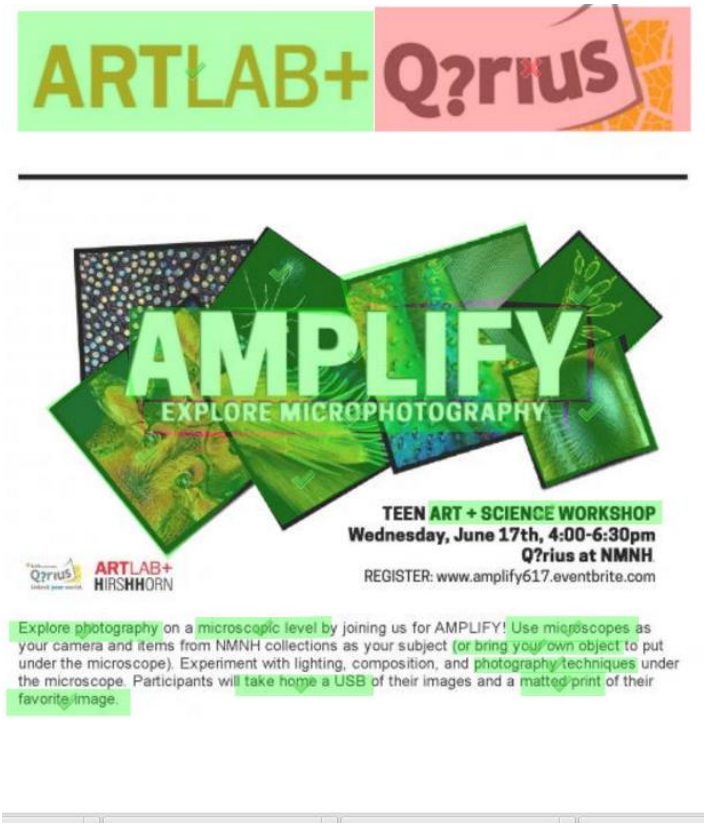
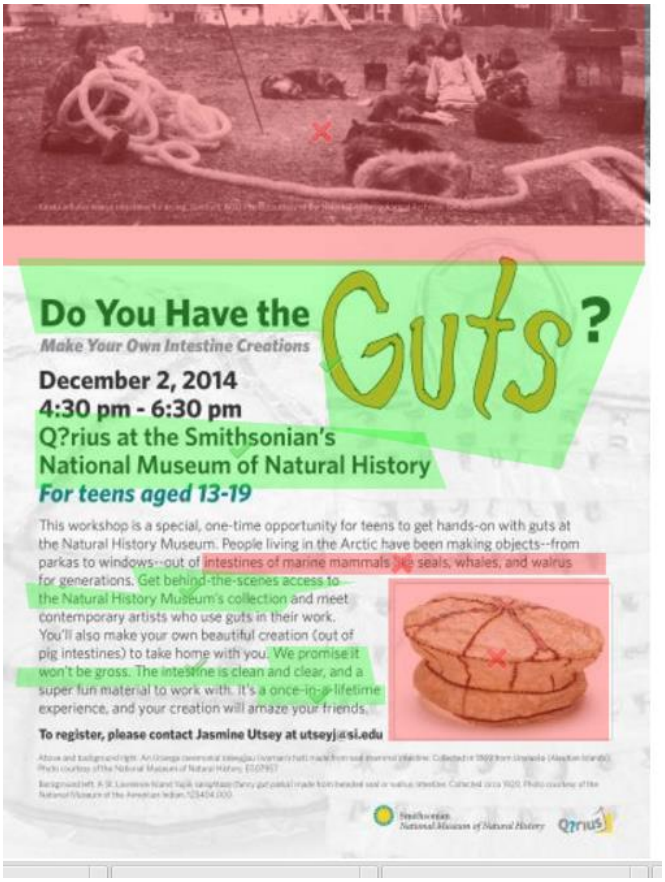
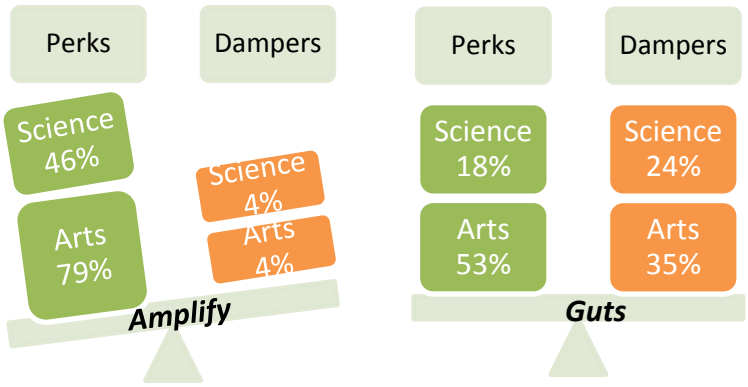


Figure 2. More than 30% of teens found five areas of the "Do you have the Guts" ad to be enthusiasm perks (green) and more than 20% of teens found three areas to be dampers (red).



Within both ads, arts-oriented respondents reacted toward both "perked" and "dampened" responses more strongly than science-oriented respondents. Those oriented toward both art and sciences, generally responded more like the science-oriented teens in relation to both ads. Although, as described above, teens found the *Amplify* ad to have far more perks than dampers, arts-oriented teens found more perks than science-oriented teens. For the *Guts* ad, Science-oriented teens found more aspects to be dampers than they found aspects to be perks whereas arts-oriented teens found more perks than dampers. Per item details organized by advertisement and orientation can be found in Appendix B Details of Responses to Advertisements.

Figure 3. Comparison of responses to *Amplify* and *Guts* advertisements grouped by responder's orientation.



	Arts-oriented		Both		Science-oriented		Whole Group	
	Count of items	%	Count	%	Count	%	Count	%
Items ranked "perked" by more than 33% of respondents								
Amplify *(28 items)*	22	79%	15	54%	13	46%	19	68%
Guts *(17 items)*	9	53%	3	18%	3	18%	5	29%
Items ranked "dampened" by more than 20% of respondents								
Amplify *(28 items)*	1	4%	1	4%	0	0%	1	4%
Guts *(17 items)*	6	35%	1	6%	4	24%	3	18%

Detailed responses by most frequently selected items are listed in Table 5 and Table 6. Also shown are items with responses that significantly differed between arts oriented and science-oriented teens.

In relation to the *Do You Have the Guts ad*, more than 30% of all three groups responded negatively to the *Guts* title photo and more than 20% of arts-oriented and science-oriented responders (not both) indicated a damper effect for the second photo and for the phrases, "make your own intestine creations" and "intestines of marine animals."

In relation to the *Amplify* ad, parts most identified as "perks" were the *Amplify* logo (71%), and reference to microphotography (62%). In contrast, was the somewhat more negative response to the *Q?rius* logo (described above). It is possible that the curiosity meant to be engendered by the odd spelling may feel too challenging to some teens.

Table 5. *Amplify* ad parts considered as perking enthusiasm by at least one third of respondents and considered as dampers by at least 1 fifth of respondents (with orientation provided if there was a significant difference between them).

Perks				Dampers			
Phrase or graphic	%*	Orientation**		Phrase or graphic	%***	Orientation**	
		Arts	Science			Arts	Science
ARTLAB+ Logo	35%	41%	28%	Q?rius Logo	20%	23%	14%
Amplify Logo	71%						
Q?rius Logo		28%	21%				
Explore	49%						
Microphotography	62%						
Photo 1 (49%)	49%						
Photo 2	52%						
Photo 3	49%	46%	56%				
Photo 4	50%						
Photo 5	48%						
Photo 6	46%						
Photo 7	37%						
microscopic level	38%						
Explore photography	35%	48%	25%				
Use microscopes	39%						
Hirshhorn		29%	7%				
Art + Science	54%						
your camera		34%	16%				
Items from NMNH collection		32%	12%				
bring your own object	34						
Experiment		35%	27%				
Composition		36%	25%				
photography techniques	34	42%	27%				
take home a USB	44						
matted print	35	43%	28%				
favorite image	34	42%	26%				

* shown if greater than 33% ** shown only if significantly different *** shown if greater than 20%

Table 6. *Do You Have the Guts* ad parts considered as perking enthusiasm by at least one third of respondents and considered as dampers by at least 1 fifth of respondents (with orientation provided if there was a significant difference between them).

Perks				Dampers			
Phrase or graphic	%*	Orientation**		Phrase or graphic	%***	Orientation**	
		Arts	Science			Arts	Science
Do you have the Guts?	55%			Photo #1	35%		
National Museum of Natural History	37%			Photo #2	30%		
one-time opportunity	33%			intestines of marine mammals	24%		
Access to collection	41%			Hands-on with guts		24%	11%
not gross	38%						
once in a lifetime	35%						

* shown if greater than 33% ** shown only if significantly different *** shown if greater than 20%

In addition to asking respondents to rate each area of the advertisement, ach ad section concluded with a question about "additional thoughts about what would make you want to attend or not attend this workshop."

For the *Guts* ad, responses to the question could be categorized into – major themes (listed in Table 7 with the percentage of responses pertaining to each). Most all (176) respondents provided an answer (all listed and coded in Appendix B tables titled Detail of Additional Thoughts about the *Do You Have the Guts* ad). The most common *Guts* response (26%) had to do with animal intestines being either too "gross" or ideologically unacceptable. More arts-oriented responders expressed averse feelings toward the subject than did science oriented teens. As can be seen in Table 7, there were few other differences between the frequency of themes based on orientation.

Some teens provided both criticism and suggestions for the ad itself. Many of these comments referenced needing better pictures and suggesting pictures that were more informative of what would happen in the workshop or what to expect when working with intestines. These suggestions were supported by comments relating to curiosity and needing to find out more about the workshop before enrolling.

Table 7. Distribution of qualitative reasons for why respondents may want to or not want to attend the *Do You Have the Guts?* workshop.

	Total		Arts		Both		Science	
	n	%	n	%	n	%	n	%
Gross (includes 1 not gross and a suggestion)	46	23%	30	31.3%	1	5%	15	19%
Ideology	6	3%	3	3.1%	1	5%	2	2%
Positive	34	17%	12	12.5%	6	27%	16	20%
Criticism and suggestions	33	17%	15	15.6%	3	14%	15	19%
Curiosity	18	9%	8	8.3%	2	9%	8	10%
Logistics	17	9%	6	6.3%	3	14%	8	10%
no interest	6	3%	4	4.2%		0%	2	2%
Other (includes food, friends, fun, get hurt or messy, repetitive, balance art and science, difficult, learning, and science curiosity)	12	6%	5	5.2%	4	18%	3	4%

Rates of "perks" and "damper" responses for individual parts of the "*Amplify*" advertisement are listed in Table 8. More than 33% of all three orientation groups responded positively to the title, "*Amplify*" and subtitles "Explore Microphotography" and "Art + Science workshop." High levels of positive responses across all three groups also occurred for all the photos and for the phrases "microscopic level" and "use microscopes." More than 33% of arts-oriented and both arts and science-oriented (but not science only) responders were additionally "perked" by the ARTLAB+ logo. In addition, more than 33% of arts-oriented responders to also indicated feeling perked by the phrases, "explore photography;" "your camera;" "experiment;" "composition," "photography techniques;" "matted print;" and "favorite image."

Table 8. Distribution of qualitative "additional" reasons for why respondents may want to or not want to attend the *Amplify* workshop.

	Total		Arts		Both		Science	
	n	%	n	%	n	%	n	%
Positive, will attend	49	24.6%	26	27.1%	5	22.7%	18	22.2%
Interested	23	11.6%	9	9.4%	2	9.1%	12	14.8%
Interdisciplinary Arts and science	13	6.5%	8	8.3%		0.0%	5	6.2%
Curious—wanting, needing more detail	13	6.5%	5	5.2%	3	13.6%	5	6.2%
Ad Criticism	11	5.5%	4	4.2%	2	9.1%	5	6.2%
Fun	11	5.5%	7	7.3%		0.0%	4	4.9%
Logistics	11	5.5%	5	5.2%	2	9.1%	4	4.9%
no interest	11	5.5%	6	6.3%	2	9.1%	3	3.7%
Learning opportunity	5	2.5%	2	2.1%		0.0%	3	3.7%
Difficult	4	2.0%	3	3.1%		0.0%	1	1.2%
Photos in the Ad	5	2.5%	2	2.1%		0.0%	3	3.7%
Social	2	1.0%		0.0%		0.0%	2	2.5%
Suggestion	2	1.0%	2	2.1%		0.0%		0.0%
Topic	2	1.0%		0.0%	1	4.5%	1	1.2%
Other	9	4.5%	2	2.1%	2	9.1%	5	6.2%
No additional thoughts	28	14.1%	15	15.6%	3	13.6%	10	12.3%
Grand Total	199	100.00%	96	100.00%	22	100.00%	81	100.0%

Each of these positive responses was significantly more frequent from arts-oriented responders than science-oriented except for "composition," and "experiment." Although higher percentages of arts-oriented responders were perked by these items, chi-square tests of differences between arts and science-oriented responders revealed significant difference only on the "once in a life-time" phrase. Arts-oriented responders were also significantly more perked by the Q?rius and Hirshhorn logos.

For this ad, reflecting the high level of positive response, damper response was extremely low. Curiously (no pun intended) only the Q?rius logo received a negative response from more than 20% of responders. Although infrequent, art-oriented responders indicated significantly less damper response to the phrase "explore photography" and significantly more to the phrase, "use microscopes," and to the photo at the bottom right of the "Y" in "*Amplify*."

Themes from additional thoughts about what would make the respondent "want to attend or not attend this workshop" (Table 8) contrasted greatly with the *Guts* ad. Positive responses were for more frequent (25%) with almost half being highly enthusiastic. Rather than being concerned about the content (which many "loved"), 11% expressed interest; 7% commented on the interdisciplinary nature of the workshop as being attractive; and 6% thought it sounded "fun". Individual coded comments can be found in Appendix B Detail of Responses to Advertisements. As with the Guts workshop advertisement, there were few differences between the frequency of themes based on respondent's orientation to arts vs. science.

Reasons to Attend or Not Attend Arts or Science Events: What motivates teens to attend both science and arts events?

What We Learned

Teens' reasons for attending or avoiding activities are similar across disciplines—thus making the challenge of attracting teens to STEAM workshops a bit easier.

Reasons for attending either type of activity included learning; interest in the topic (or in the case of the arts, interest in a specific medium or genre); enjoyment; self-expression; and interest generally in the art or science process.

Reasons for *not* attending both kinds of activities included avoiding feelings of incompetence; feelings of boredom or disinterest; or feelings of social alienation. In addition, concern for quality emerged as a consideration related to arts (but not science) events.

How We Know

The general questionnaire included four questions asking respondents to provide, in response to each, three words to describe reasons why they (1) would attend an arts-oriented activity; (2) would *not* attend an arts-oriented activity; (3) would attend a science-oriented activity; and (4) would *not* attend a science-oriented activity.

Responses to the "reason to attend" questions often correlated with the "reasons to not attend" (e.g., *creativity* as a reason to attend and *inhibits creativity* as a reason not to attend or *boring* vs. *not boring*) both arts and science activities. Because of these cross-overs in themes, the same theme list was used to code all four questions. The codebook which provides definitions and examples of each them , along with the frequencies of each them by orientation can be found in the tables in Appendix B Detail of Reasons to Attend and Avoid Arts or Science Activities. The most common reasons for attending and not attending arts and science activities are listed in Table 9.

Table 9. Six most common reasons for attending or not attending art or science-related activities.

	Art-Related Activities	Science-Related Activities
Reasons to Attend	Interested in a specific medium or genre (15%) Enjoyment (10%) **Autonomy-creativity (9%)** Learn (7%) Art process (5%) **Social (4%)**	Learn (15%) Interest in topic(s) (15%) Enjoyment (8%) Science process (6%) **Interest generally (6%)** **New Experience (5%)**
Reasons *Not* to Attend	Difficult (21%) Logistics (15%) Engaging (not): boring (8%) Interest in a specific medium or genre (8%) **Quality (7%)** Social (6%)	Difficult (22%) Logistics (17%) Engaging (not): boring (9%) Interest in topic(s) (8%) Social (6%) **Interested Generally (6%)**

Bold type indicates a theme *not* appearing in both arts and science lists.

Observations from these data included the following:

- As shown in Table 9, the most common reasons for attending or not attending activities differ very little whether the activity is arts or science-related.

- Teens attend these types of activities because they will have fun; they are interested in the topic, genre, or medium; they will learn something; and they are interested in participating in either the scientific method (e.g*., conduct an experiment* or *wear a lab coat*) or the art-making process (e.g., *let my emotions out into something beautiful* or *see various perspectives)*.

- Teens avoid activities that might be too difficult and threaten their sense of competence or self-esteem (e.g., *too hard* or *I'm afraid I won't be good enough*); for logistical reasons pertaining to cost, distance, or time; because they don't want to be bored; because they activities are not personally interesting; and because they are concerned that they will feel out of place socially.

- More teens consider "learning" a reason to attend a science activity than to attend an arts activity. And more arts-oriented teens consider "learning" a reason to attend a science activity that science-oriented teens. In relation to science "learning" rates equally in both groups.

- Unlike science activities, teens attend arts activities to experience their own sense of self. They avoid art activities because they are concerned with quality.

- For both arts and science activities, the most common reasons to attend had to do with interest in a specific topic, medium, or genre.
- Second was having fun (10% of arts comments and 8% of science)
- Equally important for attending an arts activity was the sense of creativity and self-expression. Not surprisingly only 2% of respondents expressed being able to fulfill these needs through a science activity.
- Social activity and environment were equally important to both arts and science-oriented teens.
- As a corollary to the 10% of comments related to creativity, 15% of reasons for attending science activities related to learning; though 7% of arts reasons also related to learning.
- One out of every five reasons for not attending either science or art activities related to feeling inadequate.
- Almost ten percent of reasons for not attending referenced aversion to "boring". Curiously, logistical reasons for not attending science activities were double those for not attending arts related activities.
- For arts, the genre or subject mattered as a reason for not attending than did the subject for science.
- Together, lack of interest or not feeling engaged generally made up 25 % of the reasons not to attend.

Compared Reasons to Attend Science Events: How do motivations to attend or not attend *Arts* events differ between science-oriented and arts-oriented teens?

What We Learned

Science and arts-oriented teens differed only slightly in their reasons for attending or not attending a science-related activity. Differences appeared in the frequency of comments related to *interest* and *threats to sense of competence* (arts-oriented teens had less general interest in attending and were more concerned with experiencing difficulty with the content) . On the other hand arts-oriented teens more frequently listed learning as a reason to attend a science-oriented event.

How We Know

Z-score differences in proportions (with Bonferroni adjustment for multiple tests) revealed high similarity between the reasons that arts and science-oriented teens listed for not attending a

science-oriented event (Appendix B. Table 23). Avoiding difficulty or a sense of incompetence at a science-oriented event was a more frequent concern (37.4% of words) for Arts-oriented teens than for science-oriented teens (23%) and teens equally oriented to both (16%). Arts-oriented teens also listed general interest more frequently (12% compared to 6% among science-oriented teens) while science oriented teens more frequently listed specific interest (8% compared to 4%). Science –oriented teens and teens oriented to both science and art- teens also listed logistical concerns (e.g., lace of time or transportation) more frequently (18% and 22%) than arts-oriented teens (8%).

Reasons for attending a science-related activity (Appendix B. Table 21**Error! Reference source not found.**) were even more similar between the groups than reasons for not attending. Differences between groups reflected general interest—only 2% of arts-oriented student responses referenced *general interest* as a reason for attending a science-related activity compared to 7% of responses by science-oriented teens. Yet arts-oriented students also listed *learning* as a reason to attend more frequently (23%) than did science-oriented students 13%).

Compared Reasons to Attend Arts Events: How do motivations to attend or not attend *Arts* events differ between science-oriented and arts-oriented teens?

What we learned

Arts-oriented teens also expressed more concern than did science-oriented teens about *experiencing difficulty* in an **arts-related activity**. Science-oriented teens expressed more concern about *not wanting to feel bored* by an arts activity than did arts-oriented teens. They also expressed more concern about *socializing with peer artists*.

How We Know

Z-score differences in proportions (with Bonferroni adjustment for multiple tests)also revealed high similarity between the reasons that arts and science-oriented teens listed for *not attending* an arts activities (Appendix B. Table 22). Similarly to a science-oriented activity, avoiding difficulty or a sense of incompetence persisted as a reason for not attending arts-related activities among arts-oriented teens (26% of reasons) and less so among science-oriented teens (17%). Among equally-oriented teens, the rate was 28%. Not surprisingly, science-oriented teens expressed more concern about not wanting to feel bored than did arts-oriented teens. Finally, science-oriented and equally-oriented teens expressed greater concern about social involvement with peer artists (5% and 6% respectively vs. 1.5% for arts-oriented teens).

Reasons for *attending* an arts-related activity (Appendix B. Table 20) were even more similar between the groups than reasons for not attending. The only difference was that, generalized interest (rather than a interest in a specific medium or genre) was greater among science-oriented and equally oriented teens (4% and 8% respectively, compared to 2%).

Word Interpretations:

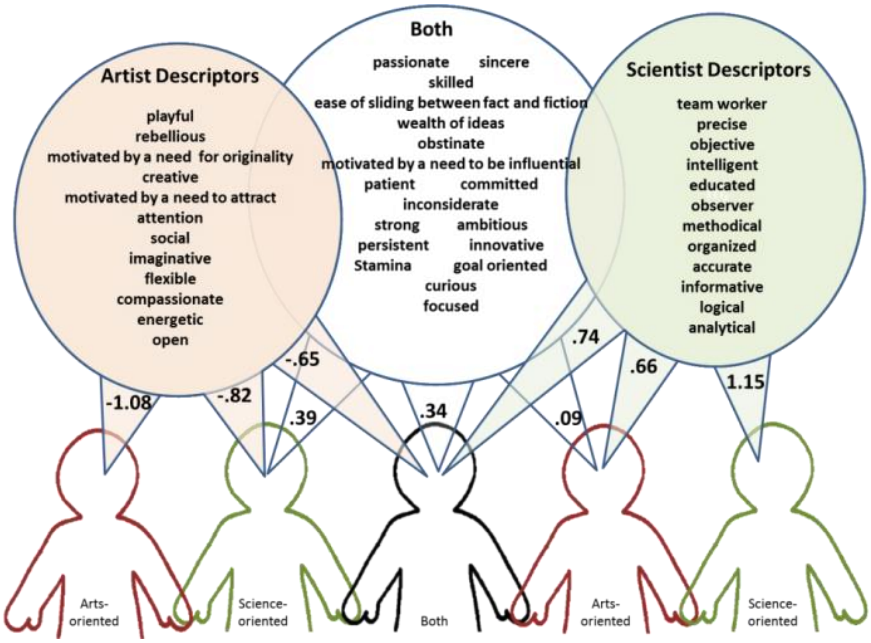
How did teens within each group describe themselves and professionals in relation to their identified science or art interest?

What We Learned

In general, teens used some words to describe artists and others to describe scientists. Arts-oriented teens identified arts-oriented words more strongly with artists than did science-oriented teens. Science-oriented teens identified science-oriented words more strongly with scientists than did arts-oriented teens. This finding provides reason to believe that change toward the middle would indicate successful steam programming.

How We Know

The word interpretation section of the questionnaire listed 41 words that had been compiled from various internet lists of words to describe both artists and scientists. For each, respondents were asked to assign a value ranging from -3 to +3 (-3 = "Describes artists TOTALLY, not scientists;" -2 = "Describes artists A LOT more than scientists;" -1 = "Describes artists SOMEWHAT more than scientists;" 0 = Describes artists and scientists EQUALLY; 1 = "Describes scientists SOMEWHAT more than artists;" 2= Describes scientists A LOT more than artists; 3= Describes scientists TOTALLY, not artists").



In general, both arts-oriented and science-oriented teens used certain words to describe artists and others to describe scientists, and some to describe both. Arts-oriented teens identified words associated with artists more strongly than did science-oriented teens. Science-oriented teens identified words associated with scientists more strongly than did arts-oriented teens. In other words, teens of one "culture" recognized the words usually applying to the "other" culture as also applying to themselves. Teens oriented to both arts and sciences used more words to describe both cultures. This finding provides reason to believe that change toward the middle would indicate successful STEAM programming such that

participants are recognizing that while the products differ, the thought processes draw from and inform both cultures.

Words and phrases most associated to artists included *playful*; *rebellions*, *motivated*, *creative*, and *motivated by a need for originality*. Science-oriented teens also associated these words with artists. Teens oriented toward both the Arts and Science also associated these words with artists, but less so than the respondents in the other two groups. Detail for each rated word can be found in Appendix B. Table 33.

Words and phrases most associated to *scientists included: team worker; precise; objective; intelligent; educated; methodical; accurate; logical; and analytical*. Arts-oriented teens also associated these words with scientists. Teens oriented toward both the Arts and Science also associated these words with scientists, but less so than the respondents in the other two groups.

How did teens within each group perceive interdisciplinary utility?

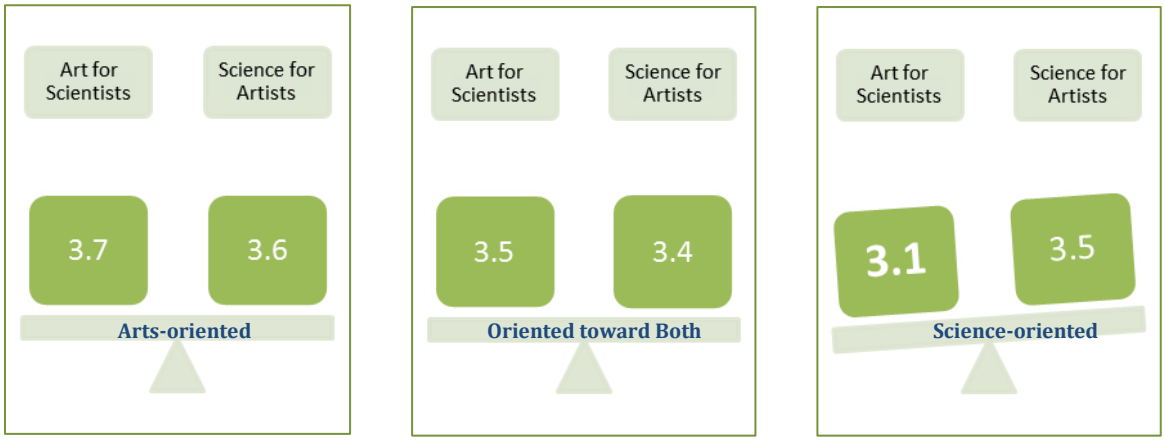
What We Learned

Science-oriented teens recognize less utility of the arts for scientists than do teens of arts or both arts and science orientation. Thus appealing to science oriented students should recognize the need to additionally inform them of potential benefits.

How We Know

Respondents used a five point scale (1= "useless"; 2= "somewhat useless;" 3= "neutral;" 4= "somewhat useful;" 5= "Useful") to answer two questions about interdisciplinary utility: "If you were a professional artist, how useful do you think it would be to your career to learn about science?" and "If you were a professional scientist, how useful do you think it would be to your career to learn about the arts?"

Figure 4. Utility of interdisciplinary study and perceived by orientation groups.



Overall, teens belief that learning about science is useful to artists (X=3.5, sd =1.1) was significantly greater than their belief that learning about the arts is useful to scientists (X=3.3, sd =1.2, t=2.6, df=198, p=.01). However, this difference was localized to science-oriented teens. Within arts-oriented or equally-oriented groups, the utility of interdisciplinary study was seen as useful for both artists and scientists (Figure 4).

Survey Results for Answering Evaluation Question #2:

How did the workshop affect participants' attitudes toward the arts and sciences?

Description of the Workshop Respondents

Altogether, 18 teens participated in the Amplify workshop. Of that group, 14 completed the pretest and 11 responded to the posttest although some were incomplete. Matched pre-post data were available from between seven and nine participants—depending on the answers they provided. Of the respondents with matched pre and post test data, five were arts-oriented, two were science-oriented, and 2 were equally interested in both disciplines (Table 10).

Table 10. Counts of workshop participants responding to pre and post-workshop questionnaires.

Orientation	Pretest Only	Post Test Only	Pre and Post	Grand Total
Arts	1		5	6
Equal Arts and Science	2		2	4
Science	2	2	2	6
Grand Total	**5**	**2**	**9**	**16**

Comparisons to the General Sample:

How did workshop participant compare to teens generally?

What We Learned

In most ways, the workshop participants' responses closely mirrored those of the General Survey respondents. On the other hand, a few differences led us to consider that teens motivated to take the workshop had, prior to the workshop, greater appreciation for where the arts and sciences meet. One indicator of greater interdisciplinary appreciation derived from results showing they valued more highly the utility of interdisciplinary learning. Another indicator was that they had more discerning reasons for wanting to attend an arts-related workshop. Finally, where they differed on word usage, they more strongly used words to describe both artists and scientists rather than just one or the other.

How We Know

Participant pre-test scores were compared to General Population scores on (1) usefulness of arts to scientists and science to artists; (2) response to the two advertisements; (3) reasons for attending art-related or science-related activities; and (4) words they associate more with one profession or the other.

Comparison of Ideas about Interdisciplinary Utility

Compared to the 199 General Survey respondents, workshop participants were more sophisticated in their recognition of the integration of arts and science. There were significant differences between workshop respondents and the general sample for both disciplines. That is, workshop students believed learning science was more useful to artists ($\bar{X}$=4.21) than did general survey respondents ($\bar{X}$=3.51; mean difference =.707; *df*=18.10, *p*=.003). Likewise, workshop participants also saw greater utility of scientists learning art ($\bar{X}$=3.86 compared to General Survey $\bar{X}$=3.27; mean difference =.59, *t*-=1.77, *df*=211, *p*=.08).

Comparison of Responses to Full STEAM Ahead advertisements.

Prior to the workshop, participants' response to the *Amplify* advertisement was not dissimilar from the general population. Not surprisingly, the only significant differences between groups occurred with names (NMNH, Q?rius, and *Amplify*), more familiar to workshop participants than to respondents in the general sample. For the *Do you Have the Guts* workshop advertisement, workshop participants differed from the general sample in their more favorable response to two aesthetic phrases: "beautiful creation" and "super fun material." This aesthetic difference may have appeared with the *Guts* ad and not the *Amplify* ad because of a ceiling effect: across both groups of respondents, the *Amplify* ad generally generated highly enthusiastic response.

Comparison of Reasons for Attending or Not Attending Arts or Science-Related Activities

When theme codes derived from the general population were applied to reasons participants gave for attending or not attending art-related or science-related activities, frequencies of themes were remarkably similar to the general sample in their reasons to attend or not attend science events and reasons to not attend arts events (see Table 11). The two populations differed, however, in their reasons to attend arts-related events. These differences (more interest in: new experiences; engaging teacher or mentor; and having a "hands-on" experience), may reflect the greater number of artists responding along with having more experience attending these types of arts-related workshops. Across all areas, workshop participants were more concerned about having a hands-on, participatory experience. Also, while members of both groups expressed a concern for a science workshop feeling too difficult, the proportion of these kinds of comments (12%) was significantly less among workshop participants (22%).

Table 11. Most common reasons to attend and not attend Arts-related and Science-related activities: comparison of workshop participants to general sample.

Reasons to Attend Arts-Related **Activities**		**Reasons *Not* to Attend**	
General sample	Workshop sample	General sample	Workshop sample
Learn (7%) Interested in a specific medium or genre (15%) Engaging: fun (10%) Art process (5%) **Autonomy-creativity (9%)** **Social (4%)**	Technique or skill (15%) **New experience (10%)** **Teacher or mentor (10%)** Fun (5%) Art process (15%) **Hands on (10%)**	Difficult (21%) Logistics (15%) Engaging (not): boring (8%) Interest in a specific medium or genre (8%) **Quality (7%)** **Social (6%)**	Difficult (8%) Logistics (8%) Boring (8%) Interest in a specific medium or genre (12%) **Not hands on (12%)** **Autonomy restricted (8%)**

Reasons to attend Science-Related Activities		**Reasons Not to attend**	
General sample	Workshop sample	General sample	Workshop sample
Learn (15%) Interest in topic(s) (15%) Engaging: fun (8%) Science process (6%) **Interest generally (6%)** New Experience (5%)	Learn (16%) Interest in topic (11%) Fun (7%) **Hands-on (22%)** **Relevant (9%)** New experience (4%)	Difficult (22%) Logistics (17%) Engaging (not): boring (9%) Interest in topic(s) (8%) **Social (6%)** **Interested Generally (6%)**	Difficult (12%) * Logistics (9%) Boring (15%) Specific interest (9%) **Not hands-on (18%)** **Repetitive (9%)**

* Significant difference between groups ($p<.05$). Themes appearing in only one group or the other appear in **bold**.

Comparison of How Words Describe Artists or Scientists

At the start of the *Amplify* workshop, participants related to the word list similarly to the teens in the general sample. Differences revealed some additional sophistication –that may be due to a bias resulting from self-selection into an interdisciplinary arts-science workshop. The participant group significantly differed from the general group on 9 words. Differences occurred with one wordngeneral population sample identified as arts-related, (*playful*); two identified as relating to both artists and scientists (*sincere* and *has ability to slide between fact and fiction*); and 6 science-related words (*precise; intelligent, observer; organized; logical; and analytical*). Except for the phrase, *has ability to slide between fact and fiction,* workshop participants ranked all the others as leaning more toward describing both artists and scientists (for detail, see Appendix B. Table 24) Workshop participants evaluated the word-phrase, *has ability to slide between fact and fiction,* as more toward describing artists than both artists and scientists, perhaps reflecting the mistrust of science that appears to exist in the general population—as demonstrated by the types of ideological phrases the general population used for not wanting to attend science events; (Table 20. Reasons to attend arts activities and Table 23.)

Workshop Effect on Identity, Interest, and Motivation:

What effect did the *Amplify* workshop have on teens' propensity toward involvement with the arts or sciences?

What We Learned

The workshop achieved a balance between stimulating participants' interest in both the arts and science. Primarily arts-oriented workshop respondents experienced increased interest in science such that it would affect their choice making about what they would choose to read, how they would choose activities, and how they would choose topics for school projects. On the other hand, participants showed greater intention toward using arts-related resources (including museum exhibits) for satisfying their curiosity.

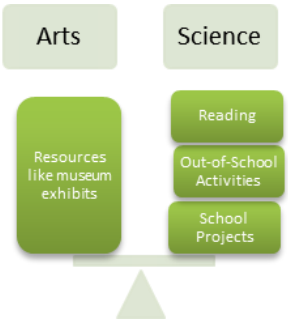
The two science-oriented workshop respondents demonstrated increased awareness of the importance of the artistic process to their scientific inquiry.

Workshop respondents increased their enthusiasm for ARTLAB+ and the Hirshhorn as a program sponsor – perhaps contributing to the programs' short term goal of increasing "curiosity in museums, their collections, and their educational programs."

How We Know

Four areas of inquiry addressed this evaluation question. First was to explore changes in how participants scored the questionnaire's statements about how their interests in the arts and sciences affect their choices and decisions *(identity)*. Second, we explored changes in how workshop participants believed they would satisfy their curiosity (*interest*). The third exploration was to look at changes in reasons for attending arts-oriented or science-oriented activities (*motivation*). Finally we looked at changes in response to the two Full STEAM Ahead advertisements.

Changes in identity as defined by interests



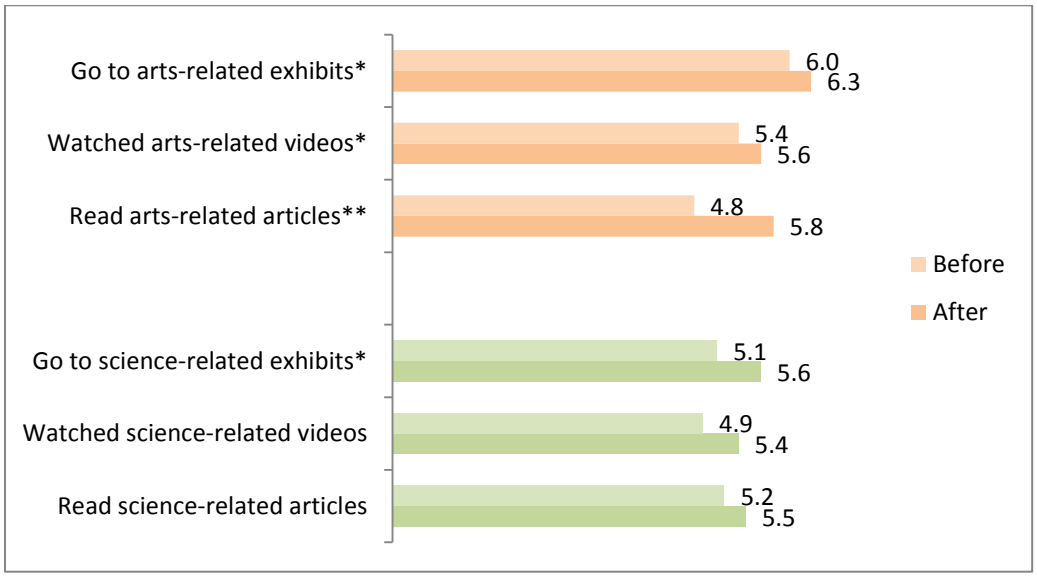
Pre- and post-workshop self-assessment of their interests (the seven point scale ranged from *-3 = totally toward the arts* through *0 = Equally toward both* to *3= totally toward science*) revealed that all scores except choosing how to spend free time changed significantly and toward a greater interest in science (for detail, see Appendix B. Table 25. After workshop changes in participants' interest leaning toward arts or science when making choices.)

Changes in intentions for satisfying curiosity

Another aspect of exploring workshop effect on personal orientation was to explore how participants perceived themselves satisfying their "curiosity" either through arts vs. science-oriented activity. A curiosity question on the post-test questionnaire asked respondents to rate (on a seven point scale: *strongly disagree to strongly agree*, before and after the workshop) six

statements about satisfying their curiosity by reading articles, watching videos, or attending exhibits either in the sciences or the arts. More specifically, the questions were worded "BEFORE (or AFTER) the workshop, I read (watched, would go to). . . to satisfy my curiosity." Results (illustrated in Figure 5) showed a *trend* toward increased intention to satisfy curiosity through science-related resources, but *significantly* increased intention to satisfy curiosity through arts-related resources--especially by reading "art-related articles."

Figure 5. Participant's perception of changes in the ways they satisfy curiosity, with changes greatest in the area of "reading art-related articles."



* significant difference, $p<.1$ **significant difference, $p<.05$ See appendix B Table 29. Detail of changes in intentions for satisfying curiosity. for detail.

Changes in reasons for attending art or science-related activities

As described above, before the workshop, students responded to the questionnaire request to list up to three reasons why they would and would not attend a "science-oriented activity (like participating in a workshop, taking a special class, or working with a scientist in his or her lab)" They answered responded to a similar request about an art-oriented activity (like participating in a workshop involving an art form--like painting, dancing, music, acting, etc.--or taking a special class, or working with an artist in his or her studio). After the workshop, respondents were shown their pre-workshop responses and asked if, now that they had completed the workshop, there was anything they wanted to add.

To assess workshop affect, we looked at themes prior to the workshop along with themes respondents added or emphasized afterward. We also looked to see how these themes differed by orientation toward each discipline.

Science-related activities. Before the workshop, participants' responses to why they would *not* attend science-related activities mostly related to avoiding boredom--caused primarily by repetitive information (*Long discussions about things I possess in my prior knowledge*), followed by overly didactic presentation and lack of "hands-on" learning (*lecture or bookwork; focus on theory rather than the physical*), the attraction or aversion to specific topics (e.g., *anything completely towards the chemistry branches*) and the presence of friends. Other comments from both arts-

oriented and science-oriented participants included relevance to school work; meeting new people; food, and "helping out". Post-program responses mostly reiterated the pre-program ones, but specifically emphasized hands-on activities.

Interestingly, only arts-oriented students referenced anxiety about the difficulty of the topic (*if it was not possible for me to understand given my previous level of education--too much jargon, etc*.) or their ability to understanding it (*If I were being judged or graded*). Also only respondents with an arts-orientation noted, especially after the workshop, a reference to fun or enjoyment (*It might be fun!; If it were a topic I enjoy*). After the workshop, one arts-oriented participant added reference to job preparation (*To learn about scientific illustrating and what it needs to be taken as a job*).

Only science-oriented students referenced logistics (distance, available time, friendly to people with disabilities, etc.) Also one science-oriented student included attending "*if it involves research*".

One science-oriented student included as a pre-workshop response, combining art and science topics; two arts-oriented students after the workshop added the inclusion of art as a reason to attend science-related activities. Specific comments and coding can be found in Appendix B. Table 26. Art-oriented and Science-oriented participants' before and after-workshop reasons to attend and not attend science-related activities.

Art-related activities. Before the workshop, the most common participant responses to why they would or would not **a**ttend art-related activities related to personal autonomy and opportunity for discovery. Participants expressed their need for personal autonomy with explanations for avoiding prescriptive-type activities (*If it seemed more step-by-step than creative* or *if it was an unfriendly environment--not open to originality/creativity* or reference to a *strict* instructor) and attending ones that allowed for personal expression (*I get to be myself; creativity encouraged*).

References to opportunity for discovery and creativity included*:*

> *The chance to discover—To try new things;* and
>
> *I enjoy creating new things; if there was an emphasis on looking at things through various perspectives and disciplines*

Both arts-oriented and science-oriented participants also referenced, but less frequently, comfort with the type of media involved; the quality of the teacher or mentor; logistics; and lack of skill. For each, examples of reasons for attending and not to attend include:

> <u>Comfort with the medium:</u>
> *I would want to attend an art oriented activity if it incorporated photography, painting, and drawing* and
>
> *If it was in a medium I didn't like.*
>
> *Not my type of art.*
>
> <u>Quality of teacher/mentor</u>:
> *If the speaker was boring* or its correlary for attending*, fun instructor*
>
> <u>Logistics:</u> *Too hot; too far away; no time*

Lack of skill:

If it required a level of knowledge I didn't already have--for example, knowing how to play the tuba.

I am not a good dancer so a dancing workshop would be difficult for me.. I have terrible stage freight so I am a horrible actor.

Some themes were only expressed by participants who identified themselves as science-oriented. These included relevance beyond the arts (*Related to science. Relevant to school*) and group experience (*I like being with others who have similar interests*);

Themes addressed only by arts-oriented participants included (in the order of frequency) new learning and improved skills; new experiences, hands-on experience; and fun. Examples include:

New learning and improved skills:
To simply learn. To acquire new experiences and extend my knowledge of forms and shapes or anything

Learn, See, Hear.

New experiences: *To try new things.*

hands-on experience; *if there was a hands-on approach to the art--not just looking but making*

Fun. *It's interactive. It's fun.*

As for new insights after the workshop, respondents mostly reiterated their pre-workshop ideas. However, one added "[to gain] more success in my own art.". One science-oriented student added: "*being with others who have similar interests, and work that encourages you to be self-guided and curious is important."* Another science-oriented participant added *"I want room to explore."*

Both of these post-workshop explanations provided some evidence that the two science-oriented respondents experienced the importance of the creative experience to their scientific process.

Changes in response to advertisements

The final way of understanding how the workshop affected these teens' motivation to attend an art or science workshop was to ask them to review their pre-workshop experience of the same two advertisements shown to the general population group (Figure 1and Figure 2 above in Focus Area 1: Response to Advertisements).

As it turned out, the workshop only minimally affected participants' perceptions of these advertisements. Participants responded significantly differently[2] to the phrase "hands-on with guts" with three participants responding more positively after than before. This finding may reflect the appreciation for "hands-on" learning expressed elsewhere. Curiously, four participants reduced their rating of the phrase "meet contemporary artists who use guts in their work" from "like" to "neutral".

[2] Detail of significant differences can be found in Appendix B Table 31. Advertising items responses that significantly from during the course of the workshop.

For the Amplify advertisement, after the workshop, participants significantly changed their responses to four of the 28 items. Expressing enthusiasm for the workshop itself , they responded more favorably to both the ARTLAB+/Hirshhorn logo and to the *Amplify* title. Of note is that they responded less positively to the Q?rius title (although only the title, "Q?rius at NMNH" not the logo, was available for highlight). Respondents also rated the word "lighting" less positively, perhaps revealing an unmet expectation. Participants' increased enthusiasm for ARTLAB+/Hirshhorn logo may be an indicator of increased comfort and enthusiasm for the institution – satisfying one of the program's goals to "increase curiosity in museums, their collections, and their educational programs"

Recommendation: The reduction in enthusiasm for the phrase "Q?rius at NMNH" taken together with the finding in the general population that the Q?rius log generated less positive response among the general population, staff should review the effectiveness of the "Q?rius" title.

Workshop Effect on Perceptions of Connections between the Arts and Science

What effect did the workshop have on participants' perceptions of the connections between art and science?

Three explorations helped to answer this question. First, we sought to find indications of workshop effect in from workshop respondents' changed ideas about the utility of artists learning about science and scientists learning about art. Second we were interested in the changes in how workshop participants used words to refer to one discipline or the other. And finally, we looked to workshop participants' own explanations of the benefit of attending a combined art/science workshop.

What We Learned

Workshop participants gained appreciation for the utility of artists knowing about science and of scientists knowing about art. While most of these changes reflected a more simple side-by-side understanding of the relationship, some reflected a deeper interdisciplinary integration.

All five arts-oriented respondents either had initially or gained from the workshop an interdisciplinary appreciation for how the arts enhance scientific endeavors. Two of these five joined a third in believing that learning about science is extremely important to artists. Both science-oriented respondents also increased their appreciation.

Demonstrated by their adjustments to how words apply to artists vs. scientists, workshop participants as being more similar. They came to understand scientists as sharing with artists the traits of *rebellious* and *sliding easily between fact and fiction*—both of which are essential to thought processes that lead to innovation. Likewise, they came to understand artists as requiring for their work science-oriented skills and thought processes—a realization that may help explain why the arts-oriented participants became more interested in engaging with science.

How We Know

Appreciation for the Usefulness of Interdisciplinary Learning

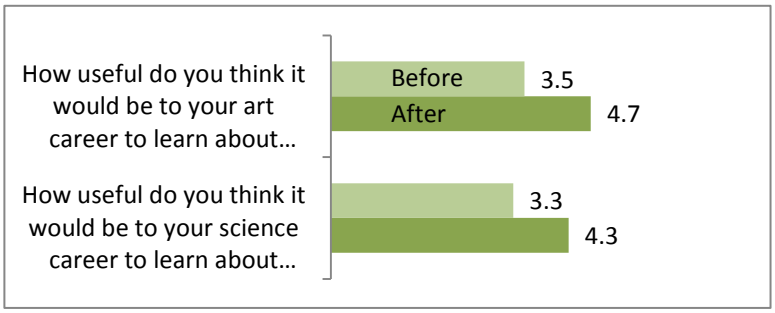


Figure 6. Increases in workshop participants assessment of the utility of arts to a science career and science to an arts career.

On a scale ranging from 1= "Useless" to 5= "Useful", eleven participants responded to retrospective questions comparing their "now" to "before the program" understanding of the utility of artists knowing about science and scientists knowing about art. When considering themselves as either scientists or the artists, participants significantly increased the degree to which they thought knowing the other discipline would be useful (Figure 6)

As described above, program participants were, in comparison to the General Sample, relatively sophisticated in their understanding of interdisciplinary benefits. After the workshop, eight participants responded to the questions "what new reasons have you found for artists to learn about science?" and " . . . for scientists to learn about art?" Their answers provided explanation of additional understanding they received from the workshop .

As noted in the introduction to this report, program planners sought to instill an appreciation of both disciplines at least as complementary silos, and ultimately, thought it would be a reach, a more sophisticated interdisciplinary appreciation of the arts and sciences and integrally related. For that reason, respondents' comments were coded as either integrated (integ) or complementary (silo). Some comments also include reference to career opportunities. In those cases, they were coded as "career."

Participant reports of new learning are listed in Table 12 and Table 13. Each response is followed by the respondents' *pre* score; *post* score, pre-program orientation and pre-program response, the response code at baseline; and the response code after the workshop.

Among the arts-oriented students, all either had or gained an interdisciplinary appreciation for how the arts enhance scientific endeavors. Movement toward interdisciplinary appreciation was less evident among science-oriented or equally-oriented participants. This finding also reflects the broader finding that generally teens find the arts less useful to the sciences than science to the arts.

Table 12. Evidence of workshop effect on participants' perception of how useful it is to scientists to learn about the arts to scientists.

Orien-tation	Retro-Pre	Post	Pre-program understanding	Post-program additions	Base-line	Add
Arts	5	5	*A scientist could learn more about how to express themselves. A second reason is you'll never know when you'll need it, and third is that they could also create something amazing themselves!) [career] siloes to interdisciplinary*	***Job opportunities***	*Integ**	*career*
Arts	4	4	*Scientists can benefit a lot from appreciating and learning to look at the world the way artists do--with various perspectives and mediums, and with a sense of wonder and awe. This benefits both their work as scientists and their happiness levels.)*	***Being able to talk about and do art successfully can contribute a lot to scientific observations--being able to draw insects, for example**.*	*Integ*	*silo*
Arts	3	3	*In order to create pictures to go with projects*	***Scientists can see things in different ways; Capture objects in more ways;***	silo	*Integ*
Arts	1	4	[No pre-program data]	***Arts are needed for everything.***		*Integ*
Equal	5	5	*1. Art helps create buildings and other important structures. / 2. We need art to connect the dots in animal habitats. / 3. Art is a means of connecting with the world in general.*	***Science involves every rule that concerns art.***	Integ	*Integ*
Equal	4	4	*Scientist draw all the time usually in the field when there drawing specimens and drawing there findings for future reference. scientist create works of art whether they know it or not like snap shots of microscopic life)*	***So they can' better represent their findings;***	silo	silo
Science	3	3	*Some scientists study art history, like figuring out how old a piece of work is.*	***Scientists can work in art restoration and do both;***	silo	Silo, Career
Science	4	5	*Different modes of thinking are engaged that enhance how someone performs in their field. / Science and art use similar skills. / Art draws connections between things in new ways*	***New skill sets and appreciation for work***	*Integ*	*Integ*

* *integrated*

Similarly, when considering themselves as artists (comments listed in Table 13), these respondents provided both conceptual (tending to reflect an integrated understanding) and practical (reflecting a silo understanding) rationale. Both demonstrated that participants understood why and how learning about science would benefit them as artists.

Table 13. Evidence of workshop effect on participants' perception of how useful it is to artists to learn about science.

Orien-tation	Retro-Pre	Post	Pre-program understanding	Post-program additions	Base-line	Add
Arts	5	5	*One reason is because they are so alike. Science is about learning the world around you, while art is about expressing it. The second reason is because if an artist wanted to create something with technology. And the third reason is because you'll never know when you'll need it!*	***[There] are definitely more job opportunities***	integ	career
Arts	3	3	*A photographer might need to learn about measurements, angles and technology.*	***Artists can explore more things using science.***	silo	silo
Arts	4	5	*Art is about looking at the world around or inside you to find inspiration, meaning and ideas, and science is about looking at the world around/inside you in an attempt to understand it. By knowing more about the various worlds, artists can derive ever more inspiration and meaning.*	***The experimental/analytical approach usually taken by scientists and researchers can be very interesting when used in an artistic/creative way.***	integ	integ
Arts	3	5	[no Pre-program data]	***There's a whole new world when you view it in both places at once.***		integ
Equal	5	5	*Science is everywhere in art it takes chemical know how to be able to mix paints and some idea of physics when creating a sculpture so that it doesn't end up tipping over and must have a great grasp on biology specifically anatomy to be able to accurately draw the human body*	***Artist[s] need to know science to be able to function chemistry physics and biology all factor into art***	silo	silo
Equal	4	5	*1.First because science can alter or even possibly increase knowledge about certain properties. Some of which include math proportions and measurements in art. / 2. Science is also very useful with art because it generates new ideas. / 3. Finally science itself produces art in everything we see, hear, feel, sense, etc. /*	***Science and art go hand in especially with bokay [bokeh?]and rule of thirds.***	integ	integ
Science	3	5	*Being aware of things around them on a deeper level. / If you're working with your body in the arts, it's useful to know about your body (dance). / Many principles of science inspire art.*	***Materials, preservation, processes.***	Integ	solo
Science	2	4	*With literary arts, they can use the science when they write so it appeals to more people. Visual artists can recreate images of science to look interesting.*	***They can use interesting science images to make art.***	solo	solo

** integrated*

Changes in how words describe artists vs. scientists

Comparison of changes in the way workshop respondents used words to describe artists and scientists showed changes in their appreciation in the commonality of both. All changes moved

toward the center point of describing both professions more than one or the other. On the average, no changes switched from describing one to the other.

For the whole group, across all orientations, participants shifted their use of the word, "rebellious" and the phrase "has ability to slide between fact and fiction" more toward scientists (Figure 7). The respondents with an arts orientation additionally shifted toward scientists the words and phrases, energetic; imaginative; motivated by a need to attract attention; playful, and social—all words that might be considered interpersonally demonstrative. The science-oriented respondents changed their use of the more intrapersonal descriptors: compassionate, open, passionate.

Across the whole group, words adjusted toward being more descriptive of artists (Figure 7) included *accurate; organized; team worker* and *objective*. All but the both-oriented responders also adjusted *informative* and *observer*. These additions may have demonstrated a new appreciation for the science-oriented skills and thought processes required in the arts—a change which may have contributed to the arts-oriented participants' increased interest in learning about science. The two science-oriented responders additionally included *ambitious; analytical; methodical; flexible; focused; goal oriented; innovative; and sincere.* These additions may have demonstrated a new appreciation and respect for the artistic process.

Figure 7. Descriptive words that shifted in meaning more toward describing both artists and scientists.

Perceived benefit of a combined art/science workshop

Participants also responded to the statement and question,

> *This workshop combined both arts and science. What did you get out of this workshop that you might not have gotten from an arts-only or science-only workshop?*

All eight responses are listed in Table 14, arranged by orientation to the arts, science, or both. Comments from arts-oriented participants helped to explicate the finding that arts-oriented participants became more open to the sciences. As with the responses to the utility of art for scientists and science for artists, these responses demonstrated appreciation for interrelationship of the two disciplines, although there was more reference to "parallel play" than true integration.

One comment about using a microscope to "study the world closely" implied an integration of science as another way of seeing. Neither of the comments from science-oriented students demonstrated a deeper integration.

Table 14. Responses addressing the added benefit of attending an art-science workshop.

Arts-oriented	
	I might not have gotten the chance to use a microscope and study the world closely
	If I had gone to a workshop that was only one subject, I would not have been able to see how art and science combine.
	It was extremely interesting to learn about the intersection of arts and sciences, or how one could pursue both areas at the same time. For example, with the scientific illustration and art conservation workshops, I learned a lot about how i could (since 'm entering college soon) potentially pursue my interests in both.
	I learned a lot more about science
Oriented to both arts and science	
	For science I probably would not have built a sculpture and in art I doubt I would have used a microscope so it's good that this workshop is a combo.I get to use my favorite things together
Science oriented	
	I have gained an understanding of how art and science are related. I know understand that certain aspects of science can be seen as artwork.
	I got how to take better pics

Expectations: How Teens experienced the workshop compared with their expectations

For purposes of learning how to best describe the workshops, project administrators were interested in participant expectations prior to the workshop and how those expectations were met or altered. To provide information about these expectations, participants responded to questions about how their workshop expectations had been unmet or exceeded. Only three respondents reported unmet expectations:

More time with microscopes (science).

That it would be very quiet (arts)

More opportunity to take pictures.(arts)

Interdisciplinary "surprises," i.e., ways their expectations had been exceeded, came from participants across all three orientations. Of these exceeded expectations, one (the first in the list below) demonstrated an appreciation for a deeper integration between the two discipline types. The remaining ones remained in the realm of silo integration. (each quote below is followed by the orientation of the respondent)

Yes the rules of art and all it has to do with science. (equal)

I loved visiting the preservation labs at the Hirshhorn! I wasn't expecting it to be that interesting but it definitely surprised me.(science)

I didn't really know about scientific illustration. (art)

I was surprised that we got to put a picture from the microscope in the museum and create a 3D model of an image. (science)

Yes I really like photographing things with the microscope (equal)

I learned to make a cool tool for my phone. I also took some cool pictures. (art)

The remaining "surprises," related more to specific experiences:

Working in groups & completing my work assignments. (science)

I was not at all expecting to meet, talk to and work with so many professionals from the Natural History Museum and the Hirshhorn. That was amazing. Also, I wasn't expecting to get to use so many pieces of equipment and artifacts from the museum (art).

Conclusions and Recommendations

- Overall, it appears that arts-oriented teens are interested in learning science and gain access through artistic avenues that relate to their artistic interests—whether performance, visual, musical, literary, etc.. More challenging is to increase science-oriented students' interest in the integrated experience of how creative, arts-like thinking enhances scientific investigation and how exposure to the arts enhances this creative ability.

  Recommendations:

  (1) continue engaging arts-oriented students in STEM through arts-based activities and

  (2) explore ways of communicating the utility/necessity of creative thinking in the sciences.

- Arts-oriented students tended to be more concerned about feeling incompetent than did science students –in both arts-based and science-based activities.

  Recommendation: Include in outreach to arts-oriented teens reassurances that the environment will be one that helps learners draw from their own experience and abilities..

- Many science-oriented teens expressed identified "boredom" as a reason to avoid arts-related activities.

  Recommendation: Include in outreach to science-oriented teens rationale for how creative arts-like thinking enhances scientific ability.

- Evidence of seeing arts and science as two separate cultures was stronger among teens in the general population than among teens who selected to participate in a STEAM workshop. After the workshop, the separation blurred even further for participants—a sign of workshop success.

  Recommendation: include in future summative evaluations measures of "cultural" (i.e. science-art) integration.

- **The *Q?rius* logo** was the only aspect of the *Amplify* ad to dampen enthusiasm among respondents (although this effect occurred only among 20%). It is possible that the curiosity meant to be engendered by the odd spelling may feel too challenging to some teens. Also,

workshop participants' enthusiasm for the phrase "Q?rius at NMNH" dampened over the course of the workshop.

Recommendation: Taken together these findings suggest that staff should reevaluate the desired intention and effect of the logo and adjust accordingly

- Teens who experienced the workshop increased their appreciation for and interest in how involvement with the arts benefits scientists and how involvement with science benefits artists.
- The workshop enhanced participants' enthusiasm for both the Hirshhorn and NMNH.
- Future study of more workshops (and therefore greater sample size) will lead to more detail about how arts-oriented and science-oriented teens differently benefit from the experiences.

Recommendations for future evaluations

Due to the size of the project we were unable to analyze some very rich data collected in response to the questionnaire items that asked respondents to list five words for each four the four categories included in professional artists and scientists and peers oriented to either the arts or sciences. With future funding, it will be important to additionally include analyses of these data; comparison of future workshop participants to the general population and effect of the workshop on these descriptors. .

Also, in retrospect, and in preparation for a conducting this study with a future workshop, a third question should be added: "List the three most important ways this workshop met your expectations."

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Appendix A Instruments

General Arts and Science Survey Questionnaire

NIMH STEAM 2015 general

Q7 Welcome to the Communicating Art and Science Survey and thanks for participating! We are interested in how young people think about science and art. Your responses will help us communicate about activities that combine them in ways that appeal to young people. Thanks so much for your help!

Q27 First we'd like to ask you some questions about yourself. Do you identify as a member of a racial or ethnic minority population?

- ❍ Yes (1)
- ❍ No (2)

Answer If First we'd like to ask you some questions about yourself. Do you identify as a member of a minor... Yes Is Selected

Q29 How would you describe your minority identity?

Q24 Do you identify as:

- ❍ Male (1)
- ❍ Female (2)
- ❍ Transgender (3)

Q25 What is your age?

If What is your age? Is Less Than 13, Then Skip To End of BlockIf What is your age? Is Greater Than 18, Then Skip To End of Block

Q1 When you think about the kind of person you are, or what you like to do in school or your spare time, which of the following statements best describes you?

- ❍ I am mostly interested in science. (1)
- ❍ I am mostly interested in the creative arts (including performing arts; visual arts, and literary arts). (-1)
- ❍ I am Interested in both the arts and sciences. (0)
- ❍ I am not very interested in either the arts or science. (4)

If I am not very interested in... Is Selected, Then Skip To End of Block

Q25 Now we'd like to know more about your interests and how you like to spend your time. Do you lean more toward science? Do you lean more toward the arts? (By the word "arts," we include performing, visual, and/or literary arts). Are you equally interested in the arts and the sciences? For each activity listed below, tell us about your interests. Do your interests lean . . .

	A LOT more toward the ARTS than science (-2)	SOMEWHAT more toward the ARTS (-1)	Equally toward both (0)	SOMEWHAT more toward the SCIENCES (1)	A LOT more toward SCIENCE than art (2)
What I choose to read	❍	❍	❍	❍	❍
How I choose to spend my free time	❍	❍	❍	❍	❍
How I choose my activities	❍	❍	❍	❍	❍
How I choose topics for projects at school	❍	❍	❍	❍	❍
Please select "Somewhat more toward the sciences" for this line.	❍	❍	❍	❍	❍

If Please select "Somewhat mor... Is Not Selected, Then Skip To End of Block

Q2 Please list five words or phrases you would use to describe qualities of people your age who are interested in the creative arts (that includes performing arts; visual arts; and literary arts).

	I describe people my age interested in art as . . . (1)
1. (1)	
2. (2)	
3. (3)	
4. (4)	
5. (5)	

Q3 Please list five words you would use to describe qualities of people your age who are interested in science

	I describe people my age interested in science as . . . (1)
1. (1)	
2. (2)	
3. (3)	
4. (4)	
5. (5)	

Q4 Please list five words or phrases that describe the most interesting/attractive aspects of professional artists. You might consider visual, performing, and/or literary artists.

	The most interesting or attractive qualities of professional artists are: (1)
1. (1)	
2. (2)	
3. (3)	
4. (4)	
5. (5)	

Q5 Please list five words or phrases that describe the most interesting/attractive aspects of scientists.

	The most interesting or attractive qualities of scientists are: (1)
1. (1)	
2. (2)	
3. (3)	
4. (4)	
5. (5)	

Q6 If you were invited to attend a science-oriented activity (like participating in a workshop, taking a special class, or working with a scientist in his or her lab), for what reasons would you NOT want to attend? Please be specific. For example, if you're not interested, what SPECIFICALLY turns you off?

	Reasons I would NOT attend a science-oriented activity (1)
SPECIFIC reason #1 (1)	
SPECIFIC reason #2 (2)	
SPECIFIC reason #3 (3)	

Q20 If you were invited to attend a science-oriented activity (like participating in a workshop, taking a special class, or working with a scientist in his or her lab), for what reasons would you WANT TO attend? Please be specific. For example, if you "like science," what SPECIFICALLY do you like?

	Things that would make me WANT TO attend a science-oriented activity (1)
SPECIFIC reason #1 (1)	
SPECIFIC reason #2 (2)	
SPECIFIC reason #3 (3)	

Q18 If you were invited to attend an art-oriented activity (like participating in a workshop involving an art form--like painting, dancing, music, acting, etc.--or taking a special class, or working with an artist in his or her studio), for what reasons would you NOT want to attend? Please be specific. For example, if you're not interested, what SPECIFICALLY turns you off?

	Reasons I would NOT want to attend an arts-oriented activity (1)
SPECIFIC reason #1 (1)	
SPECIFIC reason #2 (2)	
SPECIFIC reason #3 (3)	

Q19 If you were invited to attend an art-oriented activity (like participating in a workshop involving an art form--like painting, dancing, music, acting, etc.--or taking a special class, or working with an artist in his or her studio), for what reasons would you WANT TO attend? Please be specific. For example, if you're "like art," what SPECIFICALLY do you like?

	Things that would make me WANT TO attend an arts-oriented activity (1)
SPECIFIC reason #1 (1) SPECIFIC reason #2 (2) SPECIFIC reason #3 (3)	

Q22 If you were a professional artist, how useful do you think it would be to your career to learn about science?

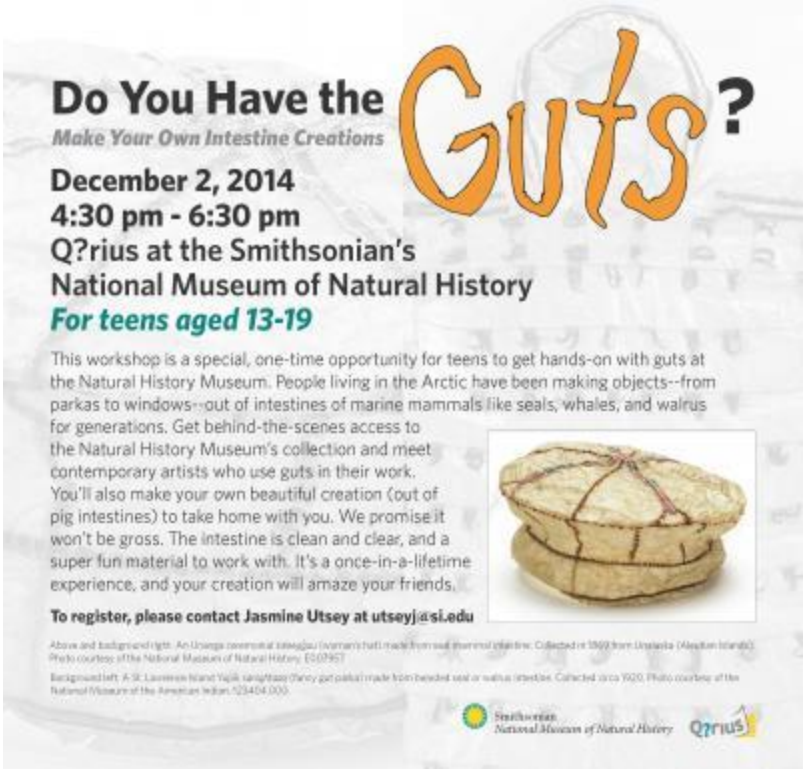
- ❍ Useless (1)
- ❍ Somewhat useless (2)
- ❍ Neutral (3)
- ❍ Somewhat useful (4)
- ❍ Useful (5)

Q24 If you were a professional scientist, how useful do you think it would be to your career to learn about the arts?

- ❍ Useless (1)
- ❍ Somewhat Useless (2)
- ❍ Neutral (3)
- ❍ Somewhat useful (4)
- ❍ Useful (5)

Q9 The advertisement below is for a workshop titled, "Do you have the guts?" You'll notice that when you drag your cursor over the text and photos, certain parts light up. Please click once (green) on the parts of the ad that perk your interest in attending the workshop. Click twice (red) on the ones that dampen your interest. Click three times to clear the shape go back to "neutral."

	Dislike (1)	Neutral (2)	Like (3)
Photo #1 (17)			
Do you have the Guts? (18)			
Make your own intestine creations (19)			
National Museum of Natural History (20)			
hands-on with guts (21)			
one-time opportunity (22)			
intestines of marine mammals (23)			
Access to collection (24)			
contemporary artists (25)			
beautiful creation (26)			
take home (27)			
not gross (28)			
super fun material (29)			
once in a lifetime (30)			
your creation (31)			
amaze your friends (32)			
photo #2 (33)			



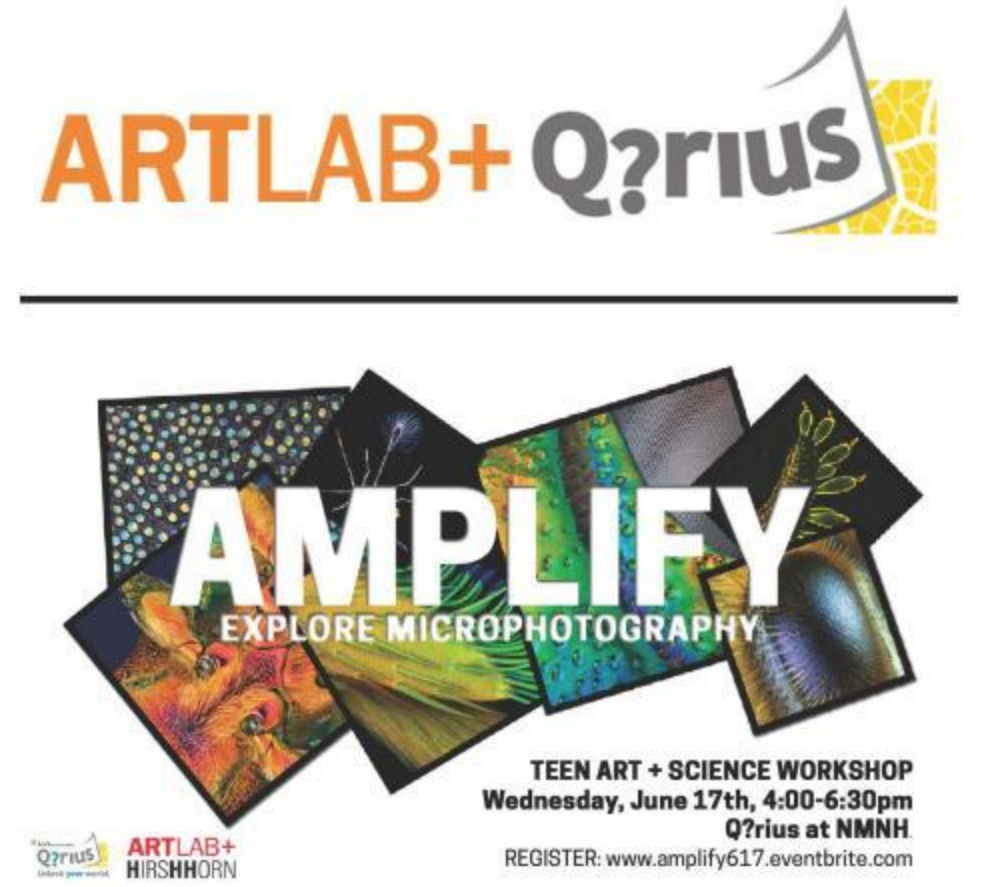
Answer If The advertisement below is for a workshop titled, "Do you have the guts?" You'll notice that when you drag your curser over the text and photos, certain parts light up. Please click once (gre... - Dislike Is Empty And The advertisement below is for a workshop titled, "Do you have the guts?" You'll notice that when you drag your curser over the text and photos, certain parts light up. Please click once (gre... - Like Is Empty

Q10 You indicated that nothing in the advertisement encouraged you to attend or discouraged you from attending the workshop. In the space below, please use at least five words to explain your response.

Q15 What additional thoughts do you have about what would make you want to attend or not attend this "Do you have the Guts?" workshop?

Q13 The next advertisement is for a workshop titled, "*Amplify*: Explore microphotography" Again, when you drag your cursor over the text and photos, certain parts will light up. Please click once (green) on the parts of the ad that perk your interest in attending the workshop. Click twice (red) on the ones that dampen your interest. Click three times to clear the shape go back to "neutral."

	Dislike (1)	Neutral (2)	Like (3)
ARTLAB+ (17)			
Amplify (19)			
Photo 1 (20)			
Explore Microphotography (21)			
Photo 2 (22)			
Photo 3 (23)			
Photo 4 (24)			
Photo 5 (25)			
Photo 6 (26)			
Photo 7 (27)			
microscopic level (28)			
Explore photography (29)			
Teen (30)			
Use microscopes (31)			
Hirshhorn (32)			
Art + Science (33)			
Q?rius (34)			
your camera (35)			
items from NIMH collections (36)			
bring your own object (37)			
Experiment (38)			
lighting (39)			
Composition (40)			
photography techniques (41)			
take home a USB (42)			
matted print (43)			
favorite image (44)			
NMNH (45)			



Answer If The next advertisement is for a workshop sponsored joingly by the Hirshhorn Museum and Sculpture Garden and the National Museum of Natural History. The workshop was ttitled, "*Amplify*: Explore... - Dislike Is Less Than 1 And The next advertisement is for a workshop sponsored joingly by the Hirshhorn Museum and Sculpture Garden and the National Museum of Natural History. The workshop was ttitled, "*Amplify*: Explore... - Like Is Less Than 1

Q14 You indicated that nothing in the advertisement encouraged you to attend or discouraged you from attending. In the space below, please use at least five words to explain your response.

Q17 What additional thoughts do you have about what would make you want to attend or not attend this "*Amplify*" workshop?

Q23 Finally, we'd like you to look at the words in the list below and make a selection based on whether you think each describes both artists and scientists equally (middle column) or if it applies more to artists or more to scientists.

	Describes artists TOTALLY, not scientists (-3)	Describes artists A LOT more than scientists (-2)	Describes artists SOMEWHAT more than scientists (-1)	Describes artists and scientists EQUALLY (0)	Describes scientists SOMEWHAT more than artists (1)	Describes scientists A LOT more than artists (2)	Describes scientists TOTALLY, not artists (3)
Educated (5)	❍	❍	❍	❍	❍	❍	❍
Intelligent (6)	❍	❍	❍	❍	❍	❍	❍
Skilled (7)	❍	❍	❍	❍	❍	❍	❍
Logical (8)	❍	❍	❍	❍	❍	❍	❍
Creative (10)	❍	❍	❍	❍	❍	❍	❍
Curious (11)	❍	❍	❍	❍	❍	❍	❍
Imaginative (13)	❍	❍	❍	❍	❍	❍	❍
Playful (14)	❍	❍	❍	❍	❍	❍	❍
Has ability to slide between fact and fiction (15)	❍	❍	❍	❍	❍	❍	❍
Innovative (16)	❍	❍	❍	❍	❍	❍	❍
Flexible (17)	❍	❍	❍	❍	❍	❍	❍
Goal oriented (19)	❍	❍	❍	❍	❍	❍	❍
Ambitious (20)	❍	❍	❍	❍	❍	❍	❍
Motivated by a need to be influential (21)	❍	❍	❍	❍	❍	❍	❍
Motivated by a need to attract attention (22)	❍	❍	❍	❍	❍	❍	❍
Has a need for originality (24)	❍	❍	❍	❍	❍	❍	❍
Inconsiderate (25)	❍	❍	❍	❍	❍	❍	❍

Obstinate (26)	❍	❍	❍	❍	❍	❍	❍
Accurate (27)	❍	❍	❍	❍	❍	❍	❍
Analytical (28)	❍	❍	❍	❍	❍	❍	❍
Focused (29)	❍	❍	❍	❍	❍	❍	❍
Methodical (30)	❍	❍	❍	❍	❍	❍	❍
Objective (31)	❍	❍	❍	❍	❍	❍	❍
Observer (32)	❍	❍	❍	❍	❍	❍	❍
Organized (33)	❍	❍	❍	❍	❍	❍	❍
Precise (34)	❍	❍	❍	❍	❍	❍	❍
Team-worker (35)	❍	❍	❍	❍	❍	❍	❍
Rebellious (47)	❍	❍	❍	❍	❍	❍	❍
Compassionate (48)	❍	❍	❍	❍	❍	❍	❍
Passionate (50)	❍	❍	❍	❍	❍	❍	❍
Social (51)	❍	❍	❍	❍	❍	❍	❍
Sincere (52)	❍	❍	❍	❍	❍	❍	❍
Informative (53)	❍	❍	❍	❍	❍	❍	❍
Energetic (64)	❍	❍	❍	❍	❍	❍	❍
Open (56)	❍	❍	❍	❍	❍	❍	❍
Patient (57)	❍	❍	❍	❍	❍	❍	❍
Persistent (58)	❍	❍	❍	❍	❍	❍	❍
Strong (59)	❍	❍	❍	❍	❍	❍	❍
Has a wealth of ideas (60)	❍	❍	❍	❍	❍	❍	❍
Has ability to be committed (61)	❍	❍	❍	❍	❍	❍	❍
Has the stamina to tackle difficult	❍	❍	❍	❍	❍	❍	❍

issues (62) Please select "Describes artists ALOT more than scientists" for this line (72)	❍	❍	❍	❍	❍	❍	❍

If Please select "Describes ar... Is Not Selected, Then Skip To End of Block

Q23 Thanks so much for your participating in our study! We really appreciate your time. Teens in our future workshops also appreciate your input!

NIMH STEAM 2015 Pre-Workshop Questionnaire

Q7 Welcome to the Amplify Workshop! As you know, this workshop combines art and science. Before you launch into this exciting week of discovery, we'd like to know a bit about who you are and what you think about science, art, and their relationship to each other. This questionnaire will help us get to know you better, learn how we can meet your needs and how we might make future workshops work well for teens. Thanks so much for your participation in our study!

Q42 To start, we'd like you to learn about your interests and how you like to spend your time. Do you lean more toward science? Do you lean more toward the arts? (By the word "arts," we include performing, visual, and/or literary arts). Are you equally interested in the arts and the sciences? For each activity listed below, tell us about your interests by completing the sentence: My interests lean . . .

	TOTALLY toward the ARTS, not science (-2)	MORE toward the ARTS (-1)	Equally toward both (0)	MORE toward SCIENCE than the arts (1)	TOTALLY toward SCIENCE, not the arts (2)
What I choose to read (2)					
How I choose to spend my free time (3)					
How I choose my activities (70)					
How I choose topics for projects at school (71)					

Q4 Please list five words or phrases that describe the most interesting/attractive aspects of professional artists (including visual, performing, and/or literary artists).

	The most interesting or attractive qualities of professional artists are: (1)
1. (1)	
2. (2)	
3. (3)	
4. (4)	
5. (5)	

Q5 Please list five words or phrases that describe the most interesting/attractive aspects of scientists.

	The most interesting or attractive qualities of scientists are: (1)
1. (1)	
2. (2)	
3. (3)	
4. (4)	
5. (5)	

Q6 If you were invited to attend a science-oriented activity (like participating in a workshop, taking a special class, or working with a scientist in his or her lab), for what reasons would you NOT want to attend? Please be specific. For example, if you're not interested, what SPECIFICALLY turns you off?

	Reasons I would NOT attend a science-oriented activity (1)
SPECIFIC reason #1 (1)	
SPECIFIC reason #2 (2)	
SPECIFIC reason #3 (3)	

Q20 If you were invited to attend a science-oriented activity (like participating in a workshop, taking a special class, or working with a scientist in his or her lab), for what reasons would you WANT TO attend? Please be specific. For example, if you "like science," what SPECIFICALLY do you like?

	Things that would make me WANT TO attend a science-oriented activity (1)
SPECIFIC reason #1 (1)	
SPECIFIC reason #2 (2)	
SPECIFIC reason #3 (3)	

Q18 If you were invited to attend an art-oriented activity (like participating in a workshop involving an art form--like painting, dancing, music, acting, etc.--or taking a special class, or working with an artist in his or her studio), for what reasons would you NOT want to attend? Please be specific. For example, if you're not interested, what SPECIFICALLY turns you off?

	Reasons I would NOT want to attend an arts-oriented activity (1)
SPECIFIC reason #1 (1)	
SPECIFIC reason #2 (2)	
SPECIFIC reason #3 (3)	

Q19 If you were invited to attend an art-oriented activity (like participating in a workshop involving an art form--like painting, dancing, music, acting, etc.--or taking a special class, or working with an artist in his or her studio), for what reasons would you WANT TO attend? Please be specific. For example, if you "like art," what SPECIFICALLY do you like?

	Things that would make me WANT TO attend an art-oriented activity (1)
SPECIFIC reason #1 (1)	
SPECIFIC reason #2 (2)	
SPECIFIC reason #3 (3)	

Q31 If you were a professional artist, how useful do you think it would be to your career to learn about science?

- ❍ Useless (1)
- ❍ Somewhat useless (2)
- ❍ Neutral (3)
- ❍ Somewhat useful (4)
- ❍ Useful (5)

Q32 If you were a professional scientist, how useful do you think it would be to your career to learn about the arts?

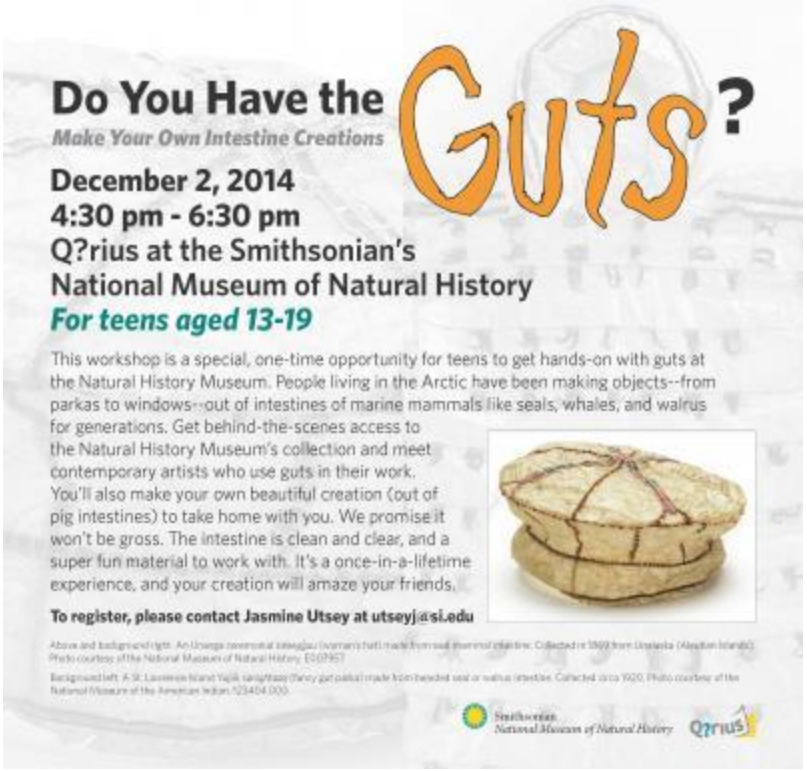
- ❍ Useless (1)
- ❍ Somewhat Useless (2)
- ❍ Neutral (3)
- ❍ Somewhat useful (4)
- ❍ Useful (5)

Q29 Please list up to three reasons why artists might want to learn more about science.

Q30 Please list up to three reasons why scientists might want to learn more about the arts.

Q9 The advertisement below is for a workshop titled, "Do you have the guts?" You'll notice that when you drag your cursor over the text and photos, certain parts light up. Please click once (green) on the parts of the ad that perk your interest in attending the workshop. Click twice (red) on the ones that dampen your interest. Click three times to clear the shape go back to "neutral."

	Dislike (1)	Neutral (2)	Like (3)
Photo #1 (17)			
Do you have the Guts? (18)			
Make your own intestine creations (19)			
National Museum of Natural History (20)			
hands-on with guts (21)			
one-time opportunity (22)			
intestines of marine mammals (23)			
Access to collection (24)			
contemporary artists (25)			
beautiful creation (26)			
take home (27)			
not gross (28)			
super fun material (29)			
once in a lifetime (30)			
your creation (31)			
amaze your friends (32)			
photo #2 (33)			



Answer If The advertisement below is for a workshop titled, "Do you have the guts?" You'll notice that when you drag your curser over the text and photos, certain parts light up. Please click once (gre... - Dislike Is Empty And The advertisement below is for a workshop titled, "Do you have the guts?"   You'll notice that when you drag your curser over the text and photos, certain parts light up. Please click once (gre... - Like Is Empty

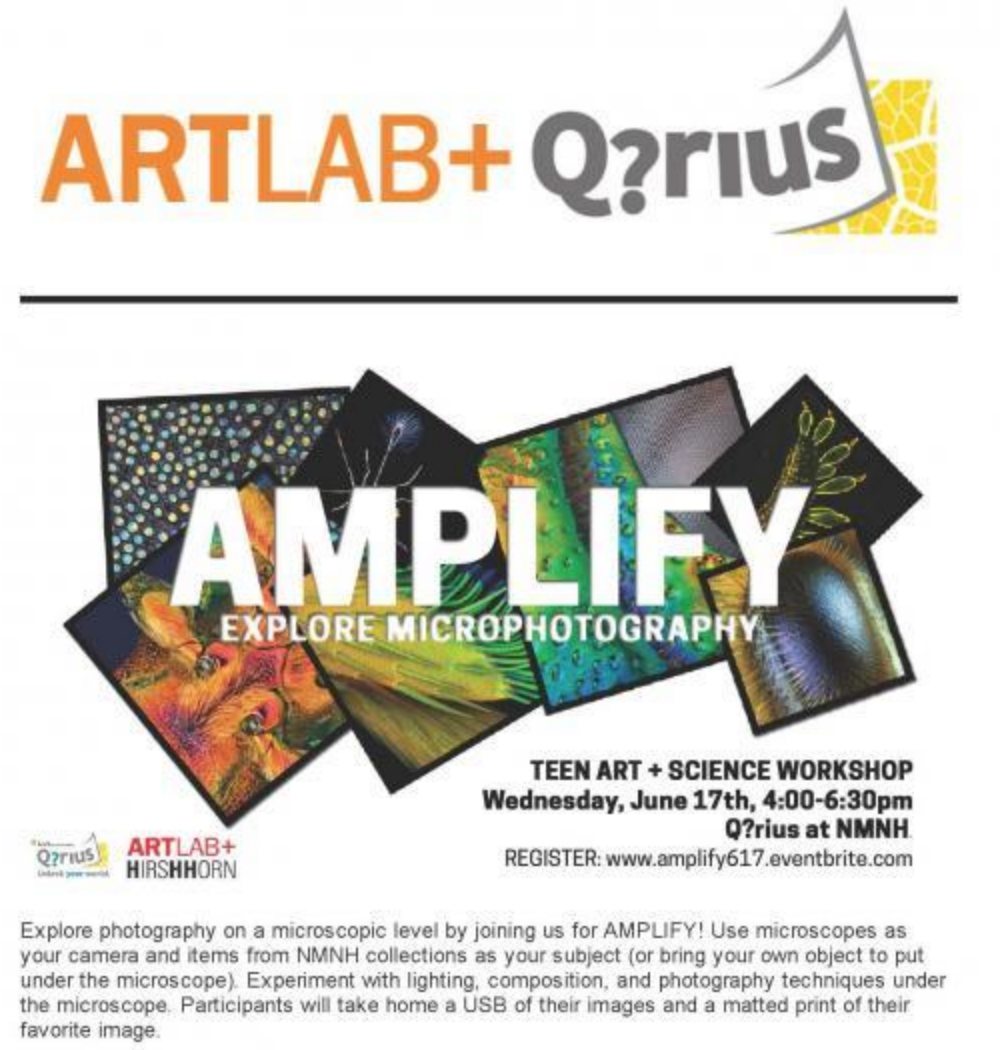
Q10 You indicated that nothing in the advertisement encouraged you to attend or discouraged you from attending the workshop. In the space below, please use at least five words to explain your response.

Q15 What additional thoughts do you have about what would make you want to attend or not attend this "Do you have the Guts?" workshop?

Q13 The next advertisement is for the *Amplify* workshop we held in June. Again, when you drag your cursor over the text and photos, certain parts will light up. Please click once (green)

on the parts of the ad that perk your interest in attending the workshop. Click twice (red) on the ones that dampen your interest. Click three times to clear the shape go back to "neutral."

	Dislike (1)	Neutral (2)	Like (3)
ARTLAB+ (17)			
Amplify (19)			
Photo 1 (20)			
Explore Microphotography (21)			
Photo 2 (22)			
Photo 3 (23)			
Photo 4 (24)			
Photo 5 (25)			
Photo 6 (26)			
Photo 7 (27)			
microscopic level (28)			
Explore photography (29)			
Teen (30)			
Use microscopes (31)			
Hirshhorn (32)			
Art + Science (33)			
Q?rius (34)			
your camera (35)			
items from NIMH collections (36)			
bring your own object (37)			
Experiment (38)			
lighting (39)			
Composition (40)			
photography techniques (41)			
take home a USB (42)			
matted print (43)			
favorite image (44)			
NMNH (45)			



Answer If The next advertisement is for a workshop sponsored jointly by the Hirshhorn Museum and Sculpture Garden and the National Museum of Natural History. The workshop was titled, "*Amplify*: Explore... - Dislike Is Less Than 1 And The next advertisement is for a workshop sponsored jointly by the Hirshhorn Museum and Sculpture Garden and the National Museum of Natural History. The workshop was titled, "*Amplify*: Explore... - Like Is Less Than 1

Q14 You indicated that nothing in the advertisement encouraged you to attend or discouraged you from attending. In the space below, please use at least five words to explain your response.

Q17 What additional thoughts do you have about what would made you want to attend or not attend this "*Amplify*" workshop?

Q22 Finally, we'd like you to look at the words in the list below and make a selection based on whether you think each describes both artists and scientists equally (middle column) or if it applies more to artists or more to scientists.

	Describes artists TOTALLY, not scientists (-3)	Describes artists ALOT more than scientists (-2)	Describes artiists SOMEWHAT more than scientists (-1)	Describes artists and scientists EQUALLY (0)	Describes scientists SOMEWHAT more than artists (1)	Describes scientists A LOT more than artists (2)	Describes scientists TOTALLY, not artists (3)
Educated (5)							
Intelligent (6)							
Skilled (7)							
Logical (8)							
Creative (10)							
Curious (11)							
Imaginative (13)							
Playful (14)							
Has ability to slide between fact and fiction (15)							
Innovative (16)							
Flexible (17)							
Goal oriented (19)							
Ambitious (20)							
Motivated by a need to be influential (21)							
Motivated by a need to attract attention (22)							
Has a need for originality (24)							
Inconsiderate (25)							
Obstinate (26)							
Accurate (27)							
Analytical (28)							
Focused (29)							
Methodical (30)							
Objective (31)							
Observer (32)							

Organized (33) Precise (34) Team-worker (35) Rebellious (47) Compassionate (48) Passionate (50) Social (51) Sincere (52) Informative (53) Energetic (64) Open (56) Patient (57) Persistent (58) Strong (59) Has a wealth of ideas (60) Has ability to be committed (61) Has the stamina to tackle difficult issues (62)							

Q43 Thanks so much for participating in our study! We really appreciate your time. Teens in future workshops also appreciate your input!

NIMH STEAM 2015 Post Workshop Questionnaire

Q7 Congratulations for completing the Amplify Workshop! We would like to know a bit about how the workshop may have affected your thoughts about artists and scientists. This questionnaire will help us learn how our workshops can be improved. Thanks so much for taking the time to help us learn.

Q30 To start, we'd like you to think again about your interests and how you like to spend your time. Do you lean more toward science? Do you lean more toward the arts? (By the word "arts," we include performing, visual, and/or literary arts). For each activity listed below, tell us about your interests. To start, we'd like you to think again about your interests and how you like to spend your time. Has this workshop affected your interests? Now, do you lean more toward science? Do you lean more toward the arts? (By the word "arts," we include performing, visual, and/or literary arts). Are you equally interested in the arts and the sciences? For each activity listed below, tell us about your interests by completing the sentence: Now that I've completed this workshop, my interests lean . . .

	TOTALLY toward the ARTS, not science (-2)	MORE toward the ARTS (-1)	Equally toward both (0)	MORE toward SCIENCE than the arts (1)	TOTALLY toward SCIENCE, not the arts. (2)
What I plan to read (2)	❍	❍	❍	❍	❍
How I plan to spend my free time (3)	❍	❍	❍	❍	❍
How I will choose my activities (70)	❍	❍	❍	❍	❍
How I plan to choose topics for projects at school (71)	❍	❍	❍	❍	❍

Q34 Now we'd like to know how you think you've changed. Each statement below is listed twice. First tell us how much each statement describes you BEFORE participating in the workshop. Then tell us how much each statement describes you NOW.

	Not at all like me (1)	Not like me (2)	Not much like me (3)	Neutral (4)	Somewhat like me (5)	Like me (6)	Just like me (7)
BEFORE the workshop I read science articles to satisfy my curiosity. (1)	❍	❍	❍	❍	❍	❍	❍
NOW I plan to read science articles to satisfy my curiosity. (2)	❍	❍	❍	❍	❍	❍	❍
BEFORE the workshop I would watch science-related videos to satisfy my curiosity. (3)	❍	❍	❍	❍	❍	❍	❍
NOW I plan to watch science-related videos to satisfy my curiosity (4)	❍	❍	❍	❍	❍	❍	❍
BEFORE the workshop I would go to science-related exhibits to satisfy my curiosity. (5)	❍	❍	❍	❍	❍	❍	❍
NOW I plan to go to science-related exhibits to satisfy my curiosity. (6)	❍	❍	❍	❍	❍	❍	❍

Q35 These next statements are the same as the ones on the last page, but they're related to the arts (visual, performing, literary, etc.). Each statement below is listed twice. First tell us how much the statement describes you BEFORE participating in the workshop. Then tell us how much the statement describes you NOW.

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Some what Agree (5)	Agree (6)	Strongly Agree (7)
BEFORE the workshop I read art-related articles to satisfy my curiosity. (1)	❍	❍	❍	❍	❍	❍	❍
NOW I plan to art-related articles to satisfy my curiosity. (2)	❍	❍	❍	❍	❍	❍	❍
BEFORE the workshop I would watch art-related videos to satisfy my curiosity (3)	❍	❍	❍	❍	❍	❍	❍
NOW I plan to watch art-related videos to satisfy my curiosity (4)	❍	❍	❍	❍	❍	❍	❍
BEFORE the workshop I would go to art-related exhibits to satisfy my curiosity. (5)	❍	❍	❍	❍	❍	❍	❍
NOW I think I will go to art-related exhibits to satisfy my curiosity. (6)	❍	❍	❍	❍	❍	❍	❍

Q1 This workshop combined both arts and science. What did you get out of this workshop that you might not have gotten from an arts-only or science-only workshop?

Q4 Before the workshop, you listed the following words to describe the most interesting or attractive qualities of professional artists: 1. ${e://Field/ProfArt1} 2. ${e://Field/ProfArt2} 3. ${e://Field/ProfArt3} 4. ${e://Field/ProfArt4} 5. ${e://Field/ProfArt5} Now that you've completed the workshop, tell us what words would be in your list NOW?

Q5 Before the workshop, you listed the following words to describe the most interesting or attractive qualities of professional scientists: 1. ${e://Field/ProfSci1} 2. ${e://Field/ProfSci2} 3. ${e://Field/ProfSci3} 4, ${e://Field/ProfSci4} 5. ${e://Field/ProfSci5} Now that you've completed the workshop, tell us what words would be in your list NOW?

Q6 Before the workshop, you listed the following reasons why you would NOT want to attend a science-oriented activity (like participating in a workshop, taking a special class, or working with a scientist in his or her lab). 1. ${e://Field/ReasonNotSci1}
2. ${e://Field/ReasonNotSci2} 3. ${e://Field/ReasonNotSci3} Now that you've completed this workshop, tell us what reasons would be in your list NOW?

Q20 Before the workshop, you listed the following reasons why you would WANT TO attend a science-oriented activity (like participating in a workshop, taking a special class, or working with a scientist in his or her lab). 1. ${e://Field/ReasonSci1}

2. ${e://Field/ReasonSci2} 3. ${e://Field/ReasonSci3} Now that you've completed this workshop, tell us what reasons would be in your list NOW?

Q18 Before the workshop, you listed the following reasons why you would NOT want to attend an art-oriented activity (like participating in a workshop involving an art form--like painting, dancing, music, acting, etc. or taking a special class, or working with an artist in his or her studio): 1. ${e://Field/ReasonNotArt1}2. ${e://Field/ReasonNotArt2}
3. ${e://Field/ReasonNotArt3} Now that you've completed this workshop, tell us what reasons would be in your list NOW?

Q19 Before the workshop, you listed the following reasons why you would WANT TO attend an art-oriented activity (like participating in a workshop involving an artform--like painting, dancing, music, acting, etc.--or taking a special class, or working with an artist in his or her studio): 1. ${e://Field/ReasonArt1} 2. ${e://Field/ReasonArt2}
3. ${e://Field/ReasonArt3} Now that you've completed this workshop, tell us what reasons would be in your list NOW?

Q31 Think of yourself as a professional artist. Now that you've completed this workshop, how useful do you think it would be to your art career to learn about science?
- ❍ Useless (1)
- ❍ Somewhat Usueless (2)
- ❍ Neutral (3)
- ❍ Somewhat Useful (4)
- ❍ Useful (5)

Q38 Thinking back to BEFORE the workshop, if you were a professional artist, how useful would you have said it would be to your art career to learn about science?
- ❍ Useless (1)
- ❍ Somewhat Useless (2)
- ❍ Neutral (3)
- ❍ Somewhat Useful (4)
- ❍ Useful (5)

Q32 Now think of yourself as a professional scientist. Now that you've completed this workshop, how useful do you think it would be to your science career to learn about the arts?

- ❍ Useless (1)
- ❍ Somewhat Useless (2)
- ❍ Neutral (3)
- ❍ Somewhat Useful (4)
- ❍ Useful (5)

Q39 Thinking back to BEFORE the workshop, if you were a professional scientist, how useful would you have said it would be to your science career to learn about the arts?

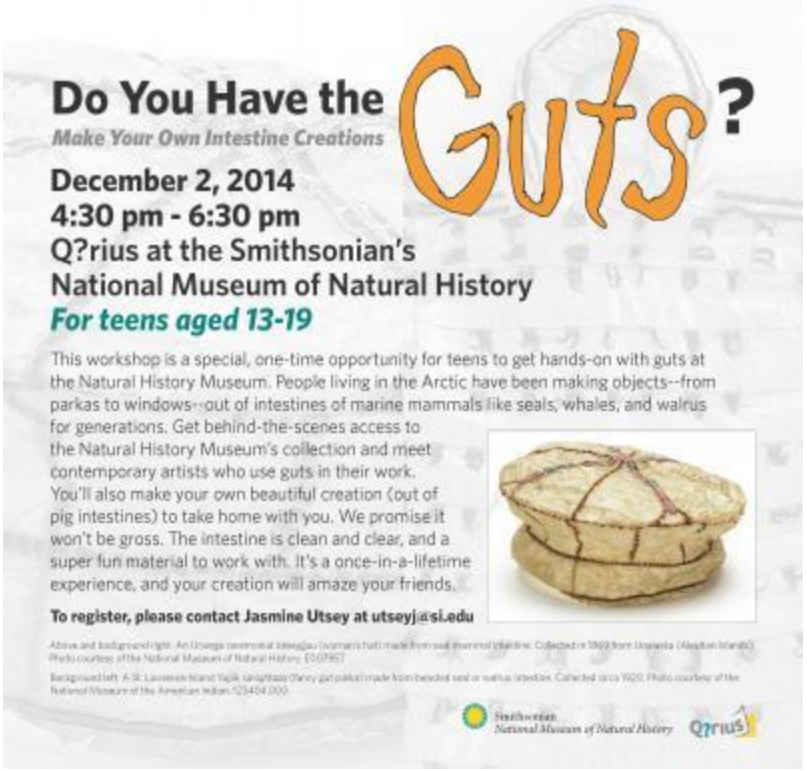
- ❍ Useless (1)
- ❍ Somewhat Useless (2)
- ❍ Neutral (3)
- ❍ Somewhat Useful (4)
- ❍ Useful (5)

Q29 Now that you've completed the *Amplify* workshop, what new reasons have you found for artists to learn more about science?

Q30 What new reasons have you found for scientists to learn more about the arts?

Q9 The advertisement below is for a workshop titled, "Do you have the guts?" We'd like to know if you see it differently now that you've been through the *Amplify* workshop.You'll notice that when you drag your curser over the text and photos, certain parts light up. Please click once (green) on the parts of the ad that NOW perk your interest in attending the workshop. Click twice (red) on the ones that dampen your interest. Click three times to clear the shape go back to "neutral."

	Dislike (1)	Neutral (2)	Like (3)
Photo #1 (17)			
Do you have the Guts? (18)			
Make your own intestine creations (19)			
National Museum of Natural History (20)			
hands-on with guts (21)			
one-time opportunity (22)			
intestines of marine mammals (23)			
Access to collection (24)			
contemporary artists (25)			
beautiful creation (26)			
take home (27)			
not gross (28)			
super fun material (29)			
once in a lifetime (30)			
your creation (31)			
amaze your friends (32)			
photo #2 (33)			



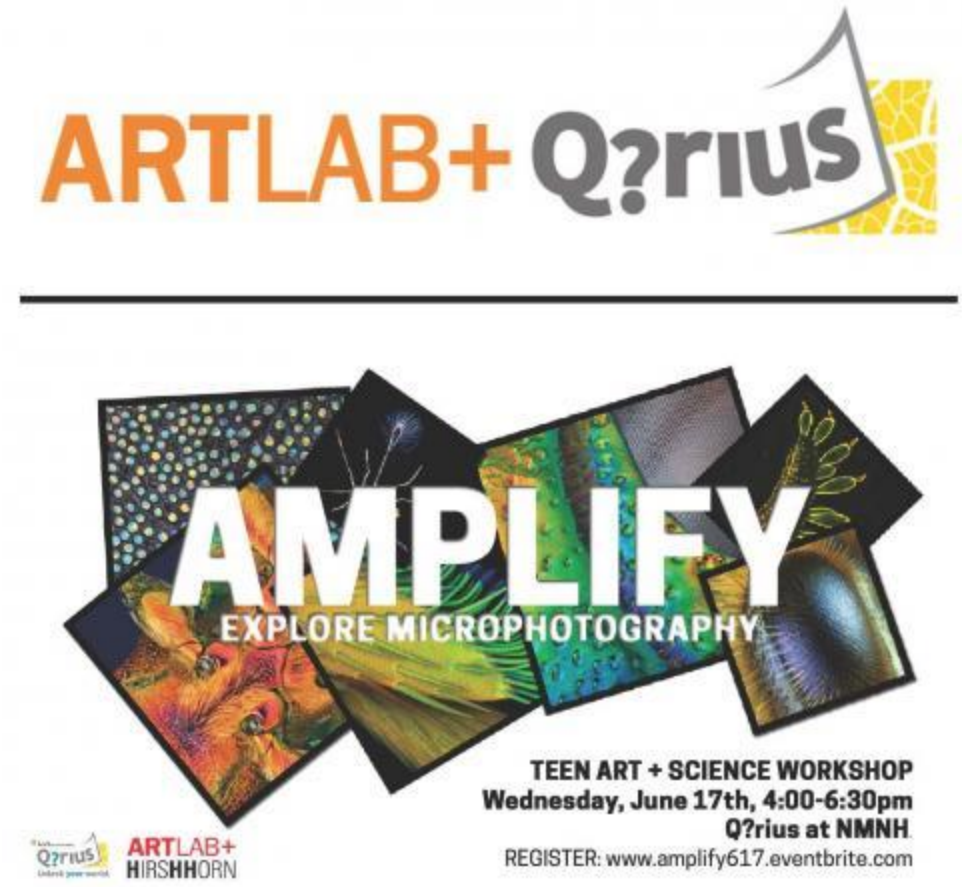
Answer If The advertisement below is for a workshop titled, "Do you have the guts?" You'll notice that when you drag your curser over the text and photos, certain parts light up. Please click once (gre... - Dislike Is Empty And The advertisement below is for a workshop titled, "Do you have the guts?" You'll notice that when you drag your curser over the text and photos, certain parts light up. Please click once (gre... - Like Is Empty

Q10 You indicated that nothing in the advertisement encouraged you to attend or discouraged you from attending the workshop. In the space below, please use at least five words to explain your response.

Q15 What additional thoughts do you have about what would make you want to attend or not attend this "Do you have the Guts?" workshop?

Q13 The next advertisement is for last June's "*Amplify*: Explore microphotography" workshop. We'd like to know if you see it differently now that you've been through it. Again, when you drag your cursor over the text and photos, certain parts will light up. Please click once (green) on the parts of the ad that perk your interest in attending the workshop. Click twice (red) on the ones that dampen your interest. Click three times to clear the shape go back to "neutral."

	Dislike (1)	Neutral (2)	Like (3)
ARTLAB+ (17)			
Amplify (19)			
Photo 1 (20)			
Explore Microphotography (21)			
Photo 2 (22)			
Photo 3 (23)			
Photo 4 (24)			
Photo 5 (25)			
Photo 6 (26)			
Photo 7 (27)			
microscopic level (28)			
Explore photography (29)			
Teen (30)			
Use microscopes (31)			
Hirshhorn (32)			
Art + Science (33)			
Q?rius (34)			
your camera (35)			
items from NIMH collections (36)			
bring your own object (37)			
Experiment (38)			
lighting (39)			
Composition (40)			
photography techniques (41)			
take home a USB (42)			
matted print (43)			
favorite image (44)			
NMNH (45)			



Answer If The next advertisement is for a workshop sponsored joingly by the Hirshhorn Museum and Sculpture Garden and the National Museum of Natural History. The workshop was ttitled, "*Amplify*: Explore... - Dislike Is Less Than 1 And The next advertisement is for a workshop sponsored joingly by the Hirshhorn Museum and Sculpture Garden and the National Museum of Natural History. The workshop was ttitled, "*Amplify*: Explore... - Like Is Less Than 1

Q14 You indicated that nothing in the advertisement encouraged you to attend or discouraged you from attending. In the space below, please use at least five words to explain your response.

Q38 What expectations did you have for this week's *Amplify* workshop that weren't met?

Q39 What if anything happened in this week's *Amplify* workshop that exceeded your expectations?

Q17 What additional thoughts do you have about what would made you want to attend or not attend this "*Amplify*" workshop?

Q37 Now we'd like you to look again at the words in the list below. Before the workshop, we asked you to use the scale below to describe how each applied to artists and sciences: Describes artists TOTALLY, not scientists Describes artists A LOT more than scientists Describes artists SOMEWHAT more than scientists Describes artists and scientists EQUALLY Describes scientists SOMEWHAT more than artists Describes scientists A LOT more than artists Describes scientists TOTALLY, not artists Your response from back then is written in the middle column (next to each word). Is your response still the same? If so, please place a mark in the "Changed?" column below if your response has changed. When you click to the next page, you can tell us your new response.

	Your previous response	If your response has changed, check here
	(1)	Changed (5)
Educated (5)		❍
Intelligent (6)		❍
Skilled (7)		❍
Logical (8)		❍
Creative (10)		❍
Curious (11)		❍
Imaginative (13)		❍
Playful (14)		❍
Has ability to slide between fact and fiction (15)		❍
Innovative (16)		❍
Flexible (17)		❍
Goal oriented (19)		❍
Ambitious (20)		❍
Motivated by a need to be influential (21)		❍
Motivated by a need to attract attention (22)		❍
Has a need for originality (24)		❍
Inconsiderate (25)		❍
Obstinate (26)		❍
Accurate (27)		❍
Analytical (28)		❍
Focused (29)		❍
Methodical (30)		❍
Objective (31)		❍
Observer (32)		❍

Organized (33)		❍
Precise (34)		❍
Team-worker (35)		❍
Rebellious (47)		❍
Compassionate (48)		❍
Passionate (50)		❍
Social (51)		❍
Sincere (52)		❍
Informative (53)		❍
Energetic (64)		❍
Open (56)		❍
Patient (57)		❍
Persistent (58)		❍
Strong (59)		❍
Has a wealth of ideas (60)		❍
Has ability to be committed (61)		❍
Has the stamina to tackle difficult issues (62)		❍

Answer If Finally, we'd like you to look again at the words in the list below. Before the workshop, we asked you to use the scale below to describe how each applied to artists and sciences: ... - Your previous response -   Is Less Than 2

Q38 You indicated that your thoughts about these words have not changed at all or only changed minimally. Please explain why you think this workshop had so little effect on your thinking about how these words describe artists and scientists. (or you can go back and tell us what changed!)

Answer If Now we'd like you to look again at the words in the list below. Before the workshop, we asked you... - Your previous response -   Is Greater Than 0

Q39 Listed below are the words with applications you said you would change. Please select the column that represents your new thoughts of how each applies to artists, scientists, or both. Also, feel free to make a comment in the space provided

[displayed only if change is selected in question above)\]

	Describes artists TOTALLY, not scientists (-3)	Describes artists A LOT more than scientists (-2)	Describes artiists SOMEWHAT more than scientists (-1)	Describes artists and scientists EQUALLY (0)	Describes scientists SOMEWHAT more than artists (1)	Describes scientists A LOT more than artists (2)	Describes scientists TOTALLY, not artists (3)
Educated (5)	❍	❍	❍	❍	❍	❍	❍
Intelligent (6)	❍	❍	❍	❍	❍	❍	❍
Skilled (7)	❍	❍	❍	❍	❍	❍	❍
Logical (8)	❍	❍	❍	❍	❍	❍	❍
Creative (10)	❍	❍	❍	❍	❍	❍	❍
Curious (11)	❍	❍	❍	❍	❍	❍	❍
Imaginative (13)	❍	❍	❍	❍	❍	❍	❍
Playful (14)	❍	❍	❍	❍	❍	❍	❍
Has ability to slide between fact and fiction (15)	❍	❍	❍	❍	❍	❍	❍
Innovative (16)	❍	❍	❍	❍	❍	❍	❍
Flexible (17)	❍	❍	❍	❍	❍	❍	❍
Goal oriented (19)	❍	❍	❍	❍	❍	❍	❍
Ambitious (20)	❍	❍	❍	❍	❍	❍	❍

Motivated by a need to be influential (21)	❍	❍	❍	❍	❍	❍	❍
Motivated by a need to attract attention (22)	❍	❍	❍	❍	❍	❍	❍
Has a need for originality (24)	❍	❍	❍	❍	❍	❍	❍
Inconsidera te (25)	❍	❍	❍	❍	❍	❍	❍
Obstinate (26)	❍	❍	❍	❍	❍	❍	❍
Accurate (27)	❍	❍	❍	❍	❍	❍	❍
Analytical (28)	❍	❍	❍	❍	❍	❍	❍
Focused (29)	❍	❍	❍	❍	❍	❍	❍
Methodical (30)	❍	❍	❍	❍	❍	❍	❍
Objective (31)	❍	❍	❍	❍	❍	❍	❍
Observer (32)	❍	❍	❍	❍	❍	❍	❍
Organized (33)	❍	❍	❍	❍	❍	❍	❍
Precise (34)	❍	❍	❍	❍	❍	❍	❍
Team-worker (35)	❍	❍	❍	❍	❍	❍	❍
Rebellious (47)	❍	❍	❍	❍	❍	❍	❍
Compassio nate (48)	❍	❍	❍	❍	❍	❍	❍
Passionate (50)	❍	❍	❍	❍	❍	❍	❍
Social (51)	❍	❍	❍	❍	❍	❍	❍
Sincere	❍	❍	❍	❍	❍	❍	❍

(52)							
Informative (53)	❍	❍	❍	❍	❍	❍	❍
Energetic (64)	❍	❍	❍	❍	❍	❍	❍
Open (56)	❍	❍	❍	❍	❍	❍	❍
Patient (57)	❍	❍	❍	❍	❍	❍	❍
Persistent (58)	❍	❍	❍	❍	❍	❍	❍
Strong (59)	❍	❍	❍	❍	❍	❍	❍
Has a wealth of ideas (60)	❍	❍	❍	❍	❍	❍	❍
Has ability to be committed (61)	❍	❍	❍	❍	❍	❍	❍
Has the stamina to tackle difficult issues (62)	❍	❍	❍	❍	❍	❍	❍

Q37 Thanks so much for participating in our study! We really appreciate learning about how the *Amplify* workshop affected you. Teens in future workshops will also appreciate your input! Is there anything else you'd them (or us) to know about the workshop?

Appendix B. Data Detail

Detail of Race/Ethnicity groups

Table 15. Detail of demographic sub-groups

Label	Description	n
African Descent	African-American; Nigerian-American; Black;; Afro-Caribbean	27
Asian descent	Asian; Asian-American; Asian-Indian; Vietnamese; South Asian, Muslim; Indian; Filipino; Chinese; Korean	25
Hispanic	Hispanic; Peruvian; Mexican; Latina; Hispanic Quaker; Columbian	19
Muslim	Muslim	1
Native American	Native-American	2
Bi-racial	Bi-racial; White and Hispanic; mixed; Korean; Black and Native American	4
Caucasian	Caucasian, White, Russian	4
Unknown	Not sure, teen, small, not many people are interested in the types of stuff I do; idk; good; funny; female with depression; creative; asexual; 1200	13

Detail of Responses to Advertisements

Table 16. Detail of responses to individual "Do You Have the Guts?" items grouped by responder's orientation.

	Perks			Dampers		
Orientation:	Arts	Both	Science	Arts	Both	Science
ARTLAB+	41%	36%	28%	9%	14%	11%
AMPLIFY	73%	55%	73%	4%	14%	2%
Photo 1	45%	59%	52%	7%	0%	1%
Explore Microphotography	68%	55%	58%	6%	5%	4%
Photo 2	45%	64%	49%	4%	0%	0%
Photo 3	**46%**	**64%**	**56%**	**9%**	**0%**	**0%**
Photo 4	49%	59%	47%	3%	0%	1%
Photo 5	51%	55%	47%	2%	5%	1%
Photo 6	47%	50%	48%	1%	0%	0%
Photo 7	43%	55%	48%	7%	0%	4%
microscopic level	36%	36%	38%	9%	5%	4%
Explore photography	**48%**	**41%**	**25%**	**1%**	**0%**	**9%**
Teen	28%	23%	28%	7%	0%	9%
Use microscopes	39%	36%	40%	**11%**	**5%**	**1%**
Hirshhorn	**29%**	**9%**	**7%**	2%	14%	4%
Art + Science	59%	36%	52%	6%	5%	6%
Q?rius	**28%**	**23%**	**21%**	**23%**	**32%**	**14%**
your camera	**34%**	**32%**	**16%**	1%	5%	4%
items from NIMH collections	**32%**	**23%**	**12%**	10%	9%	17%
bring your own object	40%	36%	26%	6%	0%	7%
Experiment	35%	32%	27%	3%	0%	1%
lighting	31%	32%	21%	1%	0%	5%
Composition	36%	27%	25%	5%	5%	7%

photography techniques	**42%**	**27%**	**27%**	3%	5%	10%
take home a USB	52%	32%	38%	1%	0%	5%
matted print	**43%**	**27%**	**28%**	4%	0%	6%
favorite image	42%	27%	26%	2%	0%	2%
NMNH	17%	18%	9%	16%	9%	16%
Photo 4	41%	36%	28%	9%	14%	11%

Bold Titles: High response across all three groups. **Bold values**: items functioning as perks for more than 33% of respondents within orientation or items functioning as dampers for more than 20% .
(Where there was a significant difference between groups, the X^2statistic is provided in parentheses.)

Table 17. Detail of responses to individual "Do You Have the Guts?" items grouped by responder's orientation.

	Perks			Dampers		
Orientation:	**Arts**	**Both**	**Science**	**Arts**	**Both**	**Science**
Photo #1	32%	23%	26%	**38%**	**32%**	**32%**
Do you have the Guts?	**51%**	**68%**	**57%**	24%	0%	20%
Make your own intestine creations	27%	18%	27%	**21%**	5%	**21%**
Q?rius at the National Museum of Natural History	**38%**	18%	**42%**	17%	18%	17%
Hands-on with guts	18%	14%	20%	24%	5%	11%
One-time opportunity	**35%**	27%	31%	6%	0%	4%
Intestines of marine mammals	19%	32%	25%	**30%**	5%	**22%**
Access to collection	**47%**	23%	**38%**	6%	5%	7%
Contemporary artists	**36%**	32%	23%	15%	9%	19%
Beautiful creation	**35%**	23%	23%	5%	0%	5%
Take home	15%	18%	20%	13%	5%	7%
Not gross	**44%**	36%	32%	14%	0%	20%
Super fun material	19%	9%	23%	11%	5%	5%
Once in a lifetime (X^2=6.1; p=.047)	**44%**	23%	**27%**	1%	0%	4%
Your creation	30%	14%	23%	6%	5%	2%
Amaze your friends	**34%**	32%	25%	5%	5%	7%
Photo #2	28%	41%	28%	**36%**	18%	**26%**

Bold Titles: High response across all three groups. **Bold values**: items functioning as perks for more than 33% of respondents within orientation or items functioning as dampers for more than 20% .
(Where there was a significant difference between groups, the X^2statistic is provided in parentheses.)

Detail of Additional Thoughts about the *Do you have the Guts?* advertisement (grouped first by theme, then by orientation)

Orientation	Additional reasons to or not to attend the *Guts* workshop	Theme	Subtheme
Both	I have the guts duhh	?	dry content
Both	It didnt pop	?	dry content
Science	It seems cool, but a lot more art than science	balance art and science	format
group	response	code	pictures
Arts	i think it is a cool concept and that it would spark a lot of peoples attention but the advertisement is a little dry. I think that if i saw it	criticism	pictures

Orientation	Additional reasons to or not to attend the *Guts* workshop	Theme	Subtheme
	somewhere i would not even stop and read it.		
Arts	More motivational wording	criticism	pictures
Arts	Its Clever but is poorly formatted.	criticism	positive
Arts	The pictures on the flyer are very dull and boring, but the description is very intriguing!	criticism	reaction to challenge
Arts	The description of the event wanted me to attend but the pictures seemed a little old fashioned.	criticism	title
Arts	the pictures	criticism	pictures and title
Arts	i like how the title asks you a question, it makes me want to read further. Also, the ad is almost challenging me to do something, which also makes me want to keep reading.	criticism	positive to challenge
Arts	I think it's kind of rude because they are basically saying that if you dont attend your scared/lack self-confidence. overall, I would not attend because it's very disrespectful.	criticism	information
Arts	The name sounds like a cheesy kids game show	criticism	negative; non-specific
Both	It could have better title and better picture	criticism	pictures
Both	It looks cool and it dares me to go	criticism	pictures
Science	I would try to use far more attractive detail and perhaps change the clipart on the informational flyer.	criticism	pictures
Science	The title makes me interested in what the art is about, but the title also makes me steer away from what the event is. Less wordy	criticism	wordy
Science	Better pictures	criticism	dry content
Science	The pictures didn't make me want to go	criticism	dry content
Science	The photos weren't very convincing. They didn't make me want to go.	criticism	format
Science	better flyer	criticism	pictures
Arts	It might be more challenging than i realised	curiosity	
Arts	I want to know more about it.	curiosity	
Arts	I wouldn't attend if I myself didn't get to see it in person.	curiosity	
Arts	It seems interesting I'd like to have a better experience before making my judgement towards the workshop	curiosity	
Arts	Do they work with real guts ? That may be a little weird .	curiosity	
Arts	I've never heard of artwork being made from "guts." It might be really weird or really cool.	curiosity	
Arts	I do not have enough info on it.	curiosity	
Arts	That im not 100% sure what its about	curiosity	
Both	More information about what we will do	curiosity	
Both	would need more information	curiosity	
Science	I just want to see what it's all about.	curiosity	
Science	I would like to learn more about it	curiosity	
Science	What the organization is like?	curiosity	
Science	I would attend if there are different activities	curiosity	
Science	This looks interesting. I am wondering what the material actually is. I don't know if I'd attend this, but it certainly is a blend of science and art!	curiosity	
Science	If it had a better picture, then it would make me more wanting to attend	curiosity	
Science	What is it for	curiosity	
Science	The activities at the event.	curiosity	
Science	It looks intimidating	difficult	
Both	Food	food	
Science	Will there be snacks or something like that?	food	
Arts	If the location was too far away it would make me not want to attend. If my friends were going as well that would make want to go more.	friends	
Science	Well, Id perfer if they allow it to be a solo activity rather then what they say by 'impress your friends' stuff.	friends	
Both	it seems fun	fun	
Science	It looks fun	fun	
Arts	I would hate to attend it I don't want any diseases	get hurt or messy	
Arts	How safe is it to touch intestines.	get hurt or messy	
Arts	It sounds to gross	gross	
Arts	Besides not being in the area..... I wouldn't attend because it sounds gross and weird. Making your own creation out of a pig intestine will turn many people away from this event!	gross	
Arts	I don't like the idea of using intestines to create art. I just makes my stomach turn	gross	

Orientation	Additional reasons to or not to attend the *Guts* workshop	Theme	Subtheme
Arts	It's not in my best interest to make creations out of gut.	gross	
Arts	It's just sounds cool. Then you read it and it is kinda gross	gross	
Arts	I personally would not want to attend the "Do you have the Guts?" workshop because I would feel weird making something out of pig intestines. I'm not a vegetarian but I would feel horrible making something out of a dead animal. It also sounds gross.	gross	
Arts	I think that it's gross but then yet again I personally am not intrested in learning about anything anatomy related.	gross	
Arts	it sounds disgusting	gross	
Arts	Using guts sounds really gross, whether they say it isn't or not.	gross	
Arts	If there was a cost to attend. It sounds interesting, but I might be a bit too squeamish even if the intestines are clean.	gross	
Arts	I have serious nerves and tend to overreact.	gross	
Arts	'Guts' in large lettering really gave me an odd feeling in my stomach. I'm an easily grossed out person and seeing 'intestines' and a picture of a pie (?) really. . . really threw me off.	gross	
Arts	perhaps if i felt i could learn something valuable from it, but i am squicked out by guts	gross	
Arts	I would not want to attend this workshop because I do not like the idea of using animals intenstines to make art. It does not appeal to me.	gross	
Arts	I don't think I would like to attend though it beautifully combines science and art because guts are a very disgusting material to work with and does not sound enjoyable.	gross	
Arts	sounds gross	gross	
Arts	It sounds like you would be digesting something.	gross	
Arts	It's creative but it should be more appealing	gross	
Arts	It sounds fun that you could do it with for friends, and it would be a nice way to create things, but I dont like the whole guts Idea guts or gross, even cleaned guts.	gross	
Arts	It sounds cool and I would attend , but making stuff out of intestines is gross	gross	
Arts	The "Do You Have Guts" activity seem fun but I wouldn't want to make the intestine and bring it home	gross	
Arts	It looked a bit gross and the smithsonian is a long drive from where I live, so I wouldn't want to.	gross	
Arts	I honestly... You couldn't get me to go to that. Period. No. Just. No. Gross.	gross	
Arts	I find that looking at such a body part would cause my weak stomach to release the contents it contains.	gross	
Arts	Replicating guts is not something that interests me, it's too gross for my taste	gross	
Arts	maybe I wont attend because it looks disgusting	gross	
Arts	it seems nice and cool but a lil nasty	gross	
Both	No, it seems to be an activity concerning making guts, and I'm sorry to say, I'm a neat freak.	gross	
Science	i wouldnt want to use real animal parts, it would be an interesting thing to know though	gross	
Science	It's weird and I imagine psychopaths interested in intestines attending it.	gross	
Science	that sounds disgusting	gross	
Science	bleh	gross	
Science	It's too disgusting for many girls to attend.	gross	
Science	The Smithsonian is definitely a big draw for me, as I've always wanted to go. However, anything involved insides not being inside the body is a large negative.	gross	
Science	I don't know, I might want my friends to be interested before I go in alone. It could be cool but it sounds like it might just be weird/gross.	gross	
Science	I think that the idea is kind of gross.	gross	
Science	I wouldn't want to visit it because I'm not much for innerds.	gross	
Science	The reasons I would attend this workshop is because it looks like a fun thing that different age groups would have fun doing. It's something creative and constructive and some people could learn a lot of new interesting things by going. The one reason I wuldn't go is because the though and sound of creating guts it kinda gross.	gross	
Science	Thinking about organs of different animals grosses me out	gross	
Science	Yuk!	gross	

Orientation	Additional reasons to or not to attend the *Guts* workshop	Theme	Subtheme
Science	Even though it says that it "won't be gross" it still sounds revolting.	gross	
Science	I wouldn't attend because working with animal guts sound gross.	gross	
Science	The art style would be interesting to witness, bit of morbid curiosity. However, it does still seem gross. Which, oddly, makes me both want to and not want to visit it.	gross	
Arts	I am interested in the medical field and I have already seen live surgery so I would like to see more so that I can learn. It doesn't gross me out.	gross (not)	
Arts	I would want it to be different, instead of making guts. I find that a little weird.	gross topic	
Arts	I do not like how it is intestine-theme. That is not very appealing, and is quite frankly, gross. Maybe something like "baby animal exhibit" where you get to pet small geckos. That is my suggestion. The pictures are hard to see and understand. The wordingis what gets you. "Once in a lifetime" is really pushing it but it gets your attention. Overall I wouldn't attend the workshop because the fact that it's about guts doesn't make me feel like I'm missing out on it, even if it is once in a lifetime.	gross, suggestion,	
Arts	its animal cruelty	ideology	
Arts	One question would be whether or not people have hurt animals in order to gather the intestines.	ideology	
Arts	I rather not play with actual intestines, that is just sick and wrong.	ideology	
Both	The fact that these things are made of animal intestines brings me to a biased point of view.	ideology	
Science	I would want to attend since it said a once in the lifetime oppurtunity, however it talked about using animals guts, and I am partial to animals and wouldn't want to use animal guts	ideology	
Science	I would not attend not only does this offend me because im vegetarian but i feel bad for those animals using their intestines.	ideology	
Science	I would like to learn more aobu thte human anatomy	learn	
Arts	If it was offered at more than one location or date it would probably attract more people	logistics	
Arts	does not include the price	logistics	
Arts	If the workshop itself wasn't limited when it comes to the age of the guests who can attend the event.	logistics	
Arts	If it was for more than just one day	logistics	
Arts	would like to know about fees	logistics	
Arts	If it would discuss the cost	logistics	
Both	How much would it cost? How hard is it to get in? WIll my friends be attending as well?	logistics	
Both	I don't have the money.	logistics	
Both	have it at different museums because not all of us would be able to make to the Smithsonian	logistics	
Science	Just would have to see if I had interest or if there was a conflict.	logistics	
Science	If it were close to my house.	logistics	
Science	if it was free or not	logistics	
Science	If it costs money to attend, primarily, and how much freedom we actually have. It seems like a pretty interesting event. Perhaps if there is a event limit on how many people can join?	logistics	
Science	i cant i dont live there	logistics	
Science	Its not near where I live, costly.	logistics	
Science	Cost and Travel. It matters to me how much this workshop costs and how far the location is from where I live and how much would it cost to travel.	logistics	
Science	Its not convienent where I live.	logistics	
Arts	I would not attend because I am too old for the event and have little interest in science.	no interest	
Arts	It doesn't seem fit for me.	no interest	
Arts	Working with guts, while scientific, does not peak my interest because science is a broad topic and I do not particularly enjoy the biological anatomical part where you complete hands-on activities involving animal intestine.	no interest	
Arts	SO BORING	no interest	
Science	looks a little boring to me	no interest	
Science	Its a big social thing and I dont like those kind of things!	no interest	
Arts	It seems like it would be a fun experience	positive	
Arts	As long as it's fun, I'd love it	positive	
Arts	Getting to meet people who this is how there life " is " fascinates me.	positive	

Orientation	Additional reasons to or not to attend the *Guts* workshop	Theme	Subtheme
Arts	It sounds cool and interesting for people that like this topic. It also combines science and the arts together.	positive	
Arts	I would attend because I make something new and bring it home	positive	
Arts	Its so conflicting! >_<		
Arts	it sounds so gross, yet it would be such an awesome experience!	positive	
Arts	Looks pretty cool	positive	
Arts	Seeing the advertisement may have helped me.	positive	
Arts	It seem okay i gues	positive	
Arts	I would totally attend that if it's free	positive	
Arts	None, really. Seems legit.	positive	
Arts	It seems like a very abstract way of producing art, which is why it draws my attention greatly.	positive	
Both	it sound fun and yes i have gut the just make me want to prove that i do	positive	
Both	I might attend this workshop because of the many options it has to offer	positive	
Both	I would like to attend	positive	
Both	It would be a great learning opportunity and, perhaps you might even be able apply what you learn in your every day life.	positive	
Both	i might join	positive	
Both	I don't have anything else that I would like to add. I already find it interesting when you guys use words like "Once in a lifetime" and "Amaze your friends". That makes me want to go there.	positive	
Science	It seems like a unique idea, combining both science and art, and is definitely something that would catch my eye	positive	
Science	Guts? Really? I think it would be interesting to go to learn about the guts, but I never thought about them being used in art. That kind of blows my mind. I would have to go just to see how they are used in art.....	positive	
Science	I could not attend this workshop because it is in DC and I don't live in DC, but if I could go, I definitely would.	positive	
Science	It would be very unique, although the name is somewhat unusual- yet attention getting. The experience is very different from normal courses/ experiences in a good way	positive	
Science	I like how the title could go both ways. The program seems interesting and intriguing especially for children in high school.	positive	
Science	New and interesting	positive	
Science	It just seems interesting and different	positive	
Science	I love science.	positive	
Science	I would attend because it would look good on a college app	positive	
Science	It is a unique program.	positive	
Science	I would attend if I could take pictures or videos while making my creation. Also, if the workshop includng information about the anatomy of the animals and what makes the guts such a great material for art.	positive	
Science	It seems so cool!	positive	
Science	Wanted to be a surgeon growing up..so this sounds like fun	positive	
Science	Whether or not I can touch guts with my hands!	positive	
Science	makes me want to do something even more	positive	
Science	it's a once in a lifetime opprotunity	positive	
Arts	I already know what I need to know about the subject.	repetitive	
Arts	Its been done before in the past	repetitive	
Both	I would attend the "Do You Have Guts?" Workshop if it had animals I was interested in dissecting.	science curiosity	
Arts	Amount of people, if there's more, I'd attend.	social	
Arts	give a couple more specifics on the process of how the intestines would be made	suggestion	specifics about what will happen
Arts	Pictures that show a little sneak pic of how it would look like experimenting	suggestion	more informative pictures
Arts	more or different pictures with information or captions on them. more information on what exactly someone attending would be doing.	suggestion	specifics about what will happen
Arts	If there was a picture of guts	suggestion	more informative pictures
Arts	It would be something different to try but needs more of an artsy aspect instead of just building something for science	suggestion	more art references
Arts	the history of this art	suggestion	history
Both	More colors, better pictures, pictures of kids having fun	suggestion	pictures - kids having

Orientation	Additional reasons to or not to attend the *Guts* workshop	Theme	Subtheme
Science	More descriptions on what would be happening would draw me towards it. Also mixing more of the arts and science.	suggestion	specifics about what will happen
Science	more information about what the actual workshop is and the reasoning behind the use of intestines in their creations	suggestion	specifics about what will happen
Science	The workshop caught my eye quickly with the picture and more pictures can be useful.	suggestion	more informative pictures
Science	a different picture	suggestion	more informative pictures
Science	A picture with color and more details would drag more attention.	suggestion	more attractive pictures
Science	I attend as it interests me but i would make it appeal more to people of arts. By seeing intestines it might not be appealing to some so they should try to prove why it wony be bad.	suggestion	pictures that counteract "gross"
Science	Have cool or free stuff prizes gifts	suggestion	incentives
Science	A little more history.	suggestion	history
Science	Where you can go sign up on a website	suggestion	logistics
Arts	Nothing	x	
Arts	I'm not sure	x	
Arts	none	x	
Arts	Mabey	x	
Arts	Nothing.	x	
Arts	N/A	x	
Arts	N/A	x	
Arts	not sure	x	
Arts	None	x	
Arts	Na	x	
Arts	None	x	
Arts	Yup	x	
Both	none	x	
Science	Nothing	x	
Science	not sure if i would attend the workshop	x	
Science	I don't have any other thoughts on the matter.	x	
Science	None	x	
Science	None	x	
Science	n/a	x	
Science	nothing	x	
Science	Nothing follows.	x	
Science	Maybe im pretty nuetral	x	

Detail of Additional Thoughts about the *Amplify* advertisement (grouped first by theme, then by orientation)

Number	Orientation	Additional reasons to attend or not attend the *Amplify* workshop	Theme	Sub-theme
164	Science	it makes something sound better	?	
134	Both	The artists designs, and sculpture.	arts	
94	Arts	The description was good and explained in detail what was happening and made me want to attend the event.	criticism	good description
40	Arts	More visible pictures of potential photos..	criticism	more visible photos
192	Arts	better visible pictures	criticism	pictures
32	Arts	The design was capturing unlike the science design. Makes you want to attend the workshop!	criticism	positive
16	Both	I don't know what amplify means	criticism	confused
46	Both	The pictures are eye catching	criticism	good photos
183	Science	It says it's for teens, but it seems like something for small children	criticism	appears to be for small children
162	Science	More photos and results and more art And show more photos and explain why them and not any other place	criticism	more detail
150	Science	If it had more pictures and bigger text, it would make me want to go more.	criticism	more photos
49	Science	Adding extra focus on announcing the science-aspect would make me more likely to attend.	criticism	more science

Number	Orientation	Additional reasons to attend or not attend the *Amplify* workshop	Theme	Sub-theme
73	Science	Nothing. The promotional material is great, and captured my attention!	criticism	positive
29	Arts	I would like more photos and more information	curious	more detail
33	Arts	A little more detail would be nice	curious	more detail
35	Arts	Explain what types of pictures we can take and if somebody will help us	curious	more detail
196	Arts	How many pictures can you take with you?	curious	more detail
65	Arts	More information on what was going on	curious	more info
48	Both	It looks cool and I'm curious about it	curious	cool
143	Both	more info	curious	more detail
145	Both	More examples	curious	more detail
153	Science	I want to know if this is child friendly	curious	child friendly?
137	Science	I'd like to have prior knowledge, such as in a pamphlet, about what materials are best for microphotography.	curious	more detail
144	Science	Some examples of what we can take pictures of from the collection and the cost of attendance. I would like to know how many people can join, and if there will be enough microscopes for everyone if a lot of kids come. It seems fun, though maybe we can lear a little bit about what micropictures are.	curious	more detail
166	Science	What will it do for me?	curious	more detail
108	Arts	I like most of it because it sounds very cool, and neat to learn about science, but It sounds really scientific so I'm not sure.	difficult	scientific
87	Arts	I like the idea of photography but not the idea of using a microscope.	difficult	topic
78	Arts	I don't know anything about how to use the equipment I would need.	difficult	
86	Science	Photography is not something I know much about	difficult	
37	Both	Food	food	
7	Arts	Sounds fun	fun	
70	Arts	Sounds fun!	fun	
114	Arts	it sounds very fun	fun	
115	Arts	Looks neat	fun	
170	Arts	It seems really fun	fun	
190	Arts	Microscopic photography sounds fun.	fun	
194	Arts	Sounds like a fun experience to try!	fun	
76	Science	It look fun and is hands on	fun	
90	Science	It looked fun as it is.	fun	
163	Science	seems fun	fun	
184	Science	it seems like it would be fun	fun	
132	Science	The type of objects we would experiment with sound pretty disgusting which would make me not want to attend the event. But everything else seemed pretty cool and fun and interesting. It seemed like a thing that everyone would enjoy.	gross	
91	Arts	I would enjoy attending because the work becomes my own and it involves both art and science. I love the idea of being able to take the images home and owning them yourself.	interdisciplinary arts and science	take home
10	Arts	Sounds like a very cool way to integrate arts and science together! I'd be there!	interdisciplinary arts and science	
55	Arts	This has an even amount of arts and science. Sounds cool and innovative.	interdisciplinary arts and science	
58	Arts	I love that it combines the two subjects! Maybe add a picture!	interdisciplinary arts and science	
72	Arts	it gives the chance to mix science and art together in an creative way to keep people interested	interdisciplinary arts and science	
84	Arts	information about the cost and more of the connection between science and art	interdisciplinary arts and science	
95	Arts	This workshop is a good balance between the arts and science	interdisciplinary arts and science	
133	Arts	I like this workshop because it gives people an opportunity to work with both art and science and will hopefully show them the connection between the two.	interdisciplinary arts and science	

Number	Orientation	Additional reasons to attend or not attend the *Amplify* workshop	Theme	Sub-theme
59	Science	Q?rius. Explain what it means?	interdisciplinary arts and science	q?rius
124	Science	I think I'd visit it because I like photography to an extent and it blends art with science.	interdisciplinary arts and science	
138	Science	Awesome way to join science and the arts.	interdisciplinary arts and science	
172	Science	I do love how art and science is mixed together into a single event.	interdisciplinary arts and science	
173	Science	It combines the science of the mirco-world and the art of photography. It is a perfect workshop for both scientists and artists who don't want to get their hands dirty.	interdisciplinary arts and science	
174	Science	it peaks my intrest for combing the two	interdisciplinary arts and science	
125	Arts	The option to bring your own object makes it more appealing.	interested	bring object
100	Arts	Very interesting	interested	enthusiasm
113	Arts	sounds like educational for parents	interested	for parents?
191	Arts	If a popular photographer I knew was there that would make me want to attend.	interested	if teacher/mentor
123	Arts	I love arts and photography so I would find interest in this certain appearance.	interested	photography
105	Arts	Getting to keep something from the workshop would be nice. I used to have a microscope when I was younger, so it would be a cool experience	interested	take home
147	Arts	It would be cool to keep the pictures you take and to look at them since they are very close up.	interested	take home
197	Arts	I like how you can bring things at home	interested	take home
189	Arts	I would go to see what lives on my things like my phone or my hand	interested	topic
106	Both	It gives you a great opportunity to observe multiple things under a microscope and learn what it is you are seeing.	interested	microscope
151	Both	i'd attend if it were ineresting	interested	
103	Science	Photography is an amazing art form and everyone can learn it. This workshop allows students who may not have experience with photography to learn.	interested	enthusiasm
118	Science	It's cool to see close up pictures on the microscopic level.	interested	microscope
141	Science	I like the part that people would be able to learn how to use a microscope and see closely different objects	interested	microscope
99	Science	This is interesting for me, but for those not interested in photography it may be an immediate turn off.	interested	photography
102	Science	I love photography and seeing it it different perspectives has always felt refreshing to me.	interested	photography
149	Science	I love taking pictures	interested	photography
126	Science	Using specific scientific terms quickly catches my eye.	interested	science
175	Science	something i might go to, peaks my intrest and adds something i can take home	interested	take home
109	Science	An interesting topic that would attract me	interested	topic
53	Science	I'd like to look at things through a microscope	interested	
167	Science	sounds really interesting	interested	
178	Science	looks interesting	interested	
97	Arts	It sounds like I could learn something useful.	learn	
187	Arts	I do want to attend, because I could learn something I want t olearn	learn	
148	Science	I want to learn	learn	
169	Science	A chance to learn.	learn	
177	Science	To learn about microphotography.	learn	
9	Arts	Price would be a good thing to mention	logistics	
42	Arts	does not include the price	logistics	
54	Arts	Again being able to attend for more than just one day	logistics	
88	Arts	Would *Amplify* provide materials if people do not have them?	logistics	
181	Arts	If it's not expensive, I'd attend.	logistics	
12	Both	Again: Cost? Attendance?	logistics	
158	Both	location and i dont have a microscope	logistics	

Number	Orientation	Additional reasons to attend or not attend the *Amplify* workshop	Theme	Sub-theme
111	Science	If it were close to my house.	logistics	
112	Science	if it was free or not	logistics	
157	Science	dont live there	logistics	
171	Science	It should be during the week	logistics	
62	Arts	A different experience	new experience	
44	Arts	Looking at bugs close up is creepy.	no interest	bugs
41	Arts	i wouldnt want to amplify anything	no interest	
82	Arts	i am squicked out by microbiology.	no interest	
129	Arts	I kind of don't like small pictures, I like pictures of landscapes and whatnot. This microphotography thing just isn't an interest of mine.	no interest	
180	Arts	I don't want to go to workshops!	no interest	
186	Arts	just sounds a bit much.	no interest	
168	Both	not that interested need more info	no interest	more detail
182	Both	Nope, sorry	no interest	
89	Science	would not be interested in the art portion	no interest	art
43	Science	I just like to hear the word "*Amplify*"	no interest	only hear word, "amplify"
119	Science	i will not attend	no interest	
34	Arts	Not fun	not fun	
120	Science	not sure	not sure	
93	Arts	The images on the flyer were pleasing to look at so, the add made me more likely to attend.	photos	positive
101	Science	The photos were colorful and made me want to go	photos	positive
128	Science	The poster is pretty.	photos	
80	Arts	The colorful images and specific target audiences (teens) make me feel interested in seeing more.	pictures	
52	Science	The pictures look unique	pictures	
61	Arts	I would attend it because you can look at microscopic photos	positive	activity
75	Arts	Cool pictures. It sounds interesting even when I have little interest in science. I would actually attend this.	positive	despite no interest in science
11	Arts	I think this sounds awesome and would love to do this I love photography and love the idea of *Amplify*	positive	enthusiasm
21	Arts	I love taking pictures and this would be totally fun to do	positive	enthusiasm
23	Arts	it is a workshop that i would for sure be a part of.	positive	enthusiasm
24	Arts	It looks super fun, and i like the graphics on the advertisement	positive	enthusiasm
30	Arts	I LOVE science	positive	enthusiasm
36	Arts	I would love to attend this! Its a great opportunity to discover things	positive	enthusiasm
45	Arts	I think this workshop sounds interesting and I'd be happy to attend!	positive	enthusiasm
51	Arts	Everything would make me go. It has a hook that sounds very interesting.	positive	enthusiasm
117	Arts	nothing, it sounds great	positive	enthusiasm
122	Arts	This would be an amazing opportunity. I would so go. I love photography.	positive	enthusiasm
195	Arts	IT IS SO INTERESTINGGGGGGGG!!!	positive	enthusiasm
50	Arts	I wanted to attend it because I could bring my own thing to it and take pictures using a microscope. A free usb is also promised by the end of it to take home my photos.	positive	free usb, bring my own thing
13	Arts	It sounds like fun	positive	fun
17	Arts	it seems like it would be fun	positive	fun
27	Arts	It sounds very interesting. Still a bit unusual but I wouldn't mind attending.	positive	interesting
31	Arts	I would want to attend the "*Amplify*" workshop because I like microscopes and photography. I also think it is cool you get to bring your own object to look at and that you get a print of it.	positive	intersted
116	Arts	I would like to go and use the microscope to see the interesting things with the stuff i bring from home	positive	microscope
85	Arts	I would attend because I am actively involved within photography.	positive	photography

Number	Orientation	Additional reasons to attend or not attend the *Amplify* workshop	Theme	Sub-theme
56	Arts	Attend, because you get to take home images you did. It seems more cooler, because your using good equipment.	positive	take home
121	Arts	I want to go because I can keep my photos, and get a print of my favorite.	positive	take home
47	Arts	Good	positive	
63	Arts	Price, sounds great	positive	
64	Arts	Looks real nice	positive	
193	Arts	Nothing. I'm going.	positive	
81	Both	This is actually very interesting to me because it would be like Macro Photography but only even smaller. This is rather amazing for me because I love photography.	positive	enthusiasm
98	Both	It looks so cool. And i like photogrophy	positive	enthusiasm
161	Both	I would like to attend this event because it is a hands on thing. I would not like to attend this event if we could not bering our own things to tak a look under the microscope with.	positive	hands-on
74	Both	Getting to learn about photography would make me attend the *Amplify* workshop	positive	topic
20	Both	I would like to attend	positive	
25	Science	It sounds like it would be fun because it combines art and science, photography and microorganisms	positive	art and science
77	Science	I would be curious in using the microscope but I don't care anything about the photography aspect.	positive	despite no interest in microscope
15	Science	cool idea	positive	enthusiasm
22	Science	It seems really cool! I've always loved those macro pictures of bacteria and microscopic things.	positive	enthusiasm
57	Science	Sounds cool, I'd attend regardless	positive	enthusiasm
139	Science	I love using microscopes, so i would definitely want to go	positive	enthusiasm
146	Science	This is seriously so cool. I would definitely attend this.	positive	enthusiasm
14	Science	Seems fun.	positive	fun
83	Science	It looks really cool and like an fun experience	positive	fun
18	Science	that actually sounds really interesting	positive	interesting
28	Science	Sounds interesting, but not many guys may come.	positive	interesting
92	Science	i would attend because it seems harmless and interesting place to go and explore	positive	interesting
160	Science	I would attend. It is a good add and brings interest to me. There is nothing that turns me away from going.	positive	interesting
199	Science	I think it would be cool to see objects underneath a microscope, I've always liked that.	positive	microscope
69	Science	The pictures made me want to go	positive	pictures
198	Science	I would attend because I am a lover of science.	positive	science
5	Science	i would definitely attend this workshop. i dont see anything negative about it at all.	positive	
19	Science	0k	positive	
131	Science	provide pictures of other interacting in such activity.	social	
185	Science	I SAID I DONT LIKE SOCIAL GATHERINGS!!!!!!	social	
4	Science	The teens part makes it sound like I wouldn't like it very much/	social (not)	social
3	Arts	it would sound more appealing by adding a phrase or question that would catch the readers attention right away. Also, it would sound more appealing if micro photography was described in more detail	suggestion	more detail
39	Arts	It would be better if it was more "hands on".	suggestion	more hands on
2	Both	Photography	topic	
8	Science	the kind of things youd be able to use if you did and did not bring your own subjecttttt	topic	
6	Arts	I don't know.	x	
26	Arts	N/A	x	
38	Arts	Nothing.	x	
60	Arts	N/A	x	
66	Arts	None	x	
67	Arts	Nothing really .	x	
71	Arts	N/A	x	

Number	Orientation	Additional reasons to attend or not attend the *Amplify* workshop	Theme	Sub-theme
79	Arts	No.	x	
96	Arts	idk	x	
140	Arts	not sure	x	
142	Arts	None	x	
155	Arts	Nothing was good ad	x	
176	Arts	N/A	x	
179	Arts	None.	x	
188	Arts	None	x	
1	Both	nothing	x	
135	Both	n/a	x	
159	Both	none	x	
68	Science	nothing	x	
107	Science	None.	x	
110	Science	None	x	
127	Science	None	x	
130	Science	none	x	
136	Science	None	x	
152	Science	n/a	x	
154	Science	Not much really	x	
156	Science	nothing	x	
165	Science	Nothing follows.	x	

Detail of Reasons to Attend and Avoid Art and Science-Related Activities

Table 18. Codebook of themes for reasons to attend and avoid art and science related activities (green = science; pink = arts).

Theme	Definition	Category	Orien-tation	Examples
Accomplishment: contribution	reference to an outcome that involves helping others	attend	Science	
			Art	
		not attend	Science	
			Art	
Art	reference words about or descriptions of art that are too general to code	attend	Art	art; it's art; colors; art can have a lot of its own personality
Art Appreciation	reference to art product as an object to be viewed or studied (not doing)	attend	Art	I love watching people make art; watching dances
		not attend	Art	
Art process	reference to qualities or activities involved in making art	attend	Art	maginative; observe;
Art product	reference to the quality of completed art process	attend	Art	artwork, beauty
Artists or Scientists in General	General statements about the character of artists	attend	Art	expressive; nice; risk takers
		not attend	Art	"drama filled" ; "too emotional"; "aggressive"
	general statements about the character of scientists	not attend	Science	pretentiousness; Athiests
Autonomy	Choice making free from tension, pressure, or ambiguity--results intrinsic motivation--passion, Inspiration, sense of freedom,	attend	Science	
		attend	Art	because I love it; explore my creativity; to find inspiration
Autonomy (not)	**based on SDT definition of autonomy as relating to an individual connecting with their intrinsic self - free from pressure, tension, or ambiguit**	not attend	Science	
			Art	"no personal space; not letting me be creative; not having any input; lack of creativity
Career	reference to gaining knowledge, experience or relationships for pursuing a career;	attend	Science	"want experience;" "college;" "science is part of my career choice" "making connections"
			Art	receiving tips about the business I never new; help me build a solid portfolio
Challenge	reference to the word, "challenge" or something related to a challenge	not attend	Art	If it were too easy
		attend	Science	"feeling smart" "hard work"
			Art	challenges my almost non-existent artistic abilities
Competence contribution	contributes to personal sense of competence	attend	Science	
			Art	
Conflict of interests Conflict of interests	obligation or choice to do something else	not attend	Science Art	love science more; feeling silly; don't have time; something better to do; not worth my time; sports event
Conflict of interests (not)	reference to attending in spite of other obligations	attend	Science	
			Art	If it blends with my schedule; a way to spend free time
Culture	reference to the word "culture"	attend	Art	culture

Theme	Definition	Category	Orien-tation	Examples
Curiosity		attend	Science	
			Art	
		not attend	Art	Questions!
Difficult	feeling inadequate, possibility of failure, material/subject too difficult	attend	Science	
			Art	no harsh criticism; if the teacher explains; If I have knowledge on the subject
		not attend	Science	Others may judge my intelligence; too technical; too difficult
			Art	Competitive; I am not talented; I'm not good at it; intimidation; too advanced; others better than me.
Difficult: criticism	use of word "criticism"	not attend	Art	
Difficulty overcome	reference to help with concerns about not being able to be successful	attend	Science	
			Art	
Discovery	exploration; finding out about new things;	attend	Science	I could discover something; enlightening
	exploration; finding out about new things;	attend	Art	find a new hobby; exposure to different genres; inspiration to the arts;
Engaging (not): Boring	specific reference to the word, "boring" or to the concept	not attend	Art	I get bored easily; nothing to do; can be tiresome
		not attend	Science	
Engaging (not) : busy work	reference to menial tasks	not attend	Science	
Engaging: fun	fun, entertaining, exciting, enjoyment, engaging	attend	Science	I might have fun; do fund activities; games
		attend	Art	
Engaging (not): fun (not)	reference to the word "fun," "joy" or "enjoy"	not attend	Science	"might feel like school, not something fun" "I didn't enjoy the experience"
		not attend	Art	
Engaging: hands on, not didactic	reference to "hands-on"; interactivity, participation	attend	Science	
			Art	
Engaging (not): too didactic, not hands-on	reference to too many words, lectures, or tedium, not hands-on, or busy work	not attend	Science	it's just a long lecture; taking notes; a lot of talking
			Art	if was just a lecture; I don't like [just] looking at paintings
Engaging (not): too long	reference to "long" without specific enough information to assume "too didactic"	not attend	Science	the class is way too long
Enviroment	reference to where the activity takes place or its condition	attend	Art	clean, well-ventilated, huge area of past works from the famous
Family	reference to family as motivation	attend	Art	mymom asked me; my family would be in terested in what I saw
Food	reference to food	attend	Science	
			Art	
Friends	references to friends or people known before the activity	attend	Science	
			Art	
	statements about presence or absence of friends or known peers	not attend	Science	
			Art	no one else going

Theme	Definition	Category	Orien-tation	Examples
Get messy or hurt	reference to safety or messiness	not attend	Science	"injury" "if any experiments involve something messy"
			Art	paint getting all over me;
Group experience	reference to interacting with others during the activitiy	attend		to undestand other artists; sharing of ideas; to hear others' work
Ideological	reference to large ideological or political issues such as liberalness; homosexuality; "decency";	not attend	Science	animal tests; evolution; water science; or "nt about something scientifically proven
		not attend	Art	annoying leftist; cross a line of decency;
Interdisciplinary	seeking a blend of disciplines	attend	Science	including math
			Art	If it involved science; combination with other subjects
		not attend	Science	"don't just want to do science" "want a variety"
Interest in a specific medium or genre	reference to a medium, genre, or style either generally (e.g., "depends on the style") or specifically (.e.g., "jazz" or "music").	attend	Art	type of art; I'm a great performer, musical;medium I'm interested in.
		not attend	Art	
Interest in specific topic	interest in a specific topic or general reference to "specific topic"	not attend	Science	"ecology" or "it's a boring subject"
		attend	Science	Topic is interesting; Astronomy; explosions
			Art	
Interested generally	interest in general	attend	Science	sounds cool;neat; I find it intersting; science is fascinating; I love learning
			Art	
	reference to interest either generally about science or in a topic;	not attend	Science	science is not very interesting to me; I'm not interested in the topic
	reference to aversion generally about the arts	not attend	Art	
Learn	reference to learning, knowledge, information, education, understanding	attend	Science	chance to learn something new; informational, educational
			Art	
	reference to knowledge, learning	not attend	Art	not learning; will not gain any knowledge
Logistics	reference to cost; distance; time;	attend	Science	
			Art	
		not attend	Science	
			Art	
Long	reference to "long" "too long" "a long time"	not attend	Art	
New experience(s)	reference to doing something new	attend	Science	step out of my comfort zone; workign with stuff you don't regularly get a chance to;
			Art	
Opportunity	references "opportuntiy" or chance to do something of value	attend	Science	get out of the house; life is short",
			Art	once in a lifetime; the opporutnity to have my paintings showcased; new opportunities
Personal techniques and skill	references to expanding an existing arts skills; to learn certain techniques to improve my art	attend	Art	anatomy practice; I want to learn how to sing
Quality	reference to the quality of the event or the results	attend	Science	
			Art	rigorous; good acting; good lessons

Theme	Definition	Category	Orien-tation	Examples
		not attend	Science	You'll never learn anything; ideotic; high expectations
Relevance	includes the word "relevant" or references utility for another purpose such as school; confidence; practicality	attend	Science	gain confidence in wekest subject; practical inforamtion; credit-bearing.
		attend	Art	
	reference to not having relevance to the respondent	not attend	Science	"it's about something I don't care about; no connection to the real world
Repetitive	reference to being too basic or about a topic already explored		Science	"I already know about the topic; basic knowledge, not advanced
Repetitive (not)		attend	Science	
			Art	
Science	references to participating in/with scientific method	attend	Science	Cool experiments; getting to see what they do in a typical day; get to wear lab coats
			Art	
Social	statements about relationships to people who attend	attend	Science	being part of a team; meet new people
			Art	
		not attend	Science	
			Art	
Social: peer artists	statements about the character of peer artists	not attend	Art	
Teachers and mentors	reference to the scientist in charge, in the role of mentor, teacher, lecturer, etc.	attend	Science	The person might be boring; cool speaker; famous science teacher
			Art	close by; free; short

Table 19. Reasons to attend arts activities: counts of themes

	Orientation							
	Arts-oriented		Equally science and arts oriented		Science-oriented		Total	
	Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
Accomplishment: contribution	3	1.4%					3	.5%
Accomplishment: personal	9	4.2%	4	3.2%	7	3.2%	20	3.6%
Art	4	1.9%	1	.8%	1	.5%	6	1.1%
Art appreciation	9	4.2%	1	.8%	6	2.7%	16	2.9%
Art process	12	5.7%	9	7.3%	9	4.1%	30	5.4%
Art product	2	.9%			1	.5%	3	.5%
Artists	1	.5%	1	.8%	2	.9%	4	.7%
Autonomy	28	13.2%	10	8.1%	18	8.1%	56	10.0%
Career	5	2.4%	4	3.2%	1	.5%	10	1.8%
Challenge			2	1.6%	1	.5%	3	.5%
Conflict of interests	4	1.9%	1	.8%			5	.9%
Conflict of interests (none)								
Culture			1	.8%			1	.2%
Curiosity								
Difficult	3	1.4%			1	.5%	4	.7%
Difficult: Criticism								
Difficulty overcome					2	.9%	2	.4%
Discovery	5	2.4%	1	.8%	9	4.1%	15	2.7%
Engaging (not)								
Engaging (not): boring								
Engaging (not): busy work								
Engaging (not): didactic, not hands-on								
Engaging (not): fun								
Engaging (not): too long								
Engaging: fun	19	9.0%	20	16.1%	22	9.9%	61	10.9%
Engaging: hands-on	2	.9%			8	3.6%	10	1.8%
Environment	3	1.4%	3	2.4%	1	.5%	7	1.3%
Family			1	.8%	2	.9%	3	.5%
Food			1	.8%	1	.5%	2	.4%
Friends	2	.9%	1	.8%	5	2.3%	8	1.4%
Fun								
Get messy (positive)			1	.8%			1	.2%
Get messy or hurt								
Group experience	4	1.9%	1	.8%	3	1.4%	8	1.4%
Ideological								
Interdisciplinary	2	.9%			2	.9%	4	.7%
Interest generally	4	1.9%	10	8.1%	9	4.1%	23	4.1%
Interest in topic(s)								
Interested: medium or genre	33	15.6%	18	14.5%	39	17.6%	90	16.1%
Learn	18	8.5%	11	8.9%	15	6.8%	44	7.9%
Logistics	5	2.4%	4	3.2%	12	5.4%	21	3.8%
New experience(s)	5	2.4%	3	2.4%	1	.5%	9	1.6%
Opportunity	1	.5%	2	1.6%	1	.5%	4	.7%
Personal technique/skill	11	5.2%	4	3.2%	8	3.6%	23	4.1%
Quality	7	3.3%			7	3.2%	14	2.5%
Relevance								
Repetitive								
Science								
Scientists in general								
Social	6	2.8%	6	4.8%	13	5.9%	25	4.5%
Social: peer artists								
Teacher(s) or mentor(s)	5	2.4%	3	2.4%	14	6.3%	22	3.9%

Table 20. Reasons to attend arts activities: Counts of themes

	Arts-oriented		Equally science and arts		Science-oriented		Total	
	Count	%	Count	N%	Count	%	Count	%
Accomplishment: contribution	3	1.4%					3	.5%
Accomplishment: personal	9	4.2%	4	3.2%	7	3.2%	20	3.6%
Art	4	1.9%	1	.8%	1	.5%	6	1.1%
Art appreciation	9	4.2%	1	.8%	6	2.7%	16	2.9%
Art process	12	5.7%	9	7.3%	9	4.1%	30	5.4%
Art product	2	.9%			1	.5%	3	.5%
Artists	1	.5%	1	.8%	2	.9%	4	.7%
Autonomy	28	13.2%	10	8.1%	18	8.1%	56	10.0%
Career	5	2.4%	4	3.2%	1	.5%	10	1.8%
Challenge			2	1.6%	1	.5%	3	.5%
Conflict of interests	4	1.9%	1	.8%			5	.9%
Conflict of interests (none)								
Culture			1	.8%			1	.2%
Curiosity								
Difficult	3	1.4%			1	.5%	4	.7%
Difficult: Criticism								
Difficulty overcome					2	.9%	2	.4%
Discovery	5	2.4%	1	.8%	9	4.1%	15	2.7%
Engaging (not)								
Engaging (not): boring								
Engaging (not): busy work								
Engaging (not): didactic, not hands-on								
Engaging (not): fun								
Engaging (not): too long								
Engaging: fun	19	9.0%	20	16.1%	22	9.9%	61	10.9%
Engaging: hands-on	2	.9%			8	3.6%	10	1.8%
Environment	3	1.4%	3	2.4%	1	.5%	7	1.3%
Family			1	.8%	2	.9%	3	.5%
Food			1	.8%	1	.5%	2	.4%
Friends	2	.9%	1	.8%	5	2.3%	8	1.4%
Fun								
Get messy (positive)			1	.8%			1	.2%
Get messy or hurt								
Group experience	4	1.9%	1	.8%	3	1.4%	8	1.4%
Ideological								
Interdisciplinary	2	.9%			2	.9%	4	.7%
Interest generally	**4**	**1.9%**	**10**	**8.1%**	**9**	**4.1%**	**23**	**4.1%**
Interest in topic(s)								
Interested: medium or genre	33	15.6%	18	14.5%	39	17.6%	90	16.1%
Learn	18	8.5%	11	8.9%	15	6.8%	44	7.9%
Logistics	5	2.4%	4	3.2%	12	5.4%	21	3.8%
New experience(s)	5	2.4%	3	2.4%	1	.5%	9	1.6%
Opportunity	1	.5%	2	1.6%	1	.5%	4	.7%
Personal technique/skill	11	5.2%	4	3.2%	8	3.6%	23	4.1%
Quality	7	3.3%			7	3.2%	14	2.5%
Relevance								
Repetitive								
Science								
Scientists in general								
Social	6	2.8%	6	4.8%	13	5.9%	25	4.5%
Social: peer artists								
Teacher(s) or mentor(s)	5	2.4%	3	2.4%	14	6.3%	22	3.9%
Techniques and materials								

BOLD indicates themes that Arts-oriented teens responded to differently than Science-oriented teens. Red indicates the within-group frequency of the differently referenced responses. **Red Bold** indicates the greater within-group frequency.

Table 21. Reasons to *Attend* science activities: counts of themes compared by orientation.

	Arts-oriented		Equally science and arts		Science-oriented		Total	
	Count	%	Count	N%	Count	%	Count	%
Accomplishment: contribution	4	2.0%			5	2.1%	9	1.6%
Accomplishment: personal	1	.5%	1	.8%	3	1.3%	5	.9%
Art								
Art appreciation								
Art process								
Art product								
Artists								
Autonomy	5	2.5%	1	.8%	6	2.6%	12	2.2%
Career	2	1.0%	1	.8%	6	2.6%	9	1.6%
Challenge	3	1.5%	1	.8%	4	1.7%	8	1.4%
Conflict of interests								
Conflict of interests (none)	2	1.0%					2	.4%
Culture								
Curiosity	2	1.0%	2	1.7%	3	1.3%	7	1.3%
Difficult								
Difficult: Criticism								
Difficulty overcome	8	3.9%	2	1.7%			10	1.8%
Discovery	13	6.4%	2	1.7%	13	5.6%	28	5.0%
Engaging (not)								
Engaging (not): boring					1	.4%	1	.2%
Engaging (not): busy work								
Engaging (not): didactic, not hands-on								
Engaging (not): fun								
Engaging (not): too long								
Engaging: fun	17	8.4%	11	9.2%	18	7.7%	46	8.3%
Engaging: hands-on	7	3.4%	4	3.3%	11	4.7%	22	4.0%
Environment								
Family								
Food			1	.8%	1	.4%	2	.4%
Friends	6	3.0%	3	2.5%	3	1.3%	12	2.2%
Fun								
Get messy (positive)								
Get messy or hurt					1	.4%	1	.2%
Group experience								
Ideological					1	.4%	1	.2%
Interdisciplinary	3	1.5%			1	.4%	4	.7%
Interest generally	**4**	**2.0%**	**12**	**10.0%**	**21**	**9.0%**	**37**	**6.7%**
Interest in topic(s)	24	11.8%	24	20.0%	41	17.6%	89	16.0%
Interested: medium or genre								
Learn	**47**	**23.2%**	**15**	**12.5%**	**30**	**12.9%**	**92**	**16.5%**
Logistics	6	3.0%	3	2.5%	11	4.7%	20	3.6%
New experience(s)	11	5.4%	9	7.5%	9	3.9%	29	5.2%
Opportunity	3	1.5%	3	2.5%	1	.4%	7	1.3%
Personal technique/skill								
Quality			1	.8%			1	.2%
Relevance	6	3.0%	4	3.3%	3	1.3%	13	2.3%
Repetitive			1	.8%	3	1.3%	4	.7%
Science	12	5.9%	9	7.5%	15	6.4%	36	6.5%
Scientists in general								
Social	11	5.4%	6	5.0%	10	4.3%	27	4.9%
Social: peer artists								
Teacher(s) or mentor(s)	6	3.0%	4	3.3%	12	5.2%	22	4.0%
Techniques and materials								

BOLD indicates themes that Arts-oriented teens responded to differently than Science-oriented teens. Red indicates the within-group frequency of the differently referenced responses. **Red Bold** indicates the greater within-group frequency.

Table 22. Reasons to *Not Attend* arts activities: counts of themes compared by orientation.

	Arts-oriented		Equally science and arts		Science-oriented		Total	
	Count	%	Count	N%	Count	%	Count	%
Accomplishment: contribution								
Accomplishment: personal								
Art								
Art appreciation			2	1.7%	3	1.3%	5	.9%
Art process								
Art product								
Artists	3	1.5%	4	3.4%	4	1.7%	11	2.0%
Autonomy	7	3.5%	1	.8%	7	3.0%	15	2.7%
Career								
Challenge	1	.5%	1	.8%			2	.4%
Conflict of interests	10	5.0%	4	3.4%	7	3.0%	21	3.8%
Conflict of interests (none)								
Culture								
Curiosity	1	.5%					1	.2%
Difficult	**52**	**26.0%**	**33**	**27.7%**	**39**	**16.7%**	124	22.4%
Difficult: Criticism	2	1.0%					2	.4%
Difficulty overcome								
Discovery								
Engaging (not)								
Engaging (not): boring	**11**	**5.5%**	**5**	**4.2%**	**33**	**14.1%**	**49**	**8.9%**
Engaging (not): busy work								
Engaging (not): didactic, not hands-on	10	5.0%			10	4.3%	20	3.6%
Engaging (not): fun								
Engaging (not): too long	2	1.0%	2	1.7%	2	.9%	6	1.1%
Engaging: fun								
Engaging: hands-on								
Environment								
Family								
Food								
Friends			2	1.7%			2	.4%
Fun			3	2.5%	3	1.3%	6	1.1%
Get messy (positive)								
Get messy or hurt	4	2.0%	1	.8%	3	1.3%	8	1.4%
Group experience								
Ideological	2	1.0%			2	.9%	4	.7%
Interdisciplinary								
Interest generally	2	1.0%	1	.8%	11	4.7%	14	2.5%
Interest in topic(s)								
Interested: medium or genre	32	16.0%	19	16.0%	37	15.8%	88	15.9%
Learn			2	1.7%	1	.4%	3	.5%
Logistics	15	7.5%	16	13.4%	19	8.1%	50	9.0%
New experience(s)								
Opportunity								
Personal technique/skill								
Quality	20	10.0%	6	5.0%	16	6.8%	42	7.6%
Relevance	3	1.5%	1	.8%	3	1.3%	7	1.3%
Repetitive	1	.5%			1	.4%	2	.4%
Science								
Scientists in general								
Social	11	5.5%	9	7.6%	13	5.6%	33	6.0%
Social: peer artists	**3**	**1.5%**	**6**	**5.0%**	**14**	**6.0%**	**23**	**4.2%**
Teacher(s) or mentor(s)	8	4.0%	1	.8%	6	2.6%	15	2.7%
Techniques and materials								

BOLD indicates themes that Arts-oriented teens responded to differently than Science-oriented teens. Red indicates the within-group frequency of the differently referenced responses. **Red Bold** indicates the greater within-group frequency.

Table 23. Reasons to *Not Attend* science activities: counts of themes compared by orientation.

	Arts-oriented		Equally science and arts		Science-oriented		Total	
	Count	%	Count	N%	Count	%	Count	%
Accomplishment: contribution								
Accomplishment: personal								
Art								
Art appreciation								
Art process								
Art product								
Artists								
Autonomy	5	2.4%	1	.8%	1	.4%	7	1.2%
Career								
Challenge								
Conflict of interests	8	3.8%	5	4.2%	8	3.5%	21	3.7%
Conflict of interests (none)								
Culture								
Curiosity								
Difficult	**79**	**37.4%**	**19**	**16.0%**	**31**	**13.4%**	**129**	**23.0%**
Difficult: Criticism								
Difficulty overcome								
Discovery								
Engaging (not)					3	1.3%	3	.5%
Engaging (not): boring	19	9.0%	12	10.1%	23	10.0%	54	9.6%
Engaging (not): busy work	2	.9%			1	.4%	3	.5%
Engaging (not): didactic, not hands-on	9	4.3%	3	2.5%	9	3.9%	21	3.7%
Engaging (not): fun	7	3.3%	2	1.7%	3	1.3%	12	2.1%
Engaging (not): too long	1	.5%	3	2.5%	2	.9%	6	1.1%
Engaging: fun								
Engaging: hands-on								
Environment					1	.4%	1	.2%
Family								
Food								
Friends			3	2.5%	3	1.3%	6	1.1%
Fun								
Get messy (positive)								
Get messy or hurt	2	.9%	3	2.5%	1	.4%	6	1.1%
Group experience								
Ideological	2	.9%	1	.8%	10	4.3%	13	2.3%
Interdisciplinary					2	.9%	2	.4%
Interest generally	**26**	**12.3%**	**3**	**2.5%**	**6**	**2.6%**	**35**	**6.2%**
Interest in topic(s)	**9**	**4.3%**	**13**	**10.9%**	**24**	**10.4%**	**46**	**8.2%**
Interested: medium or genre								
Learn								
Logistics	**17**	**8.1%**	**26**	**21.8%**	**57**	**24.7%**	**100**	**17.8%**
New experience(s)								
Opportunity								
Personal technique/skill								
Quality	2	.9%	2	1.7%	11	4.8%	15	2.7%
Relevance	3	1.4%	1	.8%	1	.4%	5	.9%
Repetitive	1	.5%	4	3.4%	2	.9%	7	1.2%
Science	5	2.4%	2	1.7%			7	1.2%
Scientists in general	5	2.4%	5	4.2%	4	1.7%	14	2.5%
Social	9	4.3%	9	7.6%	18	7.8%	36	6.4%
Social: peer artists								
Teacher(s) or mentor(s)			2	1.7%	10	4.3%	12	2.1%
Techniques and materials								

BOLD indicates themes that Arts-oriented teens responded to differently than Science-oriented teens. Red indicates the within-group frequency of the differently referenced responses. **Red Bold** indicates the greater within-group frequency.

Comparison of Workshop Participants to the General Population

Table 24. Some words that workshop participants applied to artists vs. scientists significantly differed from the general population.

	Participant	General Survey			
	Mean at pretest (14)	Mean	*t*	*df*	*p*
playful	-.64	-1.46	2.37	211	0.018
sincere	.15	-.38	1.66	210	0.097
fact/fiction	-1.0	-.22	-1.72	211	0.087
precise	.0	.61	-0.167	210	0.096
intelligent	.14	.69	-1.77	211	0.079
observer	.08	.76	-3.5	17.32	0.003
organized	.15	.84	-2.09	211	0.038
logical	.57	1.13	-1.7	211	0.090
analytical	.5	1.28	-2.26	211	0.025

* unequal variances

Detail of Changes in interest

Table 25. After workshop changes in participants' interest leaning toward arts or science when making choices.

	Arts-oriented (n=7)		Science-oriented (n=2)		Total Sample		
	Before	After	Before	After	Before	After	Change
Reading (n=9)	-1.2	0.8	1.0	1.5	-0.4	1.2	1.7 (*t*=3.8, *df*=8, *p*=.005)
Free Time (n=8)	-1.8	-1.2	0.0	0.5	-1.1	-0.8	0.4 (*t*=1.0, *df*=7, *p*=.351)
Choose Activities (n=7)	-1.4	0.2	-0.5	2.0	-1.1	0.7	1.9 (*t*=3.7, *df*=6, *p*=.011)
School projects (n=8)	-0.2	1.2	1	1	0.1	1.1	1.0 (*t*=2.6, *df*=7, *p*=.033)
Average	-1.2	0.3	0.4	1.3	-0.6	0.8	1.3(*t*=9.13, *df*=8, *p*=.000)

Detail of Participants' Changes in Reasons to Attend and Not Attend Art and Science Activities

Table 26. Art-oriented and Science-oriented participants' before and after-workshop reasons to attend and not attend science-related activities.

NOT Attend PRE	NOT Attend (added after)	Attend PRE	Attend (added after)	repetitive/ not new learning	didactic/not hands on	difficult	topic	fun	mentor	logistics	relevance	science and art	Friends	Other
ARTS-Oriented														
To mix manure and check for parasites inside it. .To do anything that goes completely towards the chemistry branches of science..	To learn more about how art and science combine in the field.	To learn more about anything related to lights and how they work depending on the waves.. To learn anything about any living begin..	To learn about scientific illustrating and what it needs to be taken as a job.	X			X							X
It could be sickening .It could be boring. It could be the same information repeated over and over again		It's interesting. It might be fun!. New information		X			X	X						
The complexity .Rembering the concepts. It's kind of boring	Sometimes it can be really boring	Hands on activities. If a friend was going. If there was food	DEFINITELY the hands on activities!		XX	X								X
If I were being judged or graded. .If it focused on theory more than physical. If it were purely lectures or bookwork	If I were being judged or graded If it's difficulty was over my head If it was only lectures or bookwork	If it was in a scientific field that interested me, like biology or zoology. If it involved a hands-on experiment/activity. if it could help me in school	If it involved art If it involved a hands on experiment or activity If it was in a field I enjoyed		XX	X	X	X			X	X		
if it was not possible for me to understand given my previous level of education--too much	The same--if it was not possible for me to understand, given the complexity of the	if it offered an in-depth but accessible view into a subject I wasn't familiar with. if it	All the same ones, in addition to more arts-and-sciences workshops.	X		X	X					X		

NOT Attend PRE	NOT Attend (added after)	Attend PRE	Attend (added after)	repetitive/ not new learning	didactic/not hands on	difficult	topic	fun	mentor	logistics	relevance	science and art	Friends	Other
jargon, etc .dangerous--working with poisonous spiders, for example.	subject.	pertained to systems of some sort--of the human body, the planets, etc.. if it offered insight into real-life applications (of, for example, quantum physics)												
too much paperwork and writitng .too much individual reading.	The same	experiments with hands on activities .	The same		X									
Equally Arts and Science Oriented														
Long discussions about things I possess in my prior knowledge ..	To study more about microscopic life and learn more about the science and art of the universe.	Discussions concerning new and improved information. Organized structure. Dissections and thorough partaking in projects that include biology and chemistry	The dissections of different beings, new improved studies concerning planetary life and structure that produces profound effects.	XX										
no take stuff home .no hands-on. strict instructor		take stuff home. lots of hands-on. fun instructor		X										
It would be boring .I've already been. Too much talking		Want to learn more. New Experience. to see more		X	X									
Not something I'm interested in .Doesn't sound fun. Do not enjoy the field	Still the same if I'm not I treated why take the course	Interesting field. Good mentor. Better my understanding of the world	Same thing interesting field good, mentor sounds fun so I would do it	X			X	X	X					
Science Oriented														
Only math focused .Not disability friendly. Uninteresting topic	Too far because of transit.	Hands-on. Work with real things, not diagrams. Relevant science issues	No change! I would also love workshops that are drop in or short term.		X		X			X X	X			
Too expensive .Too far away. No time	Distance, cost, or time constraints.	Getting to do interesting activities. Learning something relevant to my school science courses. Having friends go with me	Same reasons.							X X	X			X
I find working behind a computer screen all day to be boring. I prefer to do more hands on activities. ..		I am always interested in learning new things.. I am curious to see hoe science and art will overlap in workshops. I enjoy hands on activities.		X	X							X		
Boring host .Busy.		Learning new things. Meeting new people. Helping out		X X						X				X X
..	I would not want to attend a science oriented activity if it involved chemistry and if we were conducting	. .	I would want to attend a science oriented activity if it involved environmental science, living animals, and		X		X						X	

NOT Attend PRE	NOT Attend (added after)	Attend PRE	Attend (added after)	repetitive/ not new learning	didactic/not hands on	difficult	topic	fun	mentor	logistics	relevance	science and art	Friends	Other
	research only behind a computer,		research.											
science				2	3	0	2	0	0	3	2	1	1	2
both				4	1	0	1	1	1	0	0	0	0	0
art				3	3	3	4	2	0	0	1	2	1	2
total				**9**	**7**	**3**	**7**	**3**	**1**	**3**	**3**	**3**	**2**	**4**
all groups order of frequency				1	2		2				3	3	4	4
science only										1				
art only						1		1						
outliers									1					

Note: Post-workshop additions appear in red

Table 27. Art-oriented and Science-oriented participants' before and after-workshop reasons to attend and not attend art-related activities.

NOT Attend PRE	NOT Attend (added after)	Attend PRE	Attend (added after)	new learning/improve	new experiences	not hands on	lack of skill	topic-medium	fun	mentor/teacher	logistics	relevance	science and art	group experience	Other	techniques and	autonomy	creativity & discovery	other
Oriented toward the Arts																			
. .		To simply learn.. To acquire new experiences and extend my knowledge of forms and shapes or anything..	To learn more about different techniques and have a list of mental references	x	x											xx			
Same info repeated. It could be boring. Take up precious time that I really want to use		It's interactive. It's fun. It's new information		xx		x			x		x								
If the speaker was boring. .	It would still be if the speaker was boring	The chance to discover. To try new things.	The....SAME!!!!!!😊		x					x						x		x	
If it was in a medium I didn't like. If it seemed more step-by-step than creative. If it was on a subject matter I didn't like	If it was in a medium I didn't like; If it seems more step-by-step than creative	I like opportunities to learn new techniques. I like being able to use materials I wouldn't be able to use outside of the activity. I enjoy creating new things	Same as above		x			x								x	x	x	
if it required a level of knowledge I didn't already have--for example, knowing how to play the tuba. if it was an unfriendly environment--not open to originality/creativity. (n/a)	Same things.	if it was a medium that I don't know that much about--for example, carving. **if there was a hands-on approach to the art--not just looking but making**. if **there was an emphasis on looking at things through various perspectives and disciplines**	Same things.		x	x	x										x	x	
Teachers that don't engage the students.. .	The same	Fun. I get to be myself.	The same						x	x							x		
Oriented toward both Arts and Sciences																			
If the images are graphically nude or. .	If the images were not appropriate.	Names of favorites and famous artists. Color design/creativity. New ideas and increase of expertise in this field	To gain more intellect in this subject and better success in my own art.	xx		x								x		x	x	x	xx
no hands-on. no take stuff home. Strict take stuff home		Hands-on. take stuff home. fun instructor				x											x		x
too hot. too much writing. none		to learn. to see. to hear		x							x						x	x	
Don't like the project. Not my type of art. Bad mentor	Same if the project is uninteresting then why go	Sounds fun. Helps me better my skills. I admire the artist	Also same if all those qualities are in the workshop there's no stoping me from going	x				x	x	x						x			

NOT Attend PRE	NOT Attend (added after)	Attend PRE	Attend (added after)	new learning/improve	new experiences	not hands on	lack of skill	topic-medium	fun	mentor/teacher	logistics	relevance	science and art	group experience	Other	techniques and	autonomy	creativity & discovery	other
Oriented toward the Sciences																			
Focused on music/singing. 0. Too far away/no time	Same reasons.	Focused on visual arts. Related to science. Relevant to school	Same reasons.					x			x	x	x						
I am not a good dancer so a dancing workshop would be difficult for me.. I have terrible stage freight so I am a horrible actor.		I am interested in studio art. I love painting.						x											
. .																			
. .	I would not want to attend an art oriented activity if it involved singing, dancing, or acting.		I would want to attend an art oriented activity if it incorporated photography, painting, and drawing.					x											
			science	0	0	0	1	3	0	1	1	1	1	1	0	0	1	1	0
			both	3	0	2	0	1	1	1	1	0	0	0	1	2	3	2	2
			art	2	4	2	1	1	2	2	1	0	0	0	0	3	3	3	0
			total	5	4	4	2	5	3	4	3	1	1	1	1	5	7	6	2
			Order of frequency (1= most frequent)																
			all groups order of frequency				5	2		3	4						1	2	5
			science only									1	1	1					
			art only	1	2	2			3							1			

Note: Post-workshop additions appear in red

Data detail for changes in how words describe artists and scientists

Table 28. Data detail for changes in how words describe artists and scientists.

Whole group n=9				Art (n=5)					Science (n=2)					Both (n=2)				
	pre	post	change		pre	post	change	Ab. value		pre	post	change	abs value		pre	post	change	abs value
Rebellious	**-0.63**	**-0.11**	**0.51**	Energetic	-0.20	0.40	0.60	0.60	**FactFiction**	-1.50	-1.00	0.50	0.50	FactFiction	-1.00	-0.33	0.67	0.67
Passionate	**-0.22**	**0.11**	**0.33**	Rebellious	-0.25	0.00	0.25	0.25	Team_worker	-1.50	-1.00	0.50	0.50	Rebellious	-1.00	-0.33	1.33	1.33
FactFiction	**-0.78**	**-0.56**	**0.22**	Imaginative	-0.40	0.20	0.20	0.20	**Rebellious**	-1.00	-0.50	0.50	0.50	Obstinate	-0.50	-0.33	0.17	0.17
Social	**-0.33**	**0.11**	**0.22**	FactFiction	-0.40	0.20	0.20	0.20	Compassionate	-1.00	-0.50	0.50	0.50	Passionate	-0.50	-0.33	0.83	0.83
Imaginative	-0.44	-0.33	0.11	Social	-0.40	0.20	0.20	0.20	**Passionate**	-0.50	0.00	0.50	0.50	Precise	0.00	-0.33	-0.33	0.33
Originality	-0.44	-0.33	0.11	Playful	-0.20	0.00	0.20	0.20	**Social**	-0.50	0.00	0.50	0.50	Intelligent	0.00	0.00	0.00	0.00
Open	-0.44	-0.33	0.11	Motivated.AttractAttention	-0.60	0.40	0.20	0.20	Energetic	-0.50	0.00	0.50	0.50	Skilled	0.00	0.00	0.00	0.00
Playful	-0.33	-0.22	0.11	Methodical	-0.25	0.20	0.05	0.05	Imaginative	-1.00	-1.00	0.00	0.00	Creative	0.00	0.00	0.00	0.00
Motivated.AttractAttention	-0.33	-0.22	0.11	Creative	-1.00	1.00	0.00	0.00	Playful	-1.00	-1.00	0.00	0.00	Imaginative	0.00	0.00	0.00	0.00
Compassionate	-0.22	-0.11	0.11	Originality	-0.60	0.60	0.00	0.00	Motivated.AttractAttention	-0.50	-0.50	0.00	0.00	Innovative	0.00	0.00	0.00	0.00
Creative	-0.56	-0.56	0.00	Flexible	-0.40	0.40	0.00	0.00	Originality	-0.50	-0.50	0.00	0.00	Flexible	0.00	0.00	0.00	0.00
WealthOfIdeas	-0.11	-0.11	0.00	Open	-0.20	0.20	0.00	0.00	Obstinate	-0.50	-0.50	0.00	0.00	GoalOriented	0.00	0.00	0.00	0.00
Flexible	-0.11	-0.22	-0.11	WealthOfIdeas	-0.20	0.20	0.00	0.00	Sincere	0.00	0.50	0.50	0.50	Focused	0.00	0.00	0.00	0.00
Skilled	0.00	0.00	0.00	Objective	0.00	0.20	-0.20	0.20	Educated	0.00	0.00	0.00	0.00	Compassionate	0.00	0.00	0.00	0.00
Obstinate	0.00	0.00	0.00	Skilled	0.00	0.00	0.00	0.00	**Intelligent**	0.00	0.00	0.00	0.00	Social	0.00	0.00	0.00	0.00
Strong	0.00	0.00	0.00	Innovative	0.00	0.00	0.00	0.00	Skilled	0.00	0.00	0.00	0.00	Sincere	0.00	0.00	0.00	0.00
Sincere	0.00	0.11	0.11	Ambitious	0.00	0.00	0.00	0.00	Creative	0.00	0.00	0.00	0.00	Open	0.00	0.00	0.00	0.00
Energetic	0.00	0.22	0.22	Focused	0.00	0.00	0.00	0.00	Curious	0.00	0.00	0.00	0.00	Persistent	0.00	0.00	0.00	0.00
Team_worker	0.38	-0.11	-0.49	Precise	0.00	0.00	0.00	0.00	Motivated.Influential	0.00	0.00	0.00	0.00	Strong	0.00	0.00	0.00	0.00
Informative	0.67	0.22	-0.44	Compassionate	0.00	0.00	0.00	0.00	**Inconsiderate**	0.00	0.00	0.00	0.00	WealthOfIdeas	0.00	0.00	0.00	0.00
Methodical	0.25	0.00	-0.25	Passionate	0.00	0.00	0.00	0.00	**Patient**	0.00	0.00	0.00	0.00	Committed	0.00	0.00	0.00	0.00
Ambitious	0.22	0.00	-0.22	Sincere	0.00	0.00	0.00	0.00	Persistent	0.00	0.00	0.00	0.00	Playful	0.00	0.33	0.33	0.33
Accurate	0.67	0.44	-0.22	Strong	0.00	0.00	0.00	0.00	Strong	0.00	0.00	0.00	0.00	Originality	0.00	0.33	0.33	0.33
Objective	0.43	0.22	-0.21	Team_worker	0.25	0.00	-0.25	0.25	WealthOfIdeas	0.00	0.00	0.00	0.00	Inconsiderate	0.00	0.33	0.33	0.33
Organized	0.50	0.33	-0.17	Accurate	0.60	0.40	-0.20	0.20	**Committed**	0.00	0.00	0.00	0.00	Observer	0.00	0.33	0.33	0.33
Observer	0.25	0.11	-0.14	Informative	0.60	0.40	-0.20	0.20	Stamina	0.00	0.00	0.00	0.00	Patient	0.00	0.33	0.33	0.33

		1				0												
		0.0				0.2												
Focused	**0.11**	**0**	**-0.11**	Observer	0.25	0	-0.05	0.05	Flexible	0.50	0.00	-0.50	0.50	Methodical	1.00	0.00	-1.00	1.00
		0.1				0.2												
Innovative	0.22	1	-0.11	Organized	0.25	0	-0.05	0.05	GoalOriented	0.50	0.00	-0.50	0.50	Informative	1.00	0.00	-1.00	1.00
		0.1				0.2												
GoalOriented	0.22	1	-0.11	Intelligent	0.20	0	0.00	0.00	Ambitious	0.50	0.00	-0.50	0.50	Energetic	1.00	0.00	-1.00	1.00
		0.2				0.2											-	
Educated	0.33	2	-0.11	Curious	0.20	0	0.00	0.00	Analytical	0.50	0.00	-0.50	0.50	Team_worker	0.50	0.33	-0.83	0.83
Motivated.Infl		0.2		GoalOriente		0.2								Motivated.Influent				
uential	0.33	2	-0.11	d	0.20	0	0.00	0.00	**Focused**	0.50	0.00	-0.50	0.50	al	1.00	0.33	-0.67	0.67
		0.5		Motivated.I		0.2												
Analytical	0.67	6	-0.11	nfluential	0.20	0	0.00	0.00	Methodical	0.50	0.00	-0.50	0.50	Educated	0.50	0.00	-0.50	0.50
		0.1		Inconsiderat		0.2												
Inconsiderate	**0.13**	**1**	**-0.01**	e	0.20	0	0.00	0.00	Observer	0.50	0.00	-0.50	0.50	Ambitious	0.50	0.00	-0.50	0.50
		0.1				0.2												
Precise	**0.13**	**1**	**-0.01**	Patient	0.20	0	0.00	0.00	Team_worker	0.50	0.00	-0.50	0.50	Organized	0.50	0.00	-0.50	0.50
		0.1				0.2												
Intelligent	**0.11**	**1**	**0.00**	Committed	0.20	0	0.00	0.00	Informative	0.50	0.00	-0.50	0.50	Logical	1.00	0.67	-0.33	0.33
		0.1				0.2												
Committed	**0.11**	**1**	**0.00**	Stamina	0.20	0	0.00	0.00	Innovative	1.00	0.50	-0.50	0.50	Curious	1.00	0.67	-0.33	0.33
		0.2				0.4												
Persistent	0.22	2	0.00	Educated	0.40	0	0.00	0.00	Accurate	1.00	0.50	-0.50	0.50	Analytical	1.00	0.67	-0.33	0.33
		0.2				0.4								Motivated.Attract				
Stamina	0.22	2	0.00	Obstinate	0.40	0	0.00	0.00	Objective	1.00	0.50	-0.50	0.50	Attention	0.50	0.33	-0.17	0.17
		0.3				0.4												
Curious	0.33	3	0.00	Persistent	0.40	0	0.00	0.00	Organized	1.00	0.50	-0.50	0.50	Accurate	0.50	0.33	-0.17	0.17
		0.7				0.6												
Logical	0.78	8	0.00	Analytical	0.60	0	0.00	0.00	Logical	0.50	0.50	0.00	0.00	Stamina	0.50	0.33	-0.17	0.17
		0.2				0.8												
Patient	**0.11**	**2**	**0.11**	Logical	0.80	0	0.00	0.00	**Precise**	0.50	0.50	0.00	0.00	Objective	0.50	0.67	0.17	0.17
				Average				0.07					0.26	Average				0.30

Detail of Changes in intentions for satisfying curiosity

Table 29. Detail of changes in intentions for satisfying curiosity.

BEFORE the workshop, to satisfy my curiosity, I would . . .			NOW I plan to . . .		
	X	**sd**	***X***	**sd**	**Mean change**
Read **science**-related articles	5.18	1.83	5.45	1.69	.273 (*t*=1.39, *df*=10, *p*=0.19)
Watched **science**-related videos	4.91	1.76	5.36	1.57	.455 (*t* =1.61, *df* =10, *p*=0.14)
Go to **science**-related exhibits	5.09	1.22	5.64	1.36	**.550** (*t* =1.93, *df* =10, *p*=**0.08**)
Read **arts**-related articles	**4.80**	1.55	**5.80**	1.03	**1.000** (*t* =2.54, *df* =9, *p*=**0.03**)
Watched **arts**-related videos	5.36	1.50	5.64	1.57	**.273** (*t* =1.94, *df* =10, *p*=**0.08**)
Go to **arts**-related exhibits	6.00	1.10	6.27	0.90	**.270** (*t* =1.94, *df* =10, *p*=**0.08**)

Detail of changes in perception of interdisciplinary utility

Table 30. Retrospective perception of changes in participants' understanding of the utility of the arts to scientists and science to artists (n=11;)

	Count of improved scores	Retro-pre	After	Change	Paired t-test
How useful do you think it would be to your science career to learn about the arts?	2	3.3	4.3	1.0	2.62*
How useful do you think it would be to your art career to learn about science?	5	3.5	4.7	1.3	3.54*

Table 31. Advertising items responses that significantly from during the course of the workshop.

		Dislike	Neutral	Like	Wilcoxen Signed Rank *z*	*p*
Do You Have the Guts?						
"Hands on with guts"	Pre	1	6	1	-1.73	.083
	Post	0	5	3		
"meet contemporary artists who use guts in their work"	Pre		2	6	-2.0	.046
	Post		6	2		
***Amplify*: Explore Microphotography**						
ARTLAB+ HIRSHHORN	Pre	0	6	2	-1.73	.083
	Post	0	3	5		
Amplify	Pre	0	4	4	-2.00	.046
	Post	0	0	8		
Q?rius	Pre	0	7	1	-1.73	.083
	Post	0	4	4		
"Lighting"	Pre	0	4	4	-1.73	.083
	Post	0	7	1		

Detail of changes in workshop participants perception of utility

Table 32. Coded reasons, frequencies, explanations, and examples of why teens would and would not attend arts or science events

Theme	ARTS		SCIENCE		Explanation	Examples
	Attend	Not Attend	Attend	Not Attend		
Accomplishment: contribution	0.5%		1.5%		Reference to an outcome that involves helping others	*Innovation; to share my art with others*
Accomplishment: personal	3.4%		0.8%		Reference to an outcome that relates only to the self	*To become more outgoing; to show off; build talents*
Art	1.0%				Reference to art in general	*It's art; colorful ideas*
Art appreciation	2.7%	0.8%			Reference to art product or art-making as an object to be viewed or studied (not doing)	*I love watching people make art; watching dances*
Art process	**5.0%**		**6.0%**	1.2%	References to the experience of making art	Creative activities; feel the emotion; open mind
Art product	0.5%				References to the end result of making art	*Beautiful work; make new things*
Artists or scientists in general	1.0%			2.3%	References to the general character of artists or scientists	*Scientists:* *Artists: expressive; nice; risk takers*
Autonomy	**9.4%**	2.5%	2.0%	1.2%	Based on the Self Determination Theory definition of autonomy as relating to an individual connecting with their intrinsic self -- free from pressure, tension, or ambiguity; results in intrinsic motivation accompanied by passion, Inspiration, sense of freedom, creativity	*Absence of: "no personal space; not letting me be creative; not having any input; lack of creativity;* *Presence: because I love it; explore my creativity; to find inspiration*
Career	1.7%		1.5%		Reference to gaining knowledge, experience or relationships for pursuing a career;	*"want experience;" "college;" "science is part of my career choice" "making connections"*
Challenge	0.5%	0.3%	1.3%		Reference to the word, "challenge" or something related to a challenge, or not challenging enough.	*"feeling smart" "hard work"; If it were too easy; challenges my almost non-existent artistic abilities*
Conflict of interests	0.8%	3.5%	0.3%	3.5%	Obligation or choice to do something else; attending in spite of other obligations	*Not attend: Love science more; feeling silly; don't have time; something better to do; not worth my time; sports event;* *Attend: If it blends with my schedule; a way to spend free time*
Culture	0.2%				Use of the word "culture"	*Culture!*
Curious		0.2%	1.2%		Wanting to know more about the activity	*Questions!*
Difficult	0.7%	**20.8%**		**21.6%**	Feeling inadequate, possibility of failure, material/subject too difficult	*Not attend: competitive; I am not talented; I'm not good at it; intimidation; too advanced; others better than me;*
Difficult: Criticism		0.3%			Use of the word "criticism" or "critical" in a way that may be threatening to motivation	*Attend: no harsh criticism*
Difficulty overcome	0.3%		1.7%		Reference to help with concerns about not being	*Attend: If the teacher explains; If I have knowledge on*

					able to be successful	*the subject*
Discovery	**2.5%**		**4.7%**		Exploration; finding out about new things;	*I could discover something; enlightening*
Engaging (not)				0.5%	Use of the word “engaged” with no further explanation	*“not engaging”*
Engaging (not): boring		**8.2%**	0.2%	**9.0%**	Specific reference to the word, "boring" or to the concept	*I get bored easily; nothing to do; can be tiresome*
Engaging (not): busy work				0.5%	Reference to menial tasks	
Engaging (not): didactic, not hands-on		3.4%		3.5%	Reference to lack of “hands-on” experience or to lecture and words	*if was just a lecture; I don't like [just] looking at paintings*
Engaging (not): Long		1.0%		1.0%	Reference to "long" "too long" "a long time"	
Engaging: fun	**10.2%**		**7.7%**		Reference to fun, entertaining, exciting, enjoyment, engaging	*I might have fun; do fund activities; games*
Engaging: Fun (not)				2.0%	Reference to un, entertaining, exciting, enjoyment, engaging	*"might feel like school, not something fun" "I didn't enjoy the experience"*
Engaging: hands-on	1.7%		3.7%		Reference to "hands-on"; interactivity, participation	
Environment	1.2%			0.2%	Reference to where the activity takes place or its condition	*clean, well-ventilated, huge area of past works from the famous*
Family	0.5%				Reference to family as motivation	*My mom asked me; my family would be interested in what I saw*
Food	0.3%		0.3%		Reference to food or eating	
Friends	1.3%	0.3%	2.0%	1.0%	References to friends or peers known prior to the activity.	*No one else going*
Fun		1.0%			Use of the word "fun," "joy" or "enjoy"	
Get messy (positive)	0.2%				Reference to getting messy as a positive experience	*You get messy.*
Get messy or hurt		1.3%	0.2%	1.0%	Reference to safety or messiness	*Paint getting all over me; "injury" "if any experiments involve something messy"*
Group experience	1.3%				Reference to interacting with others during the activity	*to understand other artists; sharing of ideas; to hear others' work; being part of a team*
Ideological		0.7%	0.2%	2.2%	Reference to large ideological or political issues such as liberalness; homosexuality; "decency";	*Annoying leftist; cross a line of decency;*
Interdisciplinary	0.7%		0.7%	0.3%	Seeking a blend of disciplines	*including math; If it involved science; combination with other subjects*
Interest in a specific topic, medium or genre	**15.1%**	**14.7%**	**14.9%**	**7.7%**	Interest in a specific topic, or general reference to “specific topic;” reference to a specific art medium or genre such as dance, music, jazz, painting	*Topic is interesting; Astronomy; explosions; a medium I enjoy;*
Interested generally	**3.9%**	**2.3%**	**6.2%**	**5.9%**	Interest in general as reason to attend reference to aversion generally as reason not to attend	*sounds cool; neat; I find it interesting; science is fascinating; I love learning*
Learn	**7.4%**	**0.5%**	**15.4%**		Reference to learning, knowledge, information, education, understanding	*chance to learn something new; informational, educational*
Logistics	**3.7%**	**8.4%**	**3.4%**	**16.8%**	Reference to cost; distance; time;	*Near; easy and affordable;*

New experience(s)			4.9%		Reference to doing something new	*step out of my comfort zone; working with stuff you don't regularly get a chance to; find a new hobby; exposure to different genres; inspiration to the arts;*
Opportunity	0.7%		1.2%		References "opportunity" or chance to do something of value	*Get out of the house; life is short",*
Personal technique/skill	3.9%				References to expanding existing arts skills; to learn certain techniques;	*to improve my art*
Quality	**2.3%**	**7.0%**	**0.2%**	**2.5%**	Reference to the quality of the event or the results	
Relevance		1.2%	2.2%	0.8%	Includes the word "relevant" or references utility for another purpose such as school; confidence; practicality	*Gain confidence in weakest subject; practical information; credit-bearing.*
Repetitive		0.3%	0.7%	1.2%		
Science			**6.0%**	1.2%	References to participating in/with scientific method	*Cool experiments; getting to see what they do in a typical day; get to wear lab coats*
Social	**4.2%**	**5.5%**	**4.5%**	**6.0%**	Statements about relationships to people who attend	*Meet new people*
Social: peer artists		3.9%				
Teacher(s) or mentor(s)	**3.7%**	**2.5%**	**3.7%**	**2.0%**	Reference to the scientist(s) or artist(s) in charge, in the role of mentor, teacher, lecturer, etc.	*The person might be boring; cool speaker; famous science teacher*
x ?	0.3%				Not understood by coder	
x no code	6.2%	7.4%	6.9%	6.0%	Response doesn't answer the question	

Red indicates significant difference (p<.01) between arts-oriented and science-oriented groups.

Detail of Rating of words as describing Artists and Scientists

Table 33. Words used differently, based on orientation, to describe Artists; Scientists, or both (negative numbers describe artists).

		Orientation toward		Whole Group
Values	**The Arts**	**Equally**	**Science**	
playful	-1.67 (1.12)	-0.86 (1.44)	-1.38 (1.11)	-1.46 (1.23)
rebellious	-1.36 (0.97)	**-0.86 (1.22)**	**-1.02 (0.97)**	-1.17 (1.11)
Motivated by a need for originality	-1.39 (0.99)	**-0.55 (0.53)**	**-0.95 (1.05)**	-1.12 (1)
creative	-1.27 (1.18)	**-0.68 (1.15)**	**-0.94 (1.08)**	-1.07 (1.18)
Motivated by a need to attract attention	-1.03 (1.1)	-0.82 (1.25)	-1.04 (1.18)	-1.01 (1.16)
social	-0.9 (1.24)	-0.86 (1.05)	-0.81 (1.14)	-0.86 (1.18)
imaginative	-1.05 (1.16)	**-0.59 (1.05)**	**-0.52 (1.26)**	-0.78 (1.21)
flexible	-0.99 (1.19)	**-0.55 (1.32)**	**-0.51 (1.27)**	-0.74 (1.26)
compassionate	-0.75 (1.73)	-0.59 (1.01)	-0.68 (1.65)	-0.7 (1.65)
energetic	-0.83 (1.11)	-0.5 (1.01)	-0.56 (1.26)	-0.68 (1.2)
open	-0.68 (1.2)	-0.32 (1.01)	-0.62 (1.21)	-0.61 (1.2)
passionate	**-0.6 (1.09)**	**-0.5 (1.25)**	**-0.31 (1.12)**	-0.47 (1.15)
sincere	-0.49 (0.98)	-0.18 (1.14)	-0.3 (1.1)	-0.38 (1.07)
skilled	**-0.47 (1.11)**	**-0.23 (1.36)**	**-0.04 (1.25)**	-0.27 (1.2)
ease of sliding between fact and fiction	-0.28 (1.26)	0.55 (1.14)	-0.36 (1.19)	-0.22 (1.21)
wealth of ideas	**-0.41 (1.28)**	**-0.14 (1.1)**	**0.09 (1.14)**	-0.18 (1.24)
obstinate	0.03 (1.01)	-0.32 (1.02)	-0.1 (1.08)	-0.06 (1.04)
Motivated by a need to be influential	-0.1 (0.99)	0.32 (1.09)	-0.09 (1.08)	-0.05 (1.04)
patient	-0.15 (1.24)	0.32 (1.21)	0 (1.04)	-0.04 (1.19)
committed	-0.09 (0.98)	0.32 (1.09)	0 (1.09)	-0.01 (1.06)
inconsiderate	0.06 (1.23)	-0.09 (1.38)	-0.07 (1.19)	-0.01 (1.24)
strong	**-0.17 (1.25)**	**0.14 (1.02)**	**0.21 (1.13)**	**0.02 (1.19)**
ambitious	**-0.04 (1.24)**	**0.55 (1)**	**0.26 (1.13)**	**0.15 (1.19)**
persistent	**0.1 (1.13)**	**0.36 (1.18)**	**0.42 (1.12)**	**0.26 (1.13)**
innovative	**-0.01 (1.21)**	**0.41 (1.4)**	**0.62 (1.03)**	**0.29 (1.16)**
stamina	**0.27 (1.33)**	**0.36 (1.31)**	**0.56 (1.13)**	**0.40 (1.28)**
goal oriented	**0.20 (1.31)**	**0.32 (1.14)**	**0.77 (1.2)**	**0.44 (1.25)**
curious	0.44 (1.2)	0.36 (1.25)	0.68 (1.4)	0.53 (1.3)
focused	**0.35 (1.15)**	**0.64 (0.8)**	**0.79 (1.09)**	**0.56 (1.09)**
team worker	**0.46 (1.16)**	**0.5 (0.91)**	**0.79 (0.94)**	**0.6 (1.05)**
precise	**0.32 (1.38)**	**0.77 (1.13)**	**0.91 (1.13)**	**0.61 (1.25)**
objective	**0.51 (1.2)**	**0.36 (1.14)**	**0.96 (1.04)**	**0.68 (1.13)**
intelligent	**0.2 (1.3)**	**0.82 (1.11)**	**1.22 (1.26)**	**0.68 (1.26)**
educated	**0.27 (1.35)**	**0.55 (0.95)**	**1.22 (1.1)**	**0.69 (1.21)**
observer	0.76 (1.27)	0.59 (1.25)	0.8 (1.21)	0.76 (1.25)
methodical	**0.61 (1.02)**	**0.77 (1.33)**	**1.02 (0.97)**	**0.8 (1.05)**
organized	0.81 (1.05)	0.59 (0.94)	0.94 (0.92)	0.84 (1)
accurate	**0.81 (1.08)**	**0.68 (0.99)**	**1.35 (0.98)**	**1.02 (1.05)**
informative	1 (1.02)	1 (0.78)	1.17 (0.89)	1.07 (0.95)
logical	**0.83 (1.25)**	**0.91 (0.86)**	**1.54 (1.08)**	**1.13 (1.15)**
analytical	**1.16 (1.17)**	**1.09 (1.14)**	**1.48 (1.07)**	**1.28 (1.13)**

* Averages that differed significantly (F-test probability less than .1) between groups appear in **bold** (see Appendix --- for detail).