Art of Science Learning, Phase 2—External Evaluation

Final report from a summative study of impact

June 21, 2017

The Art of SCIENCE Learning

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The Art of Science Learning, Phase 2

Integrating Informal STEM and Arts-Based Learning to Foster Innovation

External Evaluation:

Final Report from a Summative Study of Impact

June 21, 2017

Prepared by Slover Linett Audience Research Inc.

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UC DAVIS
AGGIES

1
GATHER INFORMATION
Double-click "Research Papers" to conduct research to help you choose the best location for your desalination plant.
2
PICK A LOCATION
Double-click "Plant" location and choose the best place to put your plant, based on the research and your own priorities. What's most important?
Amount of water produced
Environmental protection
Community happiness
A balance of all these
TIP: Find the HINTS!
3
COLLECT COINS
Double-click "Coins" – you have 30 seconds to collect as many coins as you can. Each time you collect 10 coins you can upgrade your plant.
QUIT

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Executive summary

Program overview

The Art of Science Learning, Phase 2 was an NSF-funded research and development project to investigate the value of incorporating arts-based learning techniques in STEM-related group innovation processes. The project team created a new, arts-infused innovation curriculum in consultation with leading national practitioners in the arts, creativity, and innovation, then deployed that curriculum in three "innovation incubators" in San Diego, Chicago, and Worcester (Mass.) in partnership with informal STEM institutions in those cities. At each incubator, diverse members of the public (from high school students to STEM and creative professionals) were recruited to participate in a year-long process. These participants, known as Fellows, identified a STEM-related civic challenge to address—**water** was chosen in San Diego, **urban nutrition** in Chicago, and **transportation** in Worcester—then organized into teams and collaborated to develop creative, implementable projects in the form of civic innovations or STEM-learning innovations. In addition to the curriculum and incubators, the Art of Science Learning held a number of public events in the incubator cities and produced a traveling exhibit. (To date, the exhibit has been shown at the Fleet Science Center in San Diego and the Elmhurst Art Museum near Chicago.) The program also included a research study conducted by Audience Viewpoints (separate from this evaluation); a website and social media content; a national partner network; and an advisory council.

About this evaluation

Slover Linett Audience Research conducted an external evaluation of the project, focusing on measuring impact rather than documenting or diagnosing process and delivery. The study was designed to answer three evaluation questions:

1. To what degree did the outputs of project teams meet the Art of Science Learning project's three objectives of being innovative, implementable, and likely to have impact?
2. What impact did the incubator activities have on Fellows' self-reported creativity, communication, tolerance for ambiguity, empathy, and other relevant attitudes?
3. What impact did the public-facing events and exhibit have on those participants' awareness of, and interest in, the role of creativity in STEM education and innovation?

The study used a mixed-methods approach. To gauge how implementable and impactful the incubator outputs were, we asked a panel of experts to assess the teams' innovation projects on a number of dimensions. To understand the impact of the innovation curriculum and incubator process on Fellows' innovation skills, we conducted a multi-wave survey of Fellows, observations and interviews with Fellows at incubator activities, and interviews with other local partners and stakeholders during and after the program. And to evaluate the impact of the public engagement events and exhibit, we conducted an online survey of event attenders, observations and interviews

at several of the events, and a kiosk survey with open-ended questions in the exhibit.

Findings

Overall, the expert reviewers made positive assessments of the teams' incubator projects. Using a top-5 box score out of 7 (in other words, counting as success any ratings that weren't overtly negative, which seemed an appropriate standard when asking professionals to judge the work of part-time, voluntary teams that included students and amateurs), we found that ~90% of the experts' ratings for **innovativeness** were in the positive range, and even higher percentages (92% and 96% for different categories of projects) for **implementability**; the assessments for **potential impact** were somewhat lower (79% and 82%). The Fellows themselves had somewhat higher confidence about their projects than the experts did, which is not surprising given their sustained immersion in the work. These findings suggest that the Art of Science Learning process generated valuable outputs, though it does not confirm the role of arts-based techniques in that process. That said, the favorable ratings associated with the innovation outputs that the Fellows created through these arts-based techniques does say something about the value of the process as a whole.

Using three-wave quantitative survey of Fellows, we were not able to identify statistically significant patterns of self-reported positive impact on the Fellows over time. The survey used mostly new and several published items to measure changes in Fellows' self-reported skills, behaviors, and attitudes in the areas of **creativity**, **collaboration**, **tolerance of ambiguity**, **empathy**, and other relevant self-perceptions. With creativity, for example, only 3 of our 20 items showed the predicted positive change between Wave 1 and Wave 3 of the program; 5 showed change in the opposite direction; and the remaining 12 measures showed no statistically significant change. The other outcome-areas showed similar results. However, for a few items within those areas we did see statistically significant movement in the direction hypothesized: Fellows became more aware of the importance of subconscious processes in creativity (see "*daydreaming*" item, page 30), more nuanced in their ideas about good communication (see page 32), and slightly more empathic in their criticism of collaborators (see page 37, table 22).

Moreover, in qualitative interviews with Fellows and incubator stakeholders we heard support for several important outcomes: that the Fellows had, in fact, experienced gains in creativity, particularly as a result of interactions between arts-oriented and science-oriented individuals—interactions that sparked creativity among both groups and revealed new perspectives; that the younger Fellows, especially students, made notable gains in their communication skills, becoming more confident in articulating and communicating their ideas to teammates and others; that Fellows became more comfortable with the ambiguity they sometimes perceived in the curriculum and incubator process (and were sometimes frustrated by); and gains in empathy as they formed relationships within and across teams—e.g., in how they viewed and practiced constructive criticism. We also found that Fellows became more inclined to describe themselves as "*scientific-minded*" over the course of the project, perhaps because they learned that "science" applies to a broader spectrum of skills and mindsets than they had believed.

Our evaluation of the public engagement events found limited but directionally positive self-reported gains in knowledge and appreciation of the role of creativity in STEM education and innovation among attenders. We attribute the small size of those gains at least in part to the fact

that the audience members at these events were already fairly engaged in STEM fields and the arts and therefore had high levels of knowledge and appreciation to begin with (a “ceiling effect”). Visitors to the traveling exhibit in San Diego and Worcester shared thoughts about the relationship between science, creativity, and the arts that align well with the animating ideas of the project.

EXIT
Adrian

Background

A. Program overview

The Art of Science Learning, Phase 2—Integrating Informal STEM and Arts-Based Learning to Foster Innovation—was a national initiative to implement and investigate the effectiveness of arts-based learning in 1) generating innovation within the informal science education (ISE) field, 2) strengthening innovation processes and creativity skills in STEM learners and professionals, and 3) fostering STEM engagement in the general public. The project was funded by the National Science Foundation and built on a previous Phase 1 grant which supported conferences in Chicago, Washington, and San Diego to explore new ways of engaging the arts to strengthen science education and spark workforce creativity. The Phase 2 project was organized around "innovation incubators" in San Diego, Chicago, and Worcester (Mass.), modeled on business incubators or "accelerators" designed to foster innovation and creativity. In each of the three Art of Science Learning incubators, diverse professionals and members of the public collaborated to generate creative ideas to address STEM-related challenges of local interest and STEM education. These participants, known as Art of Science Learning Fellows, were exposed to a new, comprehensive STEM innovation process curriculum developed by the Art of Science Learning team in consultation with leading national practitioners in the arts and innovation; the curriculum integrated arts-based-learning techniques meant to strengthen creativity skills and improve innovation outcomes.

The incubators in each city were hosted by a STEM partner institution or consortium: in San Diego, the Balboa Park Cultural Partnership (which also served as the national sponsor of the project and administered the NSF grant) and especially the Rueben H. Fleet Science Center; in Chicago, the Museum of Science & Industry; and in Worcester, the Ecotarium. At each site, Art of Science Learning faculty used the new curriculum to teach the Fellows new ways to identify problems and opportunities; generate, transform, and communicate creative ideas; collaborate on cross-disciplinary innovation teams; empathically engage audiences; and co-create innovations with audiences. After four months of this "front end" work, the Fellows at each incubator, working together and with the host institution, identified a STEM-related civic challenge to address: **water** was chosen in San Diego, **urban nutrition** in Chicago, and **transportation** in Worcester. Within those broad challenge areas, the Fellows identified specific problems they wanted to solve and self-organized into teams that would, over the next eight months, collaboratively develop creative, implementable solutions in the form of STEM-related products, processes or services *or* STEM learning programs and processes. There were 29 teams across all three sites, working on a diverse

array of projects.[1] For example:

- In the **San Diego incubator**, one team developed *Kate's Place*, which they envisioned as a mobile Water Innovation Center that would serve as a water-smart model home and garden showcasing technologies and best-practices in sustainable living, particularly in water conservation.
- In the **Worcester incubator**, one team developed *Smart Healthcare Transit*, a database application and web-based interface to improve accessibility to healthcare by efficiently facilitating the scheduling of appointments between healthcare providers and patients who are dependent on public transportation.
- In the **Chicago incubator**, one team developed *Growing Innovations*, a science and engineering curriculum for grades 6-12 which aligns with Next Generation Science Standards. Its goal is to empower students to create innovative plant-growing methods, solve technical problems, and explore the social and cultural impacts of growing local, nutritional food. The curriculum was piloted at the Mozart School in Chicago.

The last of the year-long Art of Science Learning incubators ended in January, 2015. In San Diego, several teams also participated in a supplemental **Accelerator Program**, an approximately 9-month extension to the initial incubator that provided additional support and opportunity for interested teams with promising innovations. The Accelerator Program was available only in San Diego, but teams from other incubator sites did in some cases continue working on their innovations on their own, pursuing funding and support to help them further develop the products they had begun developing during the incubation process.

In addition to the curriculum and incubators, the Art of Science Learning, Phase 2 included a number of public engagement events in each of the incubator cities as well as a traveling exhibition showcasing the program and some of the teams' projects. The exhibit was on view at the Reuben H. Fleet Science Center in San Diego from January 28 to May 15, 2016; and at the Elmhurst Art Museum from June 11 to September 18, 2016. The Art of Science Learning also benefitted from a national partner network, including the Association of Science-Technology Centers (ASTC), the American Association for the Advancement of Science (AAAS), and Americans for the Arts. Other activities included a research study conducted by Audience Viewpoints (separate from this evaluation); a project website and social media content; and a national advisory council comprised of professionals in education, science, creativity, and business.

Additional information about the project is available at the project website: artofsciencelearning.org.

[1] 29 teams were initially formed, of which 22 (79%) completed the program and were judged by external gate panels as having developed innovations which met project criteria.

B. Evaluation objectives

The Art of Science Learning, Phase 2 engaged Slover Linett Audience Research Inc. to conduct an external evaluation of the program. Specifically, the evaluation was designed to assess two dimensions of impact:

A. ***Incubators:*** Was the arts-based learning (ABL) innovation curriculum and its implementation in the incubators successful in strengthening learner/participants' innovation skills and generating implementable and potentially impactful ISE innovations?

B. ***Public:*** Did members of the public exposed to the public engagement activities (events and exhibits) become more aware of, and interested in, the role of creativity in STEM education and innovation?

To evaluate the program's impact along those two dimensions, we focused on three research questions:

- **Assessment of innovation outputs:** To what degree did the outputs of project teams meet the Art of Science Learning project's three objectives of being innovative, implementable, and likely to have impact? (See findings pages 17–26.)
- **Impact on Fellows:** What impact did the incubator activities have on Fellows' self-assessed creativity, communication, tolerance for ambiguity, and empathy, and on their attitudes toward each of these qualities? (See findings pages 27–42.)
- **Impact on the public:** What impact did the public-facing events and exhibits have on those visitors' awareness of, and interest in, the role of creativity in STEM education and innovation? (See findings pages 44–52.)

It should be noted that these are narrowly focused and highly impact-oriented evaluation goals. It was decided early in the evaluation process not to attempt to document and appraise all aspects and outcomes of the initiative, nor to assess the quality of the implementation or delivery of the various components of this complex process. This means that the evaluators can describe in this report only the impacts examined in our evaluation design; we acknowledge that additional positive outcomes may have occurred beyond the findings presented here, and we hope these observations contribute a helpful, albeit not comprehensive, picture of the value of incorporating arts-based techniques into innovation processes.

C. Methods & data sources

To achieve those objectives, we employed a mixed-methods approach. Overall, we collected quantitative survey data and conducted qualitative observations and interviews. Specifically, to evaluate the role of the innovation curriculum and incubator process in strengthening Fellows' innovation skills (the first part of Question A, above), we conducted:

- a multi-wave survey of Fellows;

- ethnographic observations and in-context interviews during the program; and
- interviews with program stakeholders during and after the program.

To evaluate the extent to which the innovation outputs of the incubators were potentially implementable and impactful (the second part of Question A, above), we asked experts in STEM education and informal learning to assess the teams' innovation projects on a number of relevant criteria. Finally, to evaluate the impact of the incubator events and outreach efforts on the public's awareness of and interest in the role of creativity in STEM education and innovation (Question B above), we conducted:

- an online survey of public engagement event attendees;
- observations and in-context interviews during public engagement events; and
- an open-ended kiosk survey within the traveling Art of Science Learning exhibit to capture visitors' qualitative impressions and reactions.

The quantitative data was analyzed using standard descriptive statistical techniques to identify outcomes; we note statistically significant differences between groups or sites where relevant. The qualitative data was analyzed using standard content analysis techniques to identify key categories, themes, and illustrative interview quotes; these findings are used both to illustrate and elaborate on themes we saw in the quantitative data and to provide additional themes not covered in the quantitative components.

As noted above, this report is not designed to provide a causal analysis or generate definitive conclusions about the extent to which the intervention (the Art of Science Learning curriculum and incubator process) was directly or independently responsible for particular outcomes. A separate research study was conducted by Audience Viewpoints in parallel to this evaluation, using an experimental design to investigate the causal relationship between the project and some of its intended impacts; please see Goldman, K.H., Yalowitz, S., and Wilcox, E., *The Impact of Arts-Based Innovation Training on the Creative Thinking Skills, Collaborative Behaviors and Innovation Outcomes of Adolescents and Adults* (2016).[2]

Findings described in this report are based on data from the following sources:

1. Expert assessments

Our primary source for assessing the incubator teams' innovations was systematic review by a team of experts with backgrounds in innovation, science, arts-based learning, and/or entrepreneurship. Most were outside of the Art of Science Learning initiative and therefore independent, while several were selected for the assessment role despite being involved in the project in some way (this was largely unavoidable given the need to bring in panelists with both expertise in innovation and understanding of the local context); none of them had any direct connection or interaction with the

[2] Available at http://www.artofsciencelearning.org/wp-content/uploads/2016/08/AoSL-Research-Report-The-Impact-of-Arts-Based-Innovation-Training-release-copy.pdf.

teams that designed the projects under assessment. We therefore view these experts as a sound source of knowledgeable, objective appraisal of the teams' outputs.

Methodology

One outside expert (Hamsa Thota) served as the "national" panelist, reviewing all projects across all three incubator sites. In addition, for each incubator site we recruited several local experts who were familiar with the issues associated with that incubator's chosen civic challenge. The panelists for each site are shown in the table below:

Table 1. Expert panelists by site

Chicago	San Diego	Worcester
Cece O'Connor	Christina Schaefer	Brad Barbera
Don Murphy	Francisco Gomez	Jenny Brandmaier
Gary Hoffman	Peter Economy	Steve Taylor
Jonathan Salem Baskin	Victoria Hamilton	Cece O'Connor
Hamsa Thota	Hamsa Thota	Hamsa Thota

Each expert was briefed on the Art of Science Learning project, on the criteria for evaluating the teams' success, and on the mechanics of reviewing teams' support materials and completing the evaluation form (see Appendix B). Reviewers were then given access to materials created by the teams to describe their projects. The specific materials varied from team to team, in some cases including links to web sites the teams had developed and in most cases including videos of the teams' presentations during Module 12 (Launch) and any accompanying materials from those presentations.

The expert reviews were submitted through an online evaluation form that focused on the extent to which a project was innovative, implementable, and likely to have an impact on the challenge it was designed to address. Projects were tagged in advance as being primarily designed to serve as "Product, Process, or Service" projects, as "STEM Learning" projects, or as "Hybrid" projects which could arguably fit in either category. In the latter case, we asked panelists to decide for themselves whether they were going to judge the projects in terms of their success as either "Product, Process, or Service" projects or as "STEM Learning" projects.

In total, we collected 110 expert panelist reviews. Of these, 57 were reviews of "Product, Process, or Service" projects and 53 reviews of "STEM Learning" projects. Please see page 17 for the expert assessment findings.

2. Fellows survey

We administered an online survey to Fellows at all 3 incubator sites to assess the impact of the program's arts-based innovation curriculum and the incubator/instructional methodology. At each of the three incubators, we administered the survey at three key junctures over the 12-month incubator process:

- Wave 1: Prior to the start of the incubator process
- Wave 2: After all front-end innovation curriculum instruction
- Wave 3: After the completion of the incubator period

We designed the survey to track and assess self-reported changes in Fellows' innovation-related skills and attitudes. Specifically, all three waves of the survey covered the following areas:

- Creativity
- Communication
- Tolerance for ambiguity
- Empathy
- Attitudes regarding creativity, communication, and collaboration

Where possible, existing published scales and measures were used or adapted (see Appendix B). Additionally, in waves 1 and 3 we collected data on self-perceptions of the personal qualities that are important to innovation. We also asked Fellows to provide demographic information on wave 1 and their own assessments about the quality and sustainability of their final team products on wave 3. Please see Appendix B for the survey instrument.

Sampling strategy

A total of 326 fellows enrolled in the incubators across all three sites (108 in San Diego, 104 in Chicago, and 114 in Worcester). In total, 40% of the initial cohort of Fellows completed the program. Completion rates, however, varied widely across sites, with 52% of Fellows completing the program in San Diego, 40% in Worcester, and 26% in Chicago.

Survey completion rates at each site were considerably higher than what we would expect in a typical population survey, possibly a result of the way the program leadership communicated to Fellows the importance of the evaluation and research components: at least 63% of participating Fellows completed the survey for any wave of data collection. Survey completion rates by site and wave are shown below.

Table 2. Survey completion rates by site

	Wave 1	Wave 2	Wave 3
San Diego	100 (93%)	59 (66%)	35 (63%)
Chicago	90 (87%)	47 (71%)	17 (63%)
Worcester	101 (89%)	54 (64%)	29 (63%)

The data collected through these three waves of the Fellows Survey were used primarily to investigate how Fellows changed over the course of the program in these self-reported measures of creativity-related skills, communication, tolerance for ambiguity, and empathy. We performed our analyses only on the responses of Fellows who not only completed the program but also completed

all three waves of the survey. We restricted the sample in this way in order to be able to identify changes over time in innovation-related skills, attitudes, and self-perceptions among those who went through the entire program. This subset is comprised of 24 Fellows in San Diego; 15 in Chicago, and 26 in Worcester.

We computed summary statistics for the survey by incubator site and assessed differences across waves. Using the subset of Fellows described above, we conducted significance testing to assess changes in innovation-related skills, attitudes, and self-perceptions from wave to wave of the survey. In addition, using the full dataset, we compared those who had completed the program to those who did not in terms of demographics and other selected measures. By illustrating differences between these two groups, we provide additional context for understanding change through the course of the program among the subset of Fellows who did complete the program. Finally, as a way of providing additional context, we analyzed differences in innovation-related skills and attitudes among the three incubator sites.

3. Observation and interviewing at incubator activities

At a sampling of incubator activities at all three sites, we conducted observations and in-context interviews of Fellows and faculty members. The observations provided us with a first-hand view of specific aspects of the curriculum and their implementation. Where relevant, we present data from these observations and interviews to illustrate or add to the quantitative findings provided in the body of this report.

Sampling strategy

Slover Linett researchers spent the equivalent of 10 in-person days across the 3 sites, spanning the duration of the incubator period. We scheduled observation sessions to coincide with intensive arts-based innovation-training workshops and team-based incubator activities and to give us access to teams at a variety of points along their innovation training and project-development processes. We observed the following six Art of Science Learning modules:

- San Diego Module 2 (Opportunity Identification) and Module 5 (Idea Selection)
- Chicago Module 5 (Idea Selection) and Module 9 (Design and Development)
- Worcester Module 7 (Collaboration in Innovation) and Module 12 (Launch)

Methodology

At each site, the Slover Linett evaluators observed the incubator activities, taking note of learner-participants' experiences with the material, collaboration dynamics within teams, and learning interactions between the Fellows and faculty, mentors, and other stakeholders. The evaluation team also conducted a series of informal, opportunistic interviews with Fellows, instructors, and others involved in the project to learn more about how the curriculum and the incubator methodology influenced Fellows' innovation skills and attitudes toward arts-based learning in the STEM domain. Please see Appendix B for observation and interviewing protocols.

4. Stakeholder interviews

To complement the understanding we would gain through those site visits, we conducted a series of interviews with key stakeholders who played a significant role in the implementation of the program at each site. The purpose of these interviews was to gather varied perspectives on the project's implementation and outcomes. We conducted a total of 14 of these interviews, mostly near the culmination of the project, after most of the project activities were complete but before stakeholders' memories of their involvement would become too distant.

Methodology

The roles played by the stakeholders we interviewed varied from site to site, but in general we included the incubator director and others with significant involvement in the local activities. Each interview comprised a combination of broad, overarching questions related to program implementation and outcomes as well as probes on particular themes that emerged across sites.

Table 3. Stakeholder interviews

Chicago	San Diego	Worcester
Rene Roy Incubator Director	**Nan Renner** (2 interviews) Incubator Director	**Joyce Kressler** Incubator Director
Jenny Brandmaier Team Mentor	**Stephanie Bedwell** Artist-in-Residence	**Cheryl Bolduc** Project Assistant
Rabiah Mayas Contact with Local Partner Institution (Museum of Science and Industry)	**Deborah Foster** Lead Local Faculty	**Nancy Budwig** National Advisory Committee Member
Joe "Spike" Schonthal Lead Local Faculty	**David Kirsh** Research Advisor	**Carrie Crane** Artist-in-Residence
		VJ Manzo Team Mentor

5. Public engagement event survey

We selected five Art of Science Learning public engagement events across the three sites for this component of the study:

- Play Day for Educators, San Diego (July 2014)
- Innovation Launch, San Diego (October 2014)
- Scientific Images, Chicago (October 2014)
- Innovation Launch, Chicago (January 2015)
- Innovation Launch, Worcester (January 2015)

In keeping with the public impact assessment goal described on page 9, above, this survey examined whether members of the public exposed to these public engagement activities felt that they became more aware of, and interested in, the role of creativity in STEM education and innovation. The survey was designed to capture information in two areas:

- attendee reactions to these particular public engagement events, both on the overall level and with respect to individual elements of the experience;
- the extent to which the public engagement events influenced attendees' attitudes about particular civic challenges; STEM innovation; STEM curriculum or learning; and/or arts-based learning.

Sampling strategy

Incubator and public event hosts gathered names and email addresses for attendees at each of those events (to the extent they were able to do so). We then sent email invitations to all attendees for whom we had contact information, receiving the following completion rates for each event:

Table 4. Survey completion rates by event

	# of responses	response rate
Play Day for Educators, San Diego	63	25%
Innovation Launch, San Diego	51	37%
Scientific Images, Chicago	20	56%
Innovation Launch, Chicago	7	28%
Innovation Launch, Worcester	36	28%

6. Public engagement event observations

To supplement the quantitative survey of public engagement event attendees, Slover Linett evaluators also conducted qualitative observations and interviews at three of the public events:

- Pueblo Watershed Exploration, San Diego (December 2013)
- Innovation Launch Event, Chicago (January 2015)
- Innovation Launch Event, Worcester (January 2015)

The observations and interviews afforded the evaluation team a first-hand look at the public's interactions with the Art of Science Learning at all three incubator sites. Insights and context from this qualitative component are woven in with the quantitative findings presented below on page 44. See also Appendix B for observation protocols.

7. Public exhibition survey kiosk

At the conclusion of the incubator process, an exhibition was hosted by two museums in the incubator communities: the Reuben H. Fleet Science Center in San Diego and the Elmhurst Art Museum in Elmhurst, Illinois (a Chicago suburb). The exhibition provided an overview of the initiative and highlighted some of the projects and prototypes developed by teams at all three incubators. A survey kiosk with a pre-programmed iPad was placed at the conclusion of the exhibition, with signage to indicate to visitors that this was an opportunity to share their thoughts and reactions to the exhibition. The kiosk survey was fielded at both exhibition sites.

Sampling strategy

Due to the opt-in nature of this data-collection method and the resulting "convenience sample" of visitors that would result, we decided not to treat the survey as a quantitative instrument. Instead, we developed a set of five open-ended questions to prompt visitors to reflect about the exhibition and the themes of the Art of Science Learning initiative. These prompts were presented on the kiosk iPad in sequence, so that a visitor approaching the kiosk would see one (but not always the same one) as the starting question. The five prompts were:

1. How do you think the arts can impact science and technology?
2. What's the most exciting thing you've learned here?
3. What other educational and civic challenges could arts-based learning help address?
4. How do the arts help you innovate?
5. Share your thoughts about the exhibit!

Visitors' open-ended responses to these questions were downloaded into an Excel spreadsheet and then aggregated and cleaned for analysis. Please see findings on page 49.

Part 1. Incubators Impact

A. Output assessments

How successful were the incubators in generating innovative, implementable, and potentially impactful projects? This section presents findings from external expert assessments of the teams' outputs—the STEM-related projects they developed over the course of the incubators. As discussed in the Methods and Data Sources section above, we obtained five reviews of each project from experts in innovation, science, arts-based learning, and entrepreneurship. These reviews focused on project outcomes with respect to three core criteria. For each of these core criteria and for each of the 22 completed projects across the three sites, each expert provided an overall assessment on a 7-point scale of the degree to which the project achieved that objective. The criteria and the scales on which they were assessed are:

- **Innovation** (i.e., novelty) – 1 =Not at all innovative; 7=Highly innovative
- **Implementability** – 1 =Not at all implementable; 7=Straightforward to implement
- **Potential for impact** – 1 =Not at all likely to have impact; 7= Highly likely to have impact

In addition, reviewers were asked a series of specific questions designed to shed additional light on these overarching criteria. These more specific questions were also scored on a 7-point scale (1=Strongly disagree; 7=Strongly agree):

- **Innovation**
    a) This project is highly original or novel.
- **Implementability**
    a) This project has high potential to actually accomplish its intended objectives.
    b) This project has high potential to deliver compelling value to a substantial number of clearly defined customers or users.
    c) [STEM Learning projects only] This team has a clear plan to ensure its project aligns with the priorities of relevant educational stakeholders.
    d) [STEM Learning projects only] This team has a clear plan to ensure its project obtains the support of relevant educational stakeholders.

- **Potential for impact**

    a) This project addresses a clear problem or opportunity related to [site specific challenge].

    b) This project demonstrates a strong grasp of actual conditions related to the problem or opportunity it is designed to address.

    c) This project addresses significant unmet needs.

    d) This team has clearly identified the revenue streams, key partners and other resources that will be needed to sustain the project over the long term.

    e) [STEM Learning projects only] This team's project is proven to be compelling to the students it aims to benefit.

For both the overall questions and the detailed questions, experts were invited to provide a narrative response explaining in their own words their reasons for selecting that response.

In addition to these outside expert assessments, our analysis draws on data from the third wave of the Fellows Survey. In Wave 3, we asked respondents for self-assessments of their teams' projects. The questions included in this portion of the Fellows Survey were the same as the questions asked of the outside experts, though Fellows were asked only the more detailed versions of the questions and not the overall assessments of innovation, implementability, and potential for impact.

Because these incubator teams were volunteers dealing with major civic challenges that have proven intractable even to seasoned experts in the respective fields (water in San Diego, nutrition in Chicago, traffic in Worcester), our primary focus for this evaluation was the question of whether the Art of Science Learning teams achieved a minimum level of innovation, implementability, and potential for impact with their projects. That is, we were more concerned with understanding the extent to which projects are assessed as better than "Not at all innovative," "Not at all implementable," and "Not at all likely to have an impact" than we were in understanding the extent to which they are considered "Highly innovative," "Straightforward to implement," and "Highly likely to have an impact." So **our primary analytical lens here is the extent to which projects achieve a Top 5 box rating (out of 7)**. As long as a project is assessed as being at least somewhat innovative, implementable, or likely to have an impact, it has met the reasonably expected threshold of the program.

Summary of findings

Based on that top-5 box criterion, the expert panelists made largely positive assessments of the projects' innovativeness, implementability, and potential for impact, with favorable scores more frequent than unfavorable ones (see below). Across the measures, the experts were somewhat less likely than the Fellows themselves to make favorable judgments about the projects. The Fellows had mostly favorable perceptions of their final products, with particular confidence that their projects addressed a clear problem related to their incubator's civic challenges (ranging from 73% to 82% across teams and sites), demonstrated a strong grasp of the conditions related to those challenges

(69% to 73%), and exhibited high potential to address them (62% to 87%). They were somewhat less confident about the more practical considerations regarding the scaling, implementation, and sustainability of these projects. More detailed analysis follows in the next few sections.

1. Innovativeness

Across sites and projects, a larger share of both outside experts and the Fellows themselves assessed the projects to have succeeded on the innovation dimension than to have failed. (As noted above and shown in the tables below, our analysis defines success or positive outcomes as a proportion of "top 5 box score" out of 7—in other words, anything other than the lowest two points on the scale.) Fully 90% of Fellows indicated at least some agreement with the statement that their projects were highly original or novel, and about half agreed strongly (top 2 boxes); only 9% said that it was not at all original or novel (bottom 2 boxes). The experts' corresponding assessments of the projects' novelty and originality were only slightly softer at 86% positive for the civic-challenge projects (the product, process, or service [PPS] column in the table) and 75% for the STEM Learning projects—whereas for overall originality (a question not asked directly of the Fellows) the experts matched the Fellows' high ratings on the related attributes of originality and novelty (91% for PPS, 89% for STEM Learning). It is worth noting that the expert panelists' assessments are higher for those PPS projects than for STEM Learning projects, with mean scores 0.6 points higher for the former on both innovativeness and originality/novelty (see full data tables in Appendix C).

Table 5. Expert and team assessment scores—innovation and novelty

	Expert Assessments Product, Process, or Service (N=57)	**Expert Assessments** STEM Learning (N=53)	**Fellows Self-Assessment** All Projects (N=58)
	Top 5 box / Mean (out of 7)	Top 5 box / Mean (out of 7)	Top 5 box / Mean (out of 7)
Overall, how innovative would you say this project is?	91% 5.0	89% 4.4	--
This project is highly original or novel.	86% 4.7	75% 4.1	90% 5.1

We break out the expert assessment findings by incubator site in the following three tables. As the mean scores (bottom row of each table) show, the Worcester teams' projects earned the highest scores for innovation, with a mean a full point higher than the lowest-scored incubator, Chicago (5.1 vs. 4.1 on the 7-point scale). On the novelty dimension, San Diego scored slightly higher than Worcester (4.7 vs. 4.5), both of which were higher than Chicago (3.8).

"I don't think we have the most innovative solutions, and I've come to a place where I think that's ok. It is a win that they worked together for this long on this topic."

—Stakeholder, Chicago

Table 6. Expert assessment scores—innovation and novelty—Chicago incubator

Chicago teams (expert assessments)	innovative	novel
Team K – EduKitch	4.0	3.7
Team L – Hacking Hunger	3.0	2.5
Team M – Growing Innovations	4.8	4.0
Team N – Seed Saddle	4.6	4.6
Team O – Crunch Time Teen Cuisine	3.6	3.2
Team R – Foodweb	4.6	4.6
mean score	**4.1**	**3.8**

Table 7. Expert assessment scores—innovation and novelty—San Diego incubator

San Diego teams (expert assessments)	innovative	novel
Team A – Trash to Paradise	5.4	5.4
Team B – The Dewers	6.2	6.8
Team BB – Build Environment Innovation Connection	4.4	3.8
Team C – Kate's Place	5.0	4.8
Team D – En Plein Aire App	3.6	3.4
Team F – Epic Water Game	5.2	5.2
Team G – DIY EcoLab	3.3	3.0
Team I – BeeLite	5.4	5.4
Team J – Water Drops Portable Water Supply	5.4	5.0
mean score	**4.8**	**4.7**

Table 8. Expert assessment scores—innovation and novelty—Worcester incubator

Worcester teams (expert assessments)	innovative	novel
Team S – Smart Healthcare Transit	5.8	5.4
Team U – Big Data Route Modeling	5.2	4.2
Team V – Art-Based STEM Curriculum	4.4	4.0
Team W – Wires Over Worcester	5.0	5.0
Team X – ConneXus	5.0	4.6
Team Y – Tasks for Transit	4.8	3.2
Team Z – Secret City Interactive	5.6	5.4
mean score	**5.1**	**4.5**

In the Fellows' own ratings (see Appendix C for tables), there were also some differences across sites. In San Diego and Worcester, a slight majority (53% and 54%, respectively) agreed strongly with the statement, "My team's project is highly original or novel," while only 29% of Chicago Fellows agreed strongly. This statement also had the highest *dis*agreement ratings in San Diego (17%) and Chicago (12%).

The non-Fellow stakeholders we spoke with at each site offered mixed perceptions of the projects' innovativeness, perhaps because of the high initial ambitions they held for the projects and their organizing role in the process. However, even where the stakeholders did not view the projects as particularly innovative, they nevertheless expressed some enthusiasm for the process and confidence in the value of the final products.

2. Implementability

With the exception of questions about funding to sustain the project over the long term, both the experts and the Fellows were positive about the implementability of the team's projects. We asked the expert panelists a general question about how implementable the project was, as well as a question regarding the subset of STEM Learning projects:

- Overall, how implementable would you say this project is? [1 = Not at all implementable; 7 = Straightforward to implement]
- [STEM Learning projects only] This team has a clear plan to ensure its project aligns with the priorities of relevant educational stakeholders [1 = I strongly disagree; 7 = I strongly agree].

Both experts and Fellows were asked four questions designed to assess particular dimensions of the implementability of projects (note that the Fellows were not asked the general question about implementability):

- This project demonstrates a strong grasp of actual conditions related to the problem or opportunity it is designed to address [1 = I strongly disagree; 7 = I strongly agree].
- This project has high potential to actually accomplish its intended objectives.
- This team has clearly identified the revenue streams, key partners and other resources that will be needed to sustain the project over the long term.
- [STEM Learning projects only] This team has a clear plan to ensure its project obtains the support of relevant educational stakeholders [1 = I strongly disagree; 7 = I strongly agree].

> **"I think [the projects] are amazing, really. A lot of things are marketable. A lot of things are viable…I was pretty darn impressed."**
>
> —Stakeholder, San Diego

As shown in the tables below, both the outside experts and the Fellows themselves mostly assessed these projects as implementable; again, more respondents from both samples gave positive scores on these measures than negative ones. For example, more than three-quarters of the Fellows (77% top 5 boxes) assessed their projects as having high potential to deliver compelling value to a substantial number of clearly defined customers or users, while only 7% said that it did not demonstrate such a grasp. And a notable 100% of Fellows said their projects gave a top-5 box score for "high potential to actually accomplish its intended objectives." In contrast to the innovation

measures, above, the expert panelists were slightly *more* likely to judge the STEM Learning projects as implementable than the PPS projects, with 61% of scores of PPS projects ranking in the top 2 boxes and only 51% of STEM Learning projects ranking that high.

Table 9. Expert and team assessment scores—implementability and related factors

	Expert Assessments Product, Process, or Service (N=57)	**Expert Assessments** STEM Learning (N=53)	**Team Self-Assessment** All Projects (N=58)
	Top 5 box / Mean (out of 7)	Top 5 box / Mean (out of 7)	Top 5 box / Mean (out of 7)
Overall, how implementable would you say this project is?	96% 5.3	92% 5.4	--
This project has high potential to actually accomplish its intended objectives.	86% 4.6	81% 4.6	100% 6.0
This project has high potential to deliver compelling value to a substantial number of clearly defined customers or users.	77% 4.5	69% 4.2	97% 5.5
This team has a clear plan to ensure its project aligns with the priorities of relevant educational stakeholders.	--	70% 4.4	--
This team has a clear plan to ensure its project obtains the support of relevant educational stakeholders.	--	72% 4.1	--
My team has clearly identified the key partners that will be needed to sustain our project over the long term.	--	--	77% 4.1

As above, we break out the expert assessments by incubator site in the three tables below. Here, the San Diego projects were ranked highest for overall implementability and all four of the component measures (tying with Worcester's mean of 4.6 on "potential value"). There were differences of greater than one point between the San Diego means and those of the lowest-scored incubator on several measures: high potential value (1.3 higher than Chicago); obtaining stakeholders' support (1.4 higher than Worcester); and aligning with stakeholders' priorities (1.8 higher than Worcester).

Table 10. Expert assessment scores—implementability and related factors—Chicago incubator

Chicago teams (expert assessments)	Implementable (overall)	Potential to accomplish objectives	High potential value	Align with stakeholders	Obtain stakeholders' support
Team K – EduKitch	5.5	4.0	3.3	4.0	4.0
Team L – Hacking Hunger	4.3	2.8	2.0	4.0	3.7
Team M – Growing Innovations	5.0	5.6	4.8	5.6	3.8
Team N – Seed Saddle	5.2	5.4	4.2	--	--
Team O – Crunch Time Teen Cuisine	4.4	4.6	3.6	3.2	3.6
Team R – Foodweb	4.6	5.0	4.6	--	--
mean score	**5.5**	**4.0**	**3.3**	**4.0**	**4.0**

Table 11. Expert assessment scores—implementability and related factors—San Diego incubator

San Diego teams (expert assessments)	Implementable (overall)	Potential to accomplish objectives	High potential value	Align with stakeholders	Obtain stakeholders' support
Team A – Trash to Paradise	5.0	4.8	5.8	6.0	5.0
Team B – The Dewers	5.8	5.4	5.4	7.0	7.0
Team BB – Build Environment Innovation Connection	5.6	4.8	4.2	5.4	4.8
Team C – Kate's Place	7.0	6.6	6.2	6.4	6.2
Team D – En Plein Aire App	6.6	4.4	4.4	--	--
Team F – Epic Water Game	6.2	5.6	5.2	5.0	5.0
Team G – DIY EcoLab	5.0	3.5	3.0	2.0	1.0
Team I – BeeLite	6.0	4.2	3.6	--	--
Team J – Water Drops Portable Water Supply	4.8	5.2	3.8	--	--
mean score	**5.8**	**4.9**	**4.6**	**5.1**	**4.7**

Table 12. Expert assessment scores—implementability and related factors—Worcester incubator

Worcester teams (expert assessments)	Implementable (overall)	Potential to accomplish objectives	High potential value	Align with stakeholders	Obtain stakeholders' support
Team S- Smart Healthcare Transit	5.8	4.8	5.2	--	--
Team U- Big Data Route Modeling	5.8	4.4	5.4	--	--
Team V- Art-Based STEM Curriculum	6.2	3.6	3.8	2.8	3.4
Team W- Wires Over Worcester	4.6	4.4	4.4	3.8	3.2
Team X- ConneXus	4.2	3.6	4.6	--	--
Team Y- Tasks for Transit	5.4	4.8	4.4	--	--
Team Z- Secret City Interactive	4.4	4.4	4.4	--	--
mean score	**5.2**	**4.3**	**4.6**	**3.3**	**3.3**

The Fellows themselves also believed their projects were implementable, and these positive self-assessments held across sites: a majority at all three incubators strongly agreed with the statement, "My team's project has high potential to fruitfully address the problem or opportunity it was designed to address." However, relatively few Fellows across all three sites believed that their projects had clearly identified revenue sources, capital resources (range across sites 0% to 8%), and key partners (range across sites: 17% to 42%) necessary to sustaining their projects over time. This may be because their project-development processes did not extend into the phase where such issues would become pressing.

The stakeholders we interviewed did not share specific thoughts about the extent to which teams had secured these practical resources and partnerships. But they were generally enthusiastic about the projects' implementability. Taken together, Fellows' and stakeholders' assessments indicate that

the projects have real potential to be marketable and viable once these practical considerations are given more thought.

3. Potential impact

Without exception, both Fellows and outside experts viewed the projects as more likely to have impact than as unlikely. This was assessed by asking the expert panelists an overall question about likelihood of impact, as well as asking both experts and Fellows the following questions designed to assess particular dimensions of the likelihood of impact (note that the Fellows were not asked the overall question about impact):

- This project addresses a clear problem or opportunity related to [site-specific challenge area] [1 = I strongly disagree; 7 = I strongly agree].
- This project demonstrates a strong grasp of actual conditions related to the problem or opportunity it is designed to address.
- This project addresses significant unmet needs.
- This team has clearly identified the revenue streams, key partners and other resources that will be needed to sustain the project over the long term.
- [STEM learning projects only] This team's project is proven to be compelling to the students it aims to benefit.

"One thing I learned is that at this stage of the game, public awareness, building a grassroots movement around urban nutrition, is a very necessary first step. A lot of [the projects] became public-awareness programs. But it doesn't get down to the business aspects of things, getting down to what we can create that could be self-sustaining."

—Stakeholder, Chicago

Fellows and, to a lesser extent, the expert reviewers were optimistic about these projects' potential for impact. Across all three sites, most Fellows strongly agreed that their project addresses a clear problem or opportunity related to transportation/nutrition/water (range across sites 73% to 82%), and over half strongly agreed that their project addresses significant unmet needs (53% to 60%). In addition, over half strongly agreed (top 2 boxes) with the statement, "My team's project has high potential to deliver compelling value to a substantial number of clearly-defined customers" (range across sites: 53% to 58%). As the tables below show, outside reviewers were somewhat less positive about the potential for impact, perhaps because of their greater experience in applied settings, but they were more optimistic than pessimistic.

Table 13. Expert and team assessment scores—impact and related factors

	Expert Assessments Product, Process, or Service (N=57)	**Expert Assessments** STEM Learning (N=53)	**Team Self-Assessment** All Projects (N=58)
	Top 5 box / Mean (out of 7)	Top 5 box / Mean (out of 7)	Top 5 box / Mean (out of 7)
Overall, how likely to have an impact would you say this project is?	82% 4.4	79% 4.3	--
This project addresses a clear problem or opportunity related to [site specific challenge].	91% 5.4	75% 4.6	97% 5.9
This project demonstrates a strong grasp of actual conditions related to the problem…it is designed to address.	89% 5.1	83% 4.9	92% 5.5
This project addresses significant unmet needs.	82% 4.4	79% 4.3	93% 5.5
This team has clearly identified revenue streams, key partners and other resources…needed to sustain the project over the long term.	60% 3.4	66% 3.5	58% 3.2
This team's project is proven to be compelling to the students it aims to benefit.	--	74% 4.4	94% 5.5

In the tables below, we show expert assessments of likely impact by incubator site. The San Diego teams earned the highest mean score for overall impact across projects at 4.6 on the 7-point scale, with Worcester a close second at 4.5. Experts gave the Chicago teams the lowest mean scores across projects on the overall impact measure as well as four out of the five component questions—in one case ("addresses a clear problem") 2.1 points lower than the San Diego teams' composite score on that question. The Worcester teams' projects were scored on par with the San Diego projects on some measures of impact, though they were given lower scores for "addresses a clear problem" (4.9 compared to San Diego's 5.6) and "identified revenue streams, partners, and resources" (3.1 compared to San Diego's 4.1).

Table 14. Expert assessment scores—impact and related factors—Chicago incubator

Chicago teams (expert assessments)	Likely to have an impact (overall)	Addresses a clear problem	Strong grasp of conditions	Significant unmet needs	Revenue streams, partners, & resources	Compelling to students
Team K – EduKitch	3.3	3.5	4.2	4.2	3.5	3.8
Team L – Hacking Hunger	3.0	4.3	4.8	4.3	2.0	3.0
Team M – Growing Innovations	4.8	4.8	5.4	5.2	3.4	5.4
Team N – Seed Saddle	3.4	4.0	3.4	4.2	2.4	--
Team O – Crunch Time Teen Cuisine	4.0	3.8	4.2	3.6	2.8	3.4
Team R – Foodweb	4.6	4.8	4.8	4.8	3.0	--
mean score	**3.3**	**3.5**	**4.2**	**4.2**	**3.5**	**3.8**

Table 15. Expert assessment scores—impact and related factors—San Diego incubator

San Diego teams (expert assessments)	Likely to have an impact (overall)	Addresses a clear problem	Strong grasp of conditions	Significant unmet needs	Revenue streams, partners, & resources	Compelling to students
Team A – Trash to Paradise	6.0	6.8	5.6	6.6	3.8	6.0
Team B – The Dewers	4.4	5.8	5.4	5.2	5.0	7.0
Team BB – Build Environment Innovation Connection	4.6	4.4	4.8	4.4	4.6	4.2
Team C – Kate's Place	6.0	6.6	6.4	5.4	5.4	6.4
Team D – En Plein Aire App	3.4	6.6	6.2	3.4	3.8	--
Team F – Epic Water Game	5.6	6.4	5.8	5.0	4.0	5.0
Team G – DIY EcoLab	3.5	3.0	2.5	2.8	2.5	1.0
Team I – BeeLite	4.2	5.4	4.8	2.8	4.4	
Team J – Water Drops Portable Water Supply	4.4	6.0	5.8	3.6	4.0	--
mean score	**4.6**	**5.6**	**5.2**	**4.3**	**4.1**	**4.9**

Table 16. Expert assessment scores—impact and related factors—Worcester incubator

Worcester teams (expert assessments)	Likely to have an impact (overall)	Addresses a clear problem	Strong grasp of conditions	Significant unmet needs	Revenue streams, partners, & resources	Compelling to students
Team S- Smart Healthcare Transit	5.0	6.2	5.8	5.8	2.2	--
Team U- Big Data Route Modeling	4.6	5.6	6.0	4.5	4.4	--
Team V- Art-Based STEM Curriculum	4.0	4.4	5.4	3.6	3.0	4.8
Team W- Wires Over Worcester	4.2	4.2	4.8	4.2	2.6	3.4
Team X- ConneXus	4.6	5.2	4.6	4.4	2.4	--
Team Y- Tasks for Transit	4.8	4.6	5.0	4.4	3.0	--
Team Z- Secret City Interactive	4.4	4.4	4.8	4.0	3.8	--
mean score	**4.5**	**4.9**	**5.2**	**4.4**	**3.1**	**4.1**

Generally, Fellows' own assessments of their projects' potential impact did not show significant differences across the three incubators. One exception was their agreement with the statement, "My team's project is proven to be compelling to the students it aims to benefit." Among those whose teams had created a STEM learning project (and were therefore asked this question), Worcester Fellows were the most likely to agree with this statement (100%) and Chicago Fellows the least likely (36%).

Stakeholders' qualitative comments revealed that they, too, felt that the projects generally had good potential for impact. However, one stakeholder did express hesitations about the potential impact of the Chicago incubator's projects, noting that the public-awareness focus of several of these initiatives may limit their potential for on-the-ground impact.

C. Impact on Fellows

Findings in this section are drawn primarily from responses to those questions on the Fellows survey that were designed to assess—and track changes in over the course of the project—specific individual traits, skills, and attitudes associated with creativity, communication, tolerance of ambiguity, and empathy, as well as attitudes about each trait and other self-perceptions that were hypothesized as relevant to the Art of Science Learning curriculum and outcomes. Where possible, we have accompanied the findings with quotes from our stakeholder interviews and notes from our incubator observations to illustrate each of the impacts discussed.

Summary of findings

Our Fellows survey included 20 distinct survey items intended to measure skills that help people express their **creativity**, 14 of which measured respondents' self-reported creativity levels and 6 of which measured their attitudes toward creativity. Across all these creativity measures, 3 showed the predicted positive change between Wave 1 and Wave 3 of the program; 5 showed change in the opposite direction than predicted; and the remaining 12 measures showed no statistically significant evidence of change.

> **"The promise of integrating art & science attracted interesting, smart people. The people who came together around this project are its greatest strength. The design of the multidisciplinary teams is a great strength."**
>
> —Stakeholder, San Diego

Within our 22 distinct measures of **collaboration** (17 measuring collaboration skills and 5 measuring attitudes toward collaboration), 7 measures showed the predicted positive change from Wave 1 to Wave 3 of the program. Two showed change in the opposite direction than predicted, and the remaining 13 showed no significant evidence of change throughout the program.

Our survey also included 10 items designed to measure Fellows' **tolerance of ambiguity**. Of these items, 3 showed the predicted positive change, 2 showed change in the opposite direction, and 5 showed no significant evidence of change between Wave 1 and Wave 3.

Of our 14 survey measures assessing **empathy**, 1 showed change in the positive, predicted direction, 3 showed change in the opposite direction, and 10 showed no significant evidence of change as the program progressed.

Finally, our survey included 4 items intended to measure Fellows' attitudes toward **collaboration**. None of these measures provided evidence that Fellows' attitudes had changed significantly in the predicted direction as the program progressed. Two measures showed evidence of change in the opposite direction than predicted.

Interpreting these inconclusive findings about Fellows impact, which could be regarded as a "null" result from the standpoint of intended program outcomes, is challenging. On the one hand, it is important to the ISE and arts fields to publish null or negative evaluation results, since these can provide as much useful insight as positive findings (and their absence from the research picture would distort that picture substantively and limit learning). On the other hand, it's also important to consider limitations and/or flaws in the evaluation design that could lead the researchers to miss what would have been confirmatory or positive findings, or to misattribute null ones. In the Art of Science Learning evaluation, for example, the data summarized above may be a reflection of one of the program's key strengths: its ability to attract intelligent, creative, collaborative, and community-minded participants *who already display the personal traits and characteristics the curriculum and incubators tried to foster.* If so, it would be difficult to measure impact on the Fellows using the survey we conducted, precisely because their self-perceptions of creativity-related attributes and attitudes had little room to increase during the program. So the potential impact of the program on those variables may have been masked in our study. In the sections below, we highlight particular measures where this may have been the case.

There is also some evidence, both from the survey and from our qualitative interviews, suggesting that the program may have impacted Fellows' creativity, communication, tolerance for ambiguity, and empathy in ways that were not measurable via our survey. Where relevant, we include quotes that illustrate those possibilities in the sections that follow.

1. Creativity

Across all three sites, our survey data provide some, albeit limited, evidence to suggest that participation in the program may have had a positive impact on the self-perception of skills that help people express their creativity. Findings from our qualitative research provide a stronger suggestion that Fellows did show gains in these creativity-related skills as they went through the curriculum: in particular, they may have benefited from being stretched out of their comfort zones and from using a variety of skills and thought processes—both artistic and analytical—all at once.

As noted above, there were five measures that warrant further mention here precisely *because* there was little increase noted from Wave 1 to Wave 3. The minimal movement detected in these five measures may have been due to the fact that the attitudinal levels captured in Wave 1 were already high to begin with—an important factor that, as discussed above, limits our ability to detect changes in some skills and attitudes throughout this analysis. These "ceiling effect" measures in our survey include disagreement with the notions that: "*Not everyone is capable of creativity*;" "*Individuals are more likely than groups to come up with truly original ideas*;" "*Creativity is something done by individuals, not something that happens on a group level*;" "*To be creative you must be artistic*;" and "*Brilliant ideas come from single 'AHA!' moments, not from working through the creative process*." As shown in the table below, disagreement on these items was high to begin and therefore could show little or no progress in the intended/predicted direction. (These and other negatively worded items are shown with a (-) in the tables below, indicating that *low* and *diminishing* responses on the scale would be considered positive from the standpoint of project goals.)

Table 17. Fellows survey—creativity (-) indicates a negatively worded question

To what extent do you agree or disagree with the following statements?" (1="Strongly disagree" to 7="Strongly agree")	**Wave 1**	**Wave 2**	**Wave 3**
	top 2 boxes % / bottom 2 boxes %		
Creativity: composite mean scores (n=65 all three waves)	**5.29**	**5.14**	**5.27**
Occasionally I like to work on extremely difficult problems	68% 6%	60% 3%	71% 3%
I only like tasks that have a high probability of success (-)	29% 3%	35% 6%	43% 6%
I do not share my ideas with others (-)	83% 0%	82% 2%	71% 6%
I often read books and magazines outside of my core interest areas	58% 5%	43% 11%	52% 5%
I sometimes use my dreams or daydreams as a source of new ideas	71% 5%	69% 5%	72% 2%
I am not afraid of failure	48% 12%	49% 11%	54% 8%
Daydreaming only wastes my time (-)	82% 0%	80% 2%	88% 0%
I don't like to work on problems that have no solution (-)	43% 6%	38% 11%	49% 6%
There are special places where I go to think	38% 17%	40% 17%	40% 14%
I keep something by my bed at night, to record ideas	28% 39%	24% 51%	34% 45%
I enjoy working with the same group of people all the time (-)	23% 8%	34% 9%	22% 9%
I do not need any more colleagues (-)	85% 0%	71% 2%	77% 2%
I seek training in new areas	86% 0%	77% 2%	83% 2%
I make an effort to meet new people	52% 3%	51% 2%	55% 0%

Table 18. Fellows survey—creativity attitudes (-) indicates a negatively worded question

To what extent do you agree or disagree with the following statements?" (1="Strongly disagree" to 7="Strongly agree")	**Wave 1**	**Wave 2**	**Wave 3**
	top 2 boxes % / bottom 2 boxes %		
Creativity attitudes: composite mean (n=65/65/57 across waves)	**5.29**	**5.14**	**5.27**
Not everyone is capable of creativity (-)	6% 68%	3% 71%	4% 70%
Individuals are more likely than groups to come up with truly original ideas (-)	3% 58%	6% 43%	4% 44%
Creativity is something done by individuals, not something that happens on a group level (-)	0% 77%	0% 74%	2% 70%
To be creative you must be artistic (-)	2% 80%	2% 82%	2% 81%
There is too much time wasted in the creative process (-)	1% 78%	0% 69%	0% 81%
Brilliant ideas come from single 'AHA!' moments, not from working through the creative process (-)	2% 65%	2% 57%	0% 65%

San Diego

The quantitative survey did not show significant increases in self-perceptions of creativity among San Diego incubator Fellows over the course of the program. Among those who completed the program, the average creativity score was approximately 5.3 (on a scale from 1 to 7) at both waves 1 and 3. However, we did detect a significant favorable impact of the program on one of the 14 items comprising the creativity scale: By wave 3, Fellows were more likely than they were at the outset of the program to disagree with the statement "*daydreaming only wastes my time*" (96% vs. 71%). We did not detect any changes regarding attitudes about creativity.

"When you are spinning your wheels on an idea, stuck at some point, applying a creative process can be a good way around it."

—Fellow, San Diego

Nonetheless, the non-Fellow stakeholders involved in the San Diego incubator shared their sense that the program led to gains in perceived creativity skills among Fellows. In particular, these stakeholders tended to emphasize ways in which collaborations between the more arts-oriented and the more science-oriented Fellows sparked creativity among both groups, helping Fellows approach their project's topic from new angles and perspectives. The more arts-oriented Fellows acknowledged that, at first, working creatively with scientifically minded people was a challenge. But as they got used to working together, they made adjustments to each other's styles, with science-oriented fellows becoming more creative and the arts-oriented fellows becoming more scientific, a productive blending of mindsets and working modes.

"The dialogue between artists and non-artists led to the non-artists thinking in new ways and [to] the artists getting concrete about things."

—Stakeholder, San Diego

"The artists benefited from the science and the scientists benefited from the art. There's a broadening that you get when you are taken out of your comfort zone."

—Stakeholder, San Diego

Chicago

Among Chicago Fellows, self-perception of creativity was at its highest at the start of the program, particularly in comparison to the middle of the incubator period (5.35 vs. 5.03). Although not statistically significant, our analyses suggest that these self-reported creativity measures might have started to go up once again as Fellows continued to progress through the program. As with the San Diego incubator, we did not find that there was a significant impact of the program on creativity-related attitudes among Chicago Fellows.

Our findings do, however, suggest that certain attitudes about creativity might impact one's likelihood of remaining in the program. Specifically, Fellows who completed the program were less likely than those who left to agree with the statement, "*creativity is something done by individuals, not something that happens on a group level*" (88% vs. 69%). It may come as no surprise that those who understand and value the importance of collaboration in the creative process are especially likely to continue in a program that prizes collaborative creativity. Additionally, it is worth noting that disagreement with this statement did not change over the course of the program. In other words, Fellows who completed the program may understand and value collaborative creativity more, but this understanding and value does not necessarily intensify as a result of their continued participation.

"It was about revealing the creative potential in people that don't think they are creative. And that's what this project is about. This tries to remove thinking as a barrier to creativity."

—Stakeholder, Chicago

"All of these projects had a unique creative DNA because of the arts-based learning. I believe that the arts kept open possibilities as they met challenges. I think the arts kept things alive for these teams."

—Stakeholder, Chicago

Stakeholder interviewees in Chicago did emphasize the creative gains Fellows made as they progressed through the incubator program. As in San Diego, several stakeholders felt that the arts helped remove barriers and/or encouraged Fellows to approach their projects from a new perspective. Chicago stakeholders also noted that the arts-based activities may have injected some emotional levity into the projects, helping the work feel "fresh" and "alive" throughout the project. Interviews with Fellows reflected this, with recognition that thinking creatively pushes one to think outside of the box in innovative ways.

Worcester

Overall, there was no significant impact of the program on these creativity measures (5.3 at both waves 1 and 3) or creativity-related attitudes among Worcester Fellows. Additionally, we found no significant differences in these two domains when comparing Fellows who did and did not complete the program.

However, stakeholders here, too, shared a sense that the teams did show gains in these creativity-related skills as the program progressed, albeit perhaps in a broader sense than our survey instrument was able to capture.

"The end results show that an educated brain in all areas is more creative and more innovative when it has a full experience and education. Not just science, not just technology. But also the arts."

—Stakeholder, Worcester

2. Communication

In general, our survey measures for the self-perception of communication skills remained statistically consistent across all three waves of the program. However, particularly in Chicago and Worcester, there is some evidence from this quantitative data to suggest that Fellows may have gained more nuanced insight into what it takes to be a good communicator as they progressed through the program. In these incubators, Fellows became more likely to agree with statements such as "*a lot of people who think they are effective communicators just talk a lot*."

Qualitatively, the stakeholders we interviewed tended not to address the topic of communication in depth, though several of their comments do suggest that successful collaboration (see section 5, Collaboration, below) often resulted from gains in communication skills within each team. A related theme that emerged from our stakeholder interviews across sites was that younger participants (especially students) made the most notable gains in their communication skills over the course of the program. In particular, stakeholders noted that student participants made great strides in their ability to confidently articulate and communicate their ideas to the rest of their team.

Table 19. Fellows survey—communication (-) indicates a negatively worded question

To what extent do you agree or disagree with the following statements?" (1="Strongly disagree" to 7="Strongly agree")	**Wave 1**	**Wave 2**	**Wave 3**
	top 2 boxes % / bottom 2 boxes %		
Communication: composite mean scores (n=65 all three waves)	**3.81**	**3.74**	**3.81**
I use my tone of voice to reinforce what I am trying to say	63% 0%	55% 0%	66% 0%
I don't hear everything a person is saying, because I am thinking about what I want to say (-)	46% 0%	46% 0%	48% 2%
When talking to someone, I try to maintain eye contact	80% 0%	72% 0%	84% 0%
I recognize when two people are trying to say the same thing, but in different ways	75% 0%	77% 0%	80% 0%
I try to watch other people's body language to help me understand what they are trying to say	72% 2%	74% 0%	77% 0%
I use my own experiences to let my friends know that I understand what they are going through	60% 0%	55% 0%	69% 0%
I try to see the other person's point of view	98% 0%	95% 0%	91% 0%
I change the way I talk to someone based on my relationship with them (e.g. friend, parent, teacher, etc.)	74% 0%	69% 0%	72% 2%
I try to respond to what someone is saying, rather than just reacting to their tone of voice	80% 0%	83% 0%	78% 0%
I interrupt other people to say what I want to say before I forget it (-)	57% 0%	51% 0%	50% 2%
I find it difficult to get my point across (-)	55% 0%	51% 3%	47% 0%

table continues

I use my hands to illustrate what I am trying to say	66% 0%	66% 0%	73% 0%
I organize thoughts in my head before speaking	57% 0%	60% 0%	55% 0%
I use body language to help reinforce what I want to say	55% 0%	56% 0%	61% 0%
I rephrase what another person said, to make sure that I understood them	58% 0%	40% 2%	59% 2%
I find ways to redirect the conversation when people rattle on and on	35% 0%	37% 3%	50% 2%
When I am listening to someone, I try to understand what they are feeling	75% 0%	77% 0%	73% 0%

Table 20. Fellows survey—communication attitudes (-) indicates a negatively worded question

To what extent do you agree or disagree with the following statements?" (1="Strongly disagree" to 7="Strongly agree")	**Wave 1**	**Wave 2**	**Wave 3**
	top 2 boxes % / bottom 2 boxes %		
Communication attitudes: composite mean (n=65 all three waves)	**5.29**	**5.14**	**5.27**
A lot of people who think they are effective communicators just talk a lot	27% 8%	37% 11%	47% 5%
A good communicator can communicate effectively the same way in every situation (-)	12% 51%	3% 57%	11% 58%
People who are outgoing are naturally better communicators (-)	9% 34%	6% 28%	12% 42%
Emotions detract from effective communication (-)	2% 43%	11% 35%	14% 46%
Communication is predominantly verbal (-)	3% 63%	2% 62%	4% 68%

San Diego

Among San Diego Fellows, overall scores for self-reported communication skills remained consistent across all three waves (3.8 out of 5 at both waves 1 and 3), as did self-reported communication-related attitudes. Regarding the statement, "*people who are outgoing are naturally better communicators*," we did note that Fellows who dropped out of the program were less likely than those who completed it to *dis*agree (37% vs. 19%). In other words, Fellows who completed the program may have been more inclined to believe the common misconception that an outgoing personality and communication skills go hand in hand. Furthermore, our findings do not suggest that this misconception changed over the course of the program.

San Diego stakeholders noted that the high school students participating in the program showed the most notable gains in their communication skills. As the quotation at left illustrates, students gained the confidence to communicate their ideas within the group and even in some cases to serve as the group's "voice" to outside collaborators and observers.

"The high school students really had a transformative experience. Quickly, it became the high school students that actually gave voice to what was going on in the group. You could go around the table and not tell the difference between them and older participants. By the 7th or 8th modules, I could step back and see them as some of the most active fellows within the group."

—Stakeholder, San Diego

One San Diego Fellow from the sciences credited the incubator program for making him a better communicator, particularly as a result of working with the arts-oriented Fellows in his team. Because the arts-oriented Fellows were all not scientifically trained, the program encouraged all Fellows to express themselves and their ideas in non-scientific ways in order to be understood by those outside their field.

Chicago

In Chicago, the Fellows' self-assessed communication skills followed a "dip and return" pattern: the mean at the initial wave was 3.8, which declined slightly to 3.7 at the middle wave, then increased to 3.9 in the final wave, slightly (and not statistically significantly) exceeding that initial level. This pattern was not seen in other incubators. Within one variable—agreement with the statement, "I find ways to redirect the conversation when people rattle on and on,"—we found that the program might have had an impact on Fellows' attitudes: they were much more likely to agree with the statement at the end of the program than at the outset (67% at wave 3 vs. 20% at wave 1).

In their communication-related attitudes, Fellows became significantly more likely to agree with the statement, "*a lot of people who think they are effective communicators just talk a lot*," by the end of the program (64% vs. 13% at wave 1). There were also some differences in communication-related attitudes between those who did and did not complete the program: Fellows who left the program early were more likely than those who completed it to agree that "*a good communicator can communicate effectively the same way in every situation*" (20% vs. 4%) and that "*emotions detract from effective communication*" (8% vs. 0%). In other words, these two misconceptions about communication were less common and/or less strong among those who completed the entire program. This may suggest that their understanding of the importance of tailoring communication styles to each situation, and of the fact that emotion can sometimes play a neutral or beneficial role in communication, better enabled these Fellows to work through some of the challenges they faced in the course of the program, and therefore remain in it.

Worcester

As we found with the San Diego incubator, Worcester Fellows' overall communication scores did not change significantly over the course of their 12 months in the program (range 3.8 to 3.9 across waves). But there were some changes over time in levels of agreement with the statement, "*I rephrase what another person is saying, to make sure that I understood them*." Fellows were more likely to agree with this statement in wave 3 than they were in wave 2 (73% vs. 46%).

Regarding communication-related attitudes, Fellows were more likely to agree with the statement, "*a lot of people who think they are effective communicators just talk a lot*," at the end of the program compared to the beginning (57% vs. 36%). Furthermore, particularly compared to the

middle part of the program, Fellows by the end of the 12 months were more likely to *dis*agree with the statement, "*people who are outgoing are naturally better communicators*" (61% vs. 42%). As we found in the Chicago incubator, Fellows who did not complete the program were more likely to agree with the misconception that "*emotions detract from effective communication*" (11% top 2 boxes among non-completers vs. 0% among completers); Fellows who did complete the program were more likely to disagree (41% bottom 2 boxes for completers vs. 28% among non-completers).

"It was amazing to watch everyone, especially the younger students, grow. They came in quiet and reserved. And they came out confident. That was a wonderful thing to see."

—Stakeholder, Worcester

Worcester stakeholders echoed one of the observations made in San Diego: that the student participants showed the most apparent gains in their communication skills. Through participation in the program, student participants appear to have gained the confidence to communicate their ideas in a team-based environment.

3. Tolerance of ambiguity

Based on our survey data, the program does not appear to have had a statistically significant overall impact on the Fellows' self-reported tolerance of ambiguity. Composite scores did not change significantly over the three waves for San Diego (range over the three waves 4.2 to 4.4 on the 7-point scale), Chicago (range 4.4 to 4.6), or Worcester (range 4.4 to 4.6). Furthermore, for the San Diego and Worcester Fellows we found no differences on this score between Fellows who did and did not complete the program. In Chicago, however, those who completed the program had higher overall tolerance for ambiguity than those who left the program (4.6 vs. 4.2), which suggests that an ability to deal well with ambiguous situations may have played a part in retention. This interpretation is supported by qualitative data from our interviews with both Fellows and stakeholders, in which we heard that the most common frustrations experienced during the program were related to difficulties dealing with ambiguity—e.g., as it related to understanding the purpose of each module in the curriculum and the connections between the arts-based activities and the teams' specific projects. Our findings suggest that the Fellows who had the greatest difficulty accepting what they experienced as a lack of clarity were those who left the program early.

"The fellows didn't understand what they were expected to do or learn. One told me something like 'It's the 3rd or 4th session and I don't know what I'm supposed to be doing.' Others were open to whatever the program had to offer and were tolerant of the ambiguity and stayed with it."

—Stakeholder, Chicago

Table 21. Fellows survey—tolerance of ambiguity (-) indicates a negatively worded question

To what extent do you agree or disagree with the following statements?" (1="Strongly disagree" to 7="Strongly agree")	Wave 1	Wave 2	Wave 3
	top 2 boxes % / bottom 2 boxes %		
Tolerance of ambiguity: composite mean scores (n=65/n=65/n=62 across waves)	**4.37**	**4.40**	**4.40**
Almost every problem has a solution (-)	8% 52%	8% 42%	11% 44%
I like to fool around with new ideas, even if they are a total waste of time	51% 2%	35% 5%	53% 5%
Nothing gets accomplished in this world unless you stick to some basic rules (-)	22% 11%	26% 11%	26% 11%
Usually, the more clearly defined rules a society has, the better off it is (-)	17% 14%	25% 11%	21% 21%
Personally, I tend to think that there is a right way and wrong way to do almost everything (-)	51% 9%	49% 5%	50% 0%
I don't need to finish a task before starting a new task	66% 8%	48% 6%	56% 6%
Before any important job, I must know how long it will take (-)	40% 12%	31% 6%	21% 11%
In a problem-solving group it is always best to systematically attack a problem (-)	15% 22%	20% 20%	16% 19%
I do not like to get started in group projects unless I feel assured that the project will be successful (-)	35% 6%	37% 0%	35% 6%

During our interviews, certain Fellows acknowledged some difficulty at the beginning of the incubator process in connecting specific curriculum modules to their team projects, though as time went on, they noted, it became easier to see the intended connections between each module. One Fellow from Chicago described his decision to embrace the ambiguous nature of the early modules, which, he told us, allowed him to stay flexible and think in an artistic way before focusing on his final project—in which, he predicted, there would be less room for flexibility.

Because we did not observe significant differences in Fellows' self-reported tolerance for ambiguity across the three incubator sites, this section will not include sub-sections for each site.

4. Empathy

Overall, self-reported empathy scores among Fellows did not change significantly as a result of participation in the program; the composite scores ranged fairly narrowly over the three waves for San Diego (from 5.2 to 5.4), Chicago (5.4 to 5.7), and Worcester (5.3 to 5.4). Our findings also do not suggest differences in empathy between those who did and did not complete the program.

Table 22. Fellows survey—empathy

(-) indicates a negatively worded question

To what extent do you agree or disagree with the following statements?" (1="Strongly disagree" to 7="Strongly agree")	**Wave 1**	**Wave 2**	**Wave 3**
	top 2 boxes % / bottom 2 boxes %		
Empathy: composite mean scores (n=64/n=65/n=57 across waves)	**5.38**	**5.32**	**5.40**
I often have tender, concerned feelings for people less fortunate than me	59% 3%	60% 3%	61% 2%
I sometimes find it difficult to see things from the "other person's" point of view (-)	33% 3%	48% 5%	53% 2%
Sometimes I don't feel very sorry for other people when they are having problems (-)	44% 6%	43% 6%	46% 7%
I try to look at everybody's side of a disagreement before I make a decision	58% 2%	49% 2%	49% 0%
When I see someone being taken advantage of, I feel kind of protective towards them	70% 2%	52% 5%	68% 2%
I sometimes try to understand my friends better by imagining how things look from their perspective	58% 3%	49% 0%	54% 0%
Other people's misfortunes do not usually disturb me a great deal (-)	55% 2%	65% 2%	58% 5%
If I'm sure I'm right about something, I don't waste much time listening to other people's arguments (-)	45% 6%	43% 5%	40% 2%
When I see someone being treated unfairly, I sometimes don't feel very much pity for them (-)	72% 0%	71% 2%	74% 2%
I am often quite touched by things that I see happen	63% 3%	57% 0%	65% 2%
I believe that there are two sides to every question and I try to look at them both	59% 0%	66% 0%	61% 0%
I would describe myself as a pretty soft-hearted person	50% 0%	49% 2%	44% 2%
When I'm upset at someone, I usually try to "put myself in their shoes" for a while	36% 0%	32% 3%	39% 9%
Before criticizing somebody, I try to imagine how I would feel if I were in their place	36% 0%	31% 0%	53% 2%

The Fellows and stakeholders we interviewed did not share specific insights about the program's impact on empathy. Yet the gains in collaboration these stakeholders noted (see next section) appear to have gone hand-in-hand with gains in empathy. Across sites, stakeholders described ways in which participants formed meaningful relationships with one another within and across teams, which likely reflected gains in empathy.

"I would say [the program's impacts on Fellows were] social first. There were a lot of friends made during the course of this. In the end there were definitely people hanging out together."

—Stakeholder, Worcester

These close and empathic relationships between Fellows may have served as a buffer against some of the frustrations and challenges inherent in pursuing projects of this complexity, scope, and duration. Interviews with Fellows reflected this, particularly in the ways they discussed constructive criticism, how to give and take it, how not to take things too personally, and the need to be patient and listen.

> **"[Fellows] dealt with [frustrations] via humor and camaraderie."**
>
> —Stakeholder, Worcester

We did not observe notable differences in Fellows' empathy across the three incubator sites.

5. Collaboration

Although data from our Fellows Survey did not yield significant evidence that self-reported collaboration skills or attitudes became more favorable, in general, stakeholders from all three sites did observe positive changes in Fellows' ability to collaborate with one another as the program progressed. Some of these measures—particularly *dis*agreement with the negatively-worded survey item *"Collaboration is rarely worth the time it takes"*—were already high among Fellows as they entered the program. As such (and as we saw with some of the creativity measures, above), we can reasonably assume that the little evidence of positive change in attitudes toward collaboration from Wave 1 to Wave 3 can be at least partially attributed to the "ceiling effect," i.e., the impossibility of increasing already-high measures.

Across the three waves, survey measures of attitudes toward collaboration and conflict showed an interesting pattern. In Chicago and Worcester, Fellows were more likely to disagree with the mistaken belief-statement, "*It's always counterproductive when conflict arises during collaborative work*," in the middle of the program than they were at the beginning or end. This may indicate that midway through the incubator process, the need to grapple with particularly challenging tasks and decisions may have lead Fellows to realize the constructive value of conflict in collaboration.

Table 23. Fellows survey—collaboration (-) indicates a negatively worded question

To what extent do you agree or disagree with the following statements?" (1="Strongly disagree" to 7="Strongly agree")	**Wave 1** top 2 boxes % / bottom 2 boxes %	**Wave 2** top 2 boxes % / bottom 2 boxes %	**Wave 3** top 2 boxes % / bottom 2 boxes %
Collaboration attitudes			
It is always counterproductive when conflict arises during collaborative work (-)	5% 55%	5% 77%	4% 60%
People are more likely to produce effective solutions through competition, rather than through collaboration (-)	0% 60%	2% 58%	0% 54%
The less life experience you have the less you have to offer when collaborating with others (-)	2% 62%	2% 54%	7% 46%
Collaboration is rarely worth the time it takes (-)	2% 89%	3% 82%	0% 72%

San Diego

For the San Diego Fellows, our survey measures did not detect any significant changes in attitudes regarding collaboration across the 3 waves, nor were there significant differences in these measures between those who did and did not complete the program at this site. However, stakeholders at this site observed that Fellows did appear to make great strides in collaboration as the program progressed. In fact, these stakeholders often cited gains in collaborative skills as one of the most notable and valuable impacts they felt the program had on participants.

"[One of the biggest benefits was] Fellows getting comfortable with working in groups of all ages; talking to people of all different fields… There was a lot of mixing and matching. Seeing how they were able to work together was really delightful."

—Stakeholder, San Diego

Chicago

As noted above, Chicago was one of two sites in which agreement with the statement, "*it's always counterproductive when conflict arises during collaborative work*," did not follow a linear pattern over the program. Participants were most likely to disagree with this statement toward the middle of the process (93%) than at the start (60%) and the end (57%). Was there a change in the nature of the conflict experienced by Fellows during the work, such that Chicago (or Worcester) teams' processes generated more favorable outcomes despite or because of conflict over time? This data doesn't answer the question, but our interviews suggest that embracing constructive conflict was an important attribute of teams' success.

"For the people who remained in the incubator, [collaborative relationships were] clearly a driving force and a reason to remain in the incubator. And there were some powerful relationships that were formed in the incubator. We connected teams with community advocacy groups and those became valuable relationships."

—Stakeholder, Chicago

In this incubator, there was also an association between completion of the program and the belief that "*collaboration is rarely worth the time it takes*." Not surprisingly, those who completed the program were less likely than those who did not to *dis*agree with this statement (93% vs. 80%). This finding implies that the willingness to withstand the challenges encountered in collaborative processes—and to spend the time necessary to work through them—may have played a role in Fellow retention.

As in San Diego, one theme that emerged across our Chicago interviews was the value that Fellows placed on the collaborative process. One stakeholder noted that Fellows collaborated not just within their project teams but also with external partners such as community advocacy groups. During a movement exercise conducted at the Chicago incubator, Fellows were also making connections across projects and discussing ways in

which they could collaborate to make one another's projects stronger. The value of collaboration was a clear highlight of program participation at this site.

However, other comments from Chicago stakeholders suggest that, at times, Fellows encountered challenges or roadblocks that stood in the way of effective collaboration, at least to some extent. As the stakeholder quoted here (see text box at right) noted, where collaboration was strained, this had the potential to undermine both the projects' progress and Fellows' satisfaction within the program.

"It's vitally important that consideration be given to helping these teams understand how to operate as a team. Because [when collaboration failed], inability to function as a team was not only the demise of the projects, it also undermined the core commitment to the incubator itself."

—Stakeholder, Chicago

Worcester

Other than the aforementioned pattern in Worcester (and Chicago) in which perceptions of the productivity of conflict appear to rise toward the middle of the incubator process, we did not identify a straightforward pattern in the survey data from Worcester Fellows. Yet the stakeholders we spoke with in Worcester said that Fellows did make great gains in their capacity for collaboration in the course of the incubators; from their perspective, collaboration was one of the most valuable aspects of program participation for Fellows. The Fellows themselves expressed a related desire for more integrated relationships across the incubator, in order to increase collaboration among all participants in the program rather than just within the project teams.

"Time and time again, Fellows said that they walked away with a new sense of how to collaborate with different kinds of people."

—Stakeholder, Worcester

6. Other self-perceptions

At the outset of the program, Fellows across all three sites most commonly described themselves as "*inquisitive*" and "*artistic*." As the program progressed, they also began to describe themselves as "*scientific-minded*." Though this change in self-perceptions did not reach statistical significance, its direction suggests that the Art of Science Learning program may have attracted curious, artistically-minded people who, through their participation, came to learn that "science" applies to a broader spectrum of skills and areas than they had previously believed. Fellows' perceptions of themselves as "*a teacher*" also increased throughout the duration of the program, though this change was also not significant. It is possible that participation in the program may have provided Fellows from many walks of life with opportunities to exercise their pedagogical skills.

Table 24. Fellows survey—other self-perceptions

To what extent do you agree or disagree with the following statements?" (1="Strongly disagree" to 7="Strongly agree")	**Wave 1** top 2 boxes % / bottom 2 boxes %	**Wave 3** top 2 boxes % / bottom 2 boxes %
I am inquisitive	94% 0%	95% 2%
I am an innovator	48% 0%	53% 2%
I am artistic	60% 2%	69% 3%
I am scientific-minded	54% 0%	71% 3%
I am entrepreneurial	38% 9%	41% 14%
I am a leader	49% 3%	66% 5%
I am a teacher	58% 5%	60% <1%

San Diego

San Diego Fellows most often described themselves as "*inquisitive*," "*an innovator*," and "*artistic*" at the start of the program; by the end, many also agreed that they were "*scientific-minded*," and the proportion describing themselves as "*a teacher*" had also risen (to 60% vs. 38% in wave 1). Interestingly, Fellows who completed the program were less likely to describe themselves in this way at the outset (35% vs. 77% among those who did not complete the program). That is, while Fellows who participated in the full 12 months had been less likely to see themselves as teachers at the beginning than those who left early, they discovered this quality in themselves as the program progressed.

We also found that San Diego Fellows who left the program early were more likely to *dis*agree that they were "*scientific-minded*" than those who completed the program (8% bottom 2 boxes vs. 0%). (There were no notable differences in positive *agreement* with this self-perception, however [67% top 2 boxes vs. 69%].) This may hint that actively perceiving oneself as not scientific-minded increased the likelihood of leaving the program.

Chicago

Fellows in the Chicago incubator primarily saw themselves as "*inquisitive*," "*a teacher*," and "*artistic*," and, as at the other two sites, were increasingly likely to see themselves as "*scientific-minded*" by the program's end. Overall, however, self-perceptions among Chicago Fellows did not change significantly over the course of the program. As with the San Diego incubator, we found that Fellows who did not complete the program were more likely to disagree that they were "*scientific-minded*," (9% vs. 0% among those who completed). Our analysis also suggests that both the most and least entrepreneurial Fellows were more likely to leave the program before completion. (Those who did not complete the program were more likely to agree *and* disagree with the statement,

"*I am entrepreneurial*" (agree 45% vs. 25%, marginally significant; and disagree 8% vs. 0%). This could indicate that there are elements of the program that fail to sustain the interest of the most entrepreneurial incoming Fellows as well as the least entrepreneurial, though perhaps for distinct reasons; the program may appeal mostly to those somewhere in the middle. It may be worth identifying the factors that speak to particular entrepreneurial tendencies among Fellows, in an attempt design future programs in ways that retain enthusiasm among the already-entrepreneurial and spark or deepen this trait among the less-so.

Worcester

Worcester Fellows most frequently described themselves as "*inquisitive*," "*a teacher*," "*scientific-minded*," and "*a leader*" when the program started, and they continued to see themselves in these terms, with some exceptions. By wave 3, Worcester Fellows were more likely than they had been at the outset to see themselves as *leaders* (74% vs. 54%), though not, as might be expected in connection with leadership, as *teachers*. In fact, they became more likely to disagree with the statement "*I am a teacher*" in wave 3 than they were in wave 1 (21% vs. 4%). This differs from our findings for the San Diego incubator, where we noted a favorable impact of the program on self-perceptions of being a teacher.

WATER GAM

Part 2. Public Impact

A. Public engagement events

This section presents findings about the general public's interactions with the Art of Science Learning initiative at public engagement events across the three incubator sites. These assessments are based primarily on data from a survey distributed to audiences/attendees at 5 engagement events across the three sites and from observations and in-context interviews conducted at several of the events. The purpose of this part of the evaluation was to measure whether members of the public exposed to the engagement activities became more aware of, and interested in, the role of creativity in STEM education and innovation. Methodological details about the event survey and observations are discussed in the Methods and Data Sources section above (page 14).

Summary of findings

Overall, we found limited but directionally positive increases in awareness and interest in the role of creativity in STEM education and innovation among those who attended the engagement events. The overall data in the charts below show a small increase in self-reported awareness or knowledge and less reported change in appreciation. Clearly, the fact that the audience members at these events were already fairly engaged in STEM fields, the arts, education, and other nonprofit areas shaped these findings; as noted above for the incubator Fellows, we are probably seeing a "ceiling effect" here in which attendees came to the event already aware of and appreciating ideas about creativity in science and therefore had little room to increase their knowledge or appreciation.

1. Profile of public event attenders

A high proportion of public engagement event attenders were already affiliated with people involved in the Art of Science Learning, with the project itself, or with a related professional field. Observational and interview data suggest that most attenders were personally acquainted with Art of Science Learning Fellows or staff, and over half of attenders indicated on the survey that they are connected to education (59%), a STEM field (52%), arts & culture (30%), or with government/public administration/nonprofits (29%). Given those affiliations, it's not surprising that event attenders were highly educated, with 92% having at least a college degree and 58% holding a master's or higher degree. Attenders at the public events spanned a wide variety of ages, mirroring those of the Fellows (who ranged from students to late-career and retired professionals).

Table 25. Public engagement event survey—attendee affiliations

Affiliation with arts, STEM fields, education, government fields	Overall	Innovation Launch	Scientific Images	Play Day for Educators
Science, Technology, Engineering, or Mathematics	52%	48%	71%	52%
Arts & Culture	30%	40%	7%	23%
Education	59%	51%	43%	75%
Government/Public Administration/Other non-profit	29%	27%	36%	29%
None of the above	5%	8%		2%
Other field of relevance to [EVENT] (Please specify):	7%	8%	7%	6%

Table 26. Public engagement event survey—attendee education

Education level	Overall	Innovation Launch	Scientific Images	Play Day for Educators
High School or GED	2%	3%	--	2%
An Associate's degree or 2-year technical education	6%	3%	21%	6%
College or a technical degree (BA, BS, BSN, etc.)	35%	23%	50%	46%
Master's degree (MA, MS, MBA, MFA, etc.)	41%	52%	--	37%
Professional or Doctorate degree (PhD, EdD, MD, DDS, JD, etc.)	17%	19%	29%	10%

Table 27. Public engagement event survey—attendee age

Age	Overall	Innovation Launch	Scientific Images	Play Day for Educators
Under 25	21%	20%	29%	22%
25-34	18%	15%	18%	22%
35-44	16%	16%	18%	15%
45-54	21%	21%	29%	20%
55-64	17%	18%	6%	18%
65 or older	7%	11%	--	4%

2. Knowledge change

Overall, the quantitative survey of engagement event attenders provides limited evidence of an increasing self-reported knowledge/awareness of the role of creativity in STEM education and innovation. Respondents were asked to rate several items in terms of whether they felt more knowledgeable about those concepts after attending the Art of Science Learning event. The means for each item range from 4.48 to 5.27 on a 7-point scale, suggesting a modest increase in knowledge. The main items that participants said they felt more knowledgeable about were the role of out-of-the-box thinking in addressing civic challenges, and pioneering solutions being considered for a city's civic challenges.

Again, the modesty of these ratings should be considered in the context of the attenders' already-high exposure to such concepts. Nearly all respondents (95%) identified themselves as being involved with a field related to Art of Science Learning project, including STEM fields, the arts, and education—and those affiliations were confirmed by our observations and interviews.

Table 28. Public engagement event survey—knowledge change

"After attending this event, I feel more knowledgeable about…" (1="Strongly disagree" to 7="Strongly agree")	**Overall**	Innovation Launch	Scientific Images	Play Day for Educators
The role of out-of-the-box thinking in addressing civic challenges	5.27	5.27	--	--
Pioneering solutions being considered for addressing [CITY]'s pressing civic challenges	5.20	5.2	--	--
The relevance of creativity to scientific advancement	5.02	5.04	5.69	4.83
What individuals can do to help improve [CITY]'s [water / transportation / urban nutrition] system	4.99	4.99	--	--
The challenges [CITY] faces with regards to [water / transportation / urban nutrition]	4.96	4.96	--	--
The ways in which the arts can help spark science innovation	4.85	4.67	5.46	4.96
The relevance of the arts to STEM (Science, Technology, Engineering and Mathematics) learning	4.81	4.60	5.38	4.98
How artists and science educators can work together to improve STEM (Science, Technology, Engineering and Mathematics) education	4.72	4.63	--	4.85
How artists and scientists work together to address civic challenges	4.71	4.71	--	--
Arts-based methods in use by educators in STEM (Science, Technology, Engineering and Mathematics) fields	4.48	4.25	--	4.81

3. Appreciation change

As with knowledge change, the appreciation data in the survey, along with our observation and interview data, show modest but consistent increases in attenders' self-reported appreciation of the role of creativity in STEM education and innovation. These appreciation ratings fall in range similar to that of the knowledge ratings shown above, and in the same relative order of degree of change. Again, little change might be expected given the already-high affiliation of the audience with such topics.

Attenders did not show particularly strong intentions to act on what they learned or experienced at the event. Just over half of respondents said they would be very likely (top 2 boxes) to share what they learned with others, seek opportunities for themselves or their children to integrate the arts and sciences, and seek opportunities to participate in science- or arts-based activities.

Table 29. Public engagement event survey—appreciation change

"After attending this event, I have a greater appreciation for…" (1="Strongly disagree" to 7="Strongly agree")	**Overall**	Innovation Launch	Scientific Images	Play Day for Educators
The role of out-of-the-box thinking in addressing civic challenges	5.10	5.10	--	--
Pioneering solutions being considered for addressing [CITY]'s pressing civic challenges	5.10	5.10	--	--
The relevance of creativity to scientific advancement	5.07	5.07	--	--
What individuals can do to help improve [CITY]'s [water / transportation / urban nutrition] system	5.07	5.03	5.08	5.12
The challenges [CITY] faces with regards to [water / transportation / urban nutrition]	5.01	5.01	--	--
The ways in which the arts can help spark science innovation	4.95	4.77	5.17	5.14
The relevance of the arts to STEM (Science, Technology, Engineering and Mathematics) learning	4.91	4.61	5.25	5.24
How artists and science educators can work together to improve STEM (Science, Technology, Engineering and Mathematics) education	4.80	4.80	--	--
How artists and scientists work together to address civic challenges	4.78	4.63	--	4.98
Arts-based methods in use by educators in STEM (Science, Technology, Engineering and Mathematics) fields	4.73	4.49	--	5.06

Table 30. Public engagement event survey—likely behavior change

"After attending this event, I feel more likely to… (1="Strongly disagree" to 7="Strongly agree") **TOP 2 BOX**	**Overall**	Innovation Launch	Scientific Images	Play Day for Educators
Share what I learned at the event with others	56%	56%	46%	58%
Seek out opportunities for my children to learn about science-related topics through arts-based learning methods	55%	56%	50%	55%
Seek out opportunities to participate in/attend more activities focused on the integration of the arts and sciences	55%	55%	36%	60%
Seek out opportunities to participate in/attend more science-based activities	51%	49%	36%	58%
Seek out opportunities to participate in/attend more arts-based activities	51%	45%	46%	60%
Seek out more information about the [water / transportation / urban nutrition]-related challenges [CITY] faces	45%	45%	--	--
Seek out ways to personally get involved in addressing the [water / transportation / urban nutrition]-related challenges in [CITY]	45%	45%	--	--
Apply lessons learned from the event in my day-to-day life	32%	29%	17%	40%

4. Satisfaction and experience at public events

Overall, engagement event attenders indicated in the survey that the event met or slightly exceeded their expectations, and that it was somewhat worth their time. Ratings were strong in some specific elements, particularly in being appropriate for children (Play Day only), being well run and well organized, and housed in a comfortable venue. The qualitative interview and observation data

confirmed that respondents were generally pleased with the events and engaged by select projects from the incubator teams, particularly those that resonated with their personal or professional interests.

Motivations for attending varied somewhat by type of event, though the primary reason for attending overall was learning about how arts and sciences can be integrated in new and interesting ways. For Play Day, learning about approaches to STEM was a top reason for attending, whereas at Scientific Images, spending time in a creative environment motivated a majority of respondents, and at Launch events the most common reason for attending was to learn about the city's incubator and the Art of Science Learning project in general. Interviewees also indicated that they were attending the event to support friends/family who were Art of Science Learning Fellows or staff.

Table 31. Public engagement event survey—overall event assessment

Overall assessment of event	Overall	Innovation Launch	Scientific Images	Play Day for Educators
(1="The event was absolutely not worth my time" to 7="The event was absolutely worth my time")	5.35	5.60	5.59	4.91

Table 32. Public engagement event survey—motivations for attending

What were the main benefits you hoped to get out of attending [EVENT]? TOP 2 BOX	Overall	Innovation Launch	Scientific Images	Play Day for Educators
Learn about how the arts and sciences can be integrated in new and interesting ways	58%	47%	69%	72%
Learn about and discuss approaches to STEM (Science, Technology, Engineering and Mathematics)	40%	23%	--	76%
Learn about the [CITY] Incubator for Innovation and the Art of Science Learning	34%	63%	--	--
Spend time in an artistic and/or creative environment	29%	23%	56%	30%
Meet people with interests similar to mine	26%	28%	6%	30%
Learn about new perspectives on how to address [CITY]'s most pressing civic challenges	23%	43%	--	--
Learn about the latest advancements and/or innovations in a scientific or technological field	9%	10%	38%	--
Spend quality time with my friends	8%	--	50%	7%
Provide a valuable learning experience for my children	8%	--	--	22%
Support the organization or venue that presented the event	2%	--	19%	--
Other (Please specify):	19%	20%	6%	20%

Table 33. Public engagement event survey—extent met expectations

How event compared to expectations	Overall	Innovation Launch	Scientific Images	Play Day for Educators
(1="The event fell short of my expectations" to 7="The event exceeded my expectations")	4.71	4.89	5.24	4.28

Table 34. Public engagement event survey—aspects of event

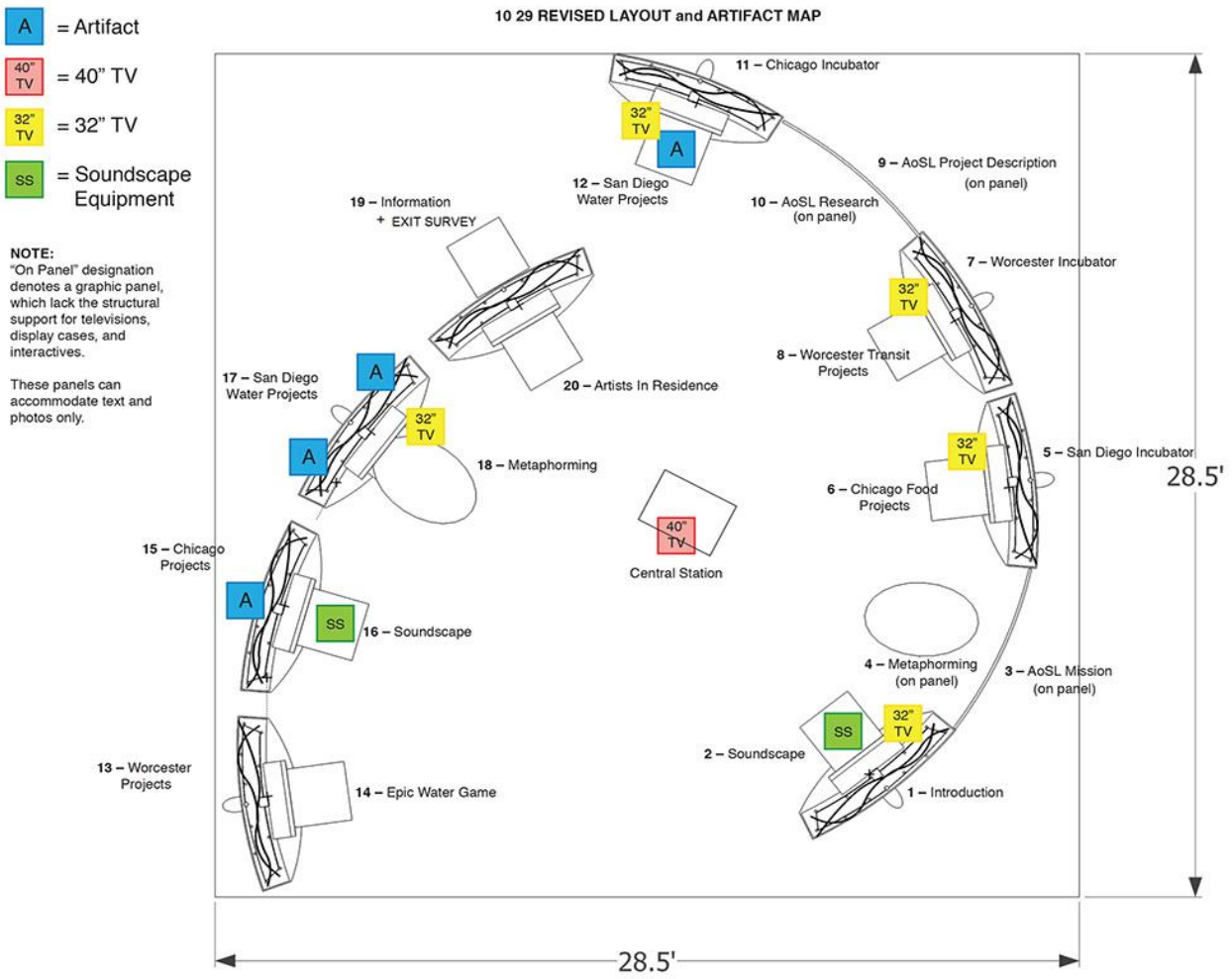
"How much do you agree or disagree with the following statements about [EVENT]?" TOP 2 BOX (1="Strongly disagree" to 7="Strongly agree")	**Overall**	Innovation Launch	Scientific Images	Play Day for Educators
The event was appropriate for children and families	72%	-	-	72%
I found the event to be well-run and well-organized	67%	75%	60%	57%
The event venue provided all the necessary amenities for a comfortable experience (i.e., convenient bathrooms, food options, parking, etc.)	67%	73%	56%	61%
I found the event to be fun and engaging	59%	65%	50%	54%
I learned something new from the event	59%	58%	67%	59%
The event held my interest throughout the entire time I was there	49%	48%	56%	48%

B. Exhibit survey

Findings in this section are drawn from visitors' responses to open-ended questions on the kiosk survey fielded at the Art of Science Learning traveling public exhibition. As noted in the Methods and Data Sources section (see page 15), unattended kiosk surveys in museums often receive a large proportion of spurious responses (e.g., nonsense or intentionally irrelevant inputs); these cases were deleted prior to analysis. Less expectedly, and perhaps due to the small scale of the Art of Science Learning exhibit relative to the size of the host museums, a large proportion of the remaining responses clearly referred not to the exhibit itself but to the host museum and its offerings. This was evidenced through comments about specific interactives and other exhibits popular at those museums, and to themes and topics not addressed in the Art of Science Learning exhibit. In very few cases did respondents seem to be responding both to the exhibit itself and to our questions about it.

There were, however, approximately 50 pertinent and sometimes thoughtful reflections occasioned by our prompts, particularly our question about the impact of the arts on science (see page 16 for all five prompts/questions). As planned, these usable responses were treated as qualitative data in our analysis. Because this component of the study did not involve systematic sampling of visitors, we cannot calculate a response rate or use the responses to estimate exhibit traffic/throughput. Nor can we associate the duration or depth of engagement with the exhibit content with certain kinds of responses to our questions. Moreover, since even those visitors who provided relatively pertinent responses used the survey interface in unsystematic ways and tended to respond to only one or two questions, and since they tended not to answer each question independently but rather provided the same kinds of reflections for all five prompts, our analysis is necessarily general: it offers an impressionistic picture of some of the thoughts offered by visitors in response to the survey prompt and/or the exhibit content. We have no way of knowing whether visitors held those thoughts prior to viewing the exhibit or gained them—or deepened them—in the course of visiting it.

Due to these limitations, this component of the study should not be mistaken for a summative/ outcomes evaluation of the exhibition. We recognize that this contributes only obliquely and


A = Artifact
40" TV = 40" TV
32" TV = 32" TV
SS = Soundscape Equipment
NOTE:
"On Panel" designation denotes a graphic panel, which lack the structural support for televisions, display cases, and interactives.
These panels can accommodate text and photos only.
10 29 REVISED LAYOUT and ARTIFACT MAP
11 – Chicago Incubator
12 – San Diego Water Projects
9 – AoSL Project Description (on panel)
10 – AoSL Research (on panel)
19 – Information + EXIT SURVEY
7 – Worcester Incubator
8 – Worcester Transit Projects
17 – San Diego Water Projects
20 – Artists In Residence
18 – Metaphorming
5 – San Diego Incubator
6 – Chicago Food Projects
28.5'
15 – Chicago Projects
Central Station
16 – Soundscape
4 – Metaphorming (on panel)
3 – AoSL Mission (on panel)
2 – Soundscape
13 – Worcester Projects
14 – Epic Water Game
1 – Introduction
28.5'

THE EPIC WATER GAME
SOUNDSCAPE
METAPHORMING
ARTISTS IN RESIDENCE
THE ART OF SCIENCE LEARNING
INTRODUCING
THE ART OF SCIENCE LEARNING

partially to the research objective for the public engagement portion of the evaluation, and in the future we would recommend using an exhibition evaluation method that permits active, rigorous sampling and, ideally, a pre-post comparison of visitors' attitudes, awareness, and knowledge about the exhibit topics.

Summary of findings

Those visitors who did take the time to enter responses to the survey were positive overall, frequently using words and phrases like "well done," "awesome," "pretty cool," and other approbative terms. (As noted above, it wasn't always possible to tell whether they were referring to the Art of Science Learning exhibit or to the host museum more generally. We focus here on participants who seemed to be fully or in large part referring to this exhibit.) One respondent found the experience "interesting and user-friendly," and another praised the "neat design, [which] inspires creativity." A respondent who volunteered that s/he is a science teacher, enthused that it's "great that the public can see what the incubators did." In response to our question about the most exciting thing s/he learned, one visitor mentioned metaphorming; another "the water reclamation project"; and a third the "drought in California."

Overall, the pertinent comments and reflections suggest that many visitors to the Art of Science Learning exhibit see science and art as a natural fit: they "go hand in hand" and "complement each other" or even, as one respondent put it, "inspire each other and therefore create each other." Several asserted that the combination of the two—"bringing in different areas of the brain"—can be "powerful," especially when they "learn from each other's methods." The link between the arts and science, several respondents indicated, is creativity, which is a necessary part of both endeavors; "Part of science is creativity," said one, and another observed that science and technology "are arts in their own ways." We saw no evidence of resistance to the conceptual joining of the two realms, either in general or in the Art of Science Learning project.

That idea that *both art and science depend on creativity* was the dominant perspective in visitors' answers to our prompt about how the arts can impact science and technology. Their comments strongly associate creativity, intuition, and inspiration, all of which are seen as advancing and activating science and technology in valuable ways. One respondent asserted that "creativity and intuition is where science and technology begin": the underlying ideas and inventions of science and technology have to start somewhere, and such moments are creative leaps that bear a strong kinship to artistic creativity. Multiple respondents echoed this point, noting that the arts can "give scientists an idea" or "new ideas for research," "influence science by encouraging new inventions," and help scientists "think outside the box" or "think from a different angle." Two others commented that art can inspire scientists to "go beyond practical constraints" and to feel that they can "do what can't be done." One visitor felt that this influence has to do with the interest that artists take in "help[ing] the world": art and artists can encourage scientists to apply their energies in new, important directions. And this idea was linked by a different respondent to social change and power:

"…[T]he people to be most feared by those with absolute power are the artists, who have the power to initiate change by the ideas represented by their art. This…is also applicable to science and technology."

As the use of the word "thinking" in the preceding paragraph suggests, for many respondents the value of the arts to science and technology is related to the unique cognitive qualities associated with creativity: it's a form of "critical thinking," "a pathway to thinking."

Obviously, all these perspectives are highly aligned with the themes of the exhibit and the underlying ideas of the Art of Science Learning initiative. Again, we saw no evidence of contrary opinions.

While the primary influence of the arts noted by visitors was on the practice of science itself, some also noted the value of the arts as a pathway for science to connect more successfully with the public. It can be an important aid in STEM education, not just in "teaching kids" but also "making learning about science and technology fun for all ages." Artistic designs can "capture people's attention," said one respondent, and more broadly the arts can, according to another, "bridge experiences within and between science and technology." Another respondent made a similar point, observing that the arts are a more "common language" than science for the public, and therefore can help "bring ideas and people together."

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Fellows profile

Who participated in the Art of Science Learning incubators? In this appendix we profile the Fellows in terms of their demographic and behavioral characteristics, both overall and within each of the three incubators. We also discuss differences between Fellows who completed and those who did not complete the program. This latter comparison is important because, as noted in the discussion of data sources, our analysis of the program's impacts on Fellows is focused on change over time *among those Fellows who completed the program*. Where there are notable differences between those who did complete the program and those who did not, these differences inform our picture of the program's impacts.

Overall

As shown in the table below, the Fellows that completed the program are predominantly female (65%), primarily white (77%), and highly educated (80% have a college degree or higher). Fellows are also fairly young: more than half (56%) of those who completed the program are under 40.

Table 5. Incubator Fellow demographics[3]

Demographics	**Overall** (completed program)
Age	n=117
18 or under	15%
19-29	23%
30-39	17%
40-49	15%
50-59	17%
60-70	9%
71 or older	3%
Gender	**n=117**
Male	35%
Female	65%
Ethnicity	**n=117**
Caucasian or White	77%
Hispanic or Latino	9%
African American or Black	5%
Asian	4%
Native Hawaiian or other Pacific Islander	1%
American Indian or Alaska Native	0%
Other: (Please specify)	1%
Prefer not to answer	7%

(table continues)

[3] This demographic profile is based on data provided in Wave 1 of the survey and includes only those respondents who completed Wave 1 of the survey *and* completed the incubator process. (In other words, it includes respondents who completed the program but did not participate in Wave 2 and/or Wave 3 of the survey.) This is in contrast to the analyses below of changes in measures of Fellows' self-perceived creativity, communication, etc., which include only those who completed the program *and* all three waves of the survey.

Education	n=117
Less than high school (I'm still enrolled in high school)	14%
Less than high school (I'm no longer enrolled in high school)	0%
High School/GED	5%
Community college/technical training or certificate	2%
College degree (BA/BS)	31%
Graduate or Postgraduate degree	49%
Employment	n=122
Full-time student	19%
Employed full time at one job	39%
Employed full time, working multiple jobs	11%
Employed part time	5%
Unemployed	1%
Self-employed	16%
Out of the workforce (e.g. stay-at-home parent, disabled)	0%
Retired	5%
Primary field you work within	n=87
Arts & Culture	16%
Education	30%
Business & Management	11%
Environmental Science	3%
Government	2%
Human development	1%
Health/public health	3%
Computer Science	3%
Mathematics	1%
Physical Science	1%
Other	29%

These Fellows also reported engaging in arts- and science-based activities, in some cases at very high rates. When asked if they had, in the past 12 months, attended a live music, theater, or dance performance; attended an art museum or gallery; or used TV, radio, or the internet to access art or arts programming, better than 90% of the Fellows who completed the program said yes to each of these questions. More than half indicated they had also taken an art class or lesson, and nearly 40% indicated that they had taught an art class or lesson.

Table 6. Incubator Fellow arts-related activities

"In the preceding 12 months have you done any of the following arts activities?" (Yes or No; Check all that apply)	**Overall** (completed program)
	n=118
Attended a live music, theater, or dance performance	97%
Attended an art museum or gallery	95%
Used TV, radio, or the Internet to access art or arts programming	90%
Emailed, posted, or shared artwork (your own or others: includes photos & music)	82%

(table continues)

Visited a crafts fair or a visual arts festival	81%
Performed or practiced in a specific art form (e.g., dance, singing, classical music, etc.)	69%
Read an arts-focused blog	64%
Took a class or lesson (whether in or out of school) in an art form or art subject	56%
Taught an art class or lesson	39%
Attended a professional conference related to the arts	30%

Participation rates in science-based activities were somewhat lower, but in certain cases still high overall. A large majority (86%) of Fellows who completed the program indicated that they had, in the past 12 months, used TV, radio, or the internet to access science programming. Nearly three-quarters (72%) indicated they had visited a science museum, and 44% indicated that they had attended a professional conference related to science (much higher than the corresponding question about arts-related conferences).

Table 7. Incubator Fellow science-related activities

"In the preceding 12 months have you done any of the following science activities?" (Yes or No; Check all that apply)	**Overall** (completed program)
	n=118
Used TV, radio, or the internet to access science programming	86%
Emailed, posted, or shared scientific information (e.g., quote or article of interest, etc.)	80%
Attended a science museum	72%
Performed a science experiment (informally or formally)	69%
Read a science-focused blog	67%
Took a science class or lesson (whether in or out of school)	54%
Attended a professional conference related to science	44%
Taught a science class or lesson	36%
Visited a science festival	33%
Participated in a science café	8%

Variation across sites

With a few exceptions, these demographic and behavioral characteristics of participants who completed the program held true across all three incubator sites (see Appendix C for tables showing demographic and behavioral questions separately for each site). However, a few differences across sites are worth mentioning:

Among those who completed the program, the **Worcester fellows tended to be a bit younger**, with an average age of 37 compared to 39 and 40 in Chicago and San Diego, respectively. Females made up a larger share of the Chicago Fellows (88%) than they did in San Diego (60%) and Worcester (58%). Moreover, Worcester Fellows who completed the program were more likely to be white (93%) than were those in Chicago (58%) or San Diego (71%). San Diego Fellows were the most likely to describe themselves as self-employed (25%, compared to 13% and 11% among Chicago and Worcester Fellows, respectively).

By at least some measures, the **San Diego Fellows were the most active in the arts** before the start of the program at the three incubator sites. San Diego Fellows were the most likely to indicate that they had attended a professional conference related to the arts (40% San Diego, 29% Chicago, 20% Worcester); have taken an art class or lesson (63% San Diego, 50% Chicago, 52% Worcester), and read an arts-focused blog (75% San Diego; 50% Chicago; 59% Worcester).

By some measures, **Worcester Fellows were the least active when it comes to science-related activities**. They were less likely than Fellows in Chicago or San Diego to have visited a science museum in the past 12 months (59% Worcester, 83% Chicago, 79% San Diego), to have attended a professional conference related to science (33% Worcester; 58% Chicago; 48% San Diego), and to have taught a science class or lesson (26% Worcester; 54% Chicago; 38% San Diego).

Variation among completing and non-completing Fellows

As noted above, this report presents findings related to the impact of the Art of Science Learning on Fellows who completed the program itself and all three waves of the survey. However, changes across time among the Fellows who completed the program tell only part of the story of impact. In this section, we contextualize those findings by comparing demographic and behavioral characteristics of those who completed and those who did not complete the program.

There are a few statistically significant differences in demographics between those who did and did not complete the program. Together, they suggest that **the people who were likely to complete the program were older and further along in their careers**. For example, older Fellows were more likely to complete the program than younger ones (38% of those who completed the program were under age 29; 47% of those who did not complete were under age 29), as were more educated Fellows (79% of those who completed the program had a college degree or higher, vs. 66% of those who did not complete the program). Full-time students were less likely to complete the program (19% of those who completed the program and 29% of those who did not were full-time students). Finally, the ethnicity of Fellows who completed the program was different from those who did not (77% of completers were white, vs. 55% of non-completers).

The data also suggest some interesting differences in terms of participation in arts and science activities in the 12 months preceding the start of the program. By at least a few measures, **those who completed the program were more likely to be involved in the arts and less likely to be involved in the sciences** than those who did not complete the program. For example, those who completed the program were more likely to have attended an art museum or gallery (95%) and attended a live music, theater, or dance performance (97%) than those who did not complete the program (83% and 91%, respectively). On the other hand, those who completed the program were less likely to have participated in a café (8%), watched science programming on TV (93%), or read a science-focused blog (67%) than those that did not complete the program (15%, 86%, and 79%, respectively). While these differences do not provide conclusive evidence that those who completed the program were different from those who did not in terms of their participation in arts and science activities, they do suggest that attrition was somewhat higher among those highly

interested in science than among those highly interested in the arts.

Interestingly, there is little evidence that those who ultimately completed the program were, at the start of the program, different from those who did not complete the program in terms of their creativity, communication skills, tolerance of ambiguity, or empathy. Later in this report, we present more detailed findings related to change over time in these characteristics among those that did complete the program. In this report (see section C, below) we focus only differences in terms of measures of creativity, communication skills, tolerance of ambiguity, and empathy between those who completed the program and those who did not.

Across a wide range of measures, we found only three cases in which there was a statistically significant difference at the start of the program (i.e., in Wave 1 surveys) between those who did and those who did not finish the program. As measured by likelihood of selecting a top two box on a seven-point scale (Strongly disagree=1; Strongly agree=7):

- Those who finished were more likely (57%) than those who did not finish the program (40%) to agree with the statement "I don't need to finish a task before starting new tasks";
- Those who finished the program were less likely (74%) than those who did not finish the program (87%) to agree with the statement "When I am listening to someone I try to understand what they are feeling"; and
- Those who finished were also less likely (8%) than those who did not finish the program (19%) to agree with the statement "A good communicator can communicate effectively the same way in every situation".

These findings may suggest that being tolerant of ambiguity played a role in whether people finished the program. They may also suggest that, when it comes to communication, being less focused on others' feelings and ones' standards in terms of what it means to be a good communicator also played a role. However, the more striking fact is that these were the only three among nearly 70 measures on which there was any evidence of systematic differences between those who did and did not complete the program. This suggests that the two groups are, by and large, very similar to one another in terms of creativity, communication skills, tolerance of ambiguity, and empathy.

Appendix

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   v. Public Engagement observations protocol

C. Detailed data tables

Art of Science Learning
Expert Assessment

Thank you for taking the time to participate in the evaluation of the outputs of the Art of Science Learning San Diego Incubator. In this Expert Panel Review Form, you will be asked to answer a series of questions about each project you review. We recommend you complete your review of the materials provided to you for each project before beginning the assessment of that project.

If you need to leave the review form before you're finished, or if you step away from the computer and your review form times out, you may close the window and use the link in your original email invitation to return at your convenience. The website will return you to the review form at the point you left off. If you need to go back to a previous page, either while you're completing the form or when you return after closing out of an incomplete review form, please click the "Previous page" link at the bottom of the page. **Please do not use your web browser's back button to return to a previous page.**

Please be assured that all responses will be kept anonymous. We will not connect the names of any members of the Expert Panel with the individual comments they provide in this process.

Once again thank you for taking the time to assist with the Art of Science Learning evaluation.

1. **The list below shows the projects in the San Diego Incubator that were characterized as primarily "Product, Process, and Service," "STEM Learning," or Hybrid projects. Please select the project you now wish to evaluate.** [Reviewers will answer the questions that follow separately for each project]
    - **Product, Process, and Service**
        - Team D – En Plein Aire App
        - Team G – DIY EcoLab
        - Team I – BeeLite
        - Team J – Water Drops Portable Water Supply
    - **STEM Learning**
        - Team BB – Build Environment Innovation Connection
        - Team C – Kate's Place
    - **Hybrid** (These projects include some characteristics of "Product, Process, Service" projects and some characteristics of "STEM Learning" projects. We ask that you assess these projects according to the dimension along which you believe they achieved the most success. That is, if you think a project succeeded as STEM Learning project more than it did as Product, Process, Service project, we ask that you review that project as a STEM Learning project.)
        - Team A – Trash to Paradise
        - Team B – The Dewers
        - Team F – Epic Water Game

2. Overall, how innovative would you say this project is?

1 – Not at all innovative	2	3	4	5	6	7 – Highly innovative

3. Overall, how implementable would you say this project is?

1 – Not at all implementable	2	3	4	5	6	7 – Straightforward to implement

4. Overall, how likely to have an impact would you say this project is?

1 – Not at all likely to have an impact	2	3	4	5	6	7 – Highly likely to have an impact

- **Please provide any supporting or clarifying information you would like to include to explain why you selected this response.** [text box after each of the above]

5. For each of the statements below, please rate your level of agreement or disagreement:

	1 strongly disagree	2	3	4	5	6	7 strongly agree
This project addresses a clear problem or opportunity related to water supply and demand.							
This project demonstrates a strong grasp of actual conditions related to the problem or opportunity it is designed to address.							
This project addresses significant unmet needs.							
This project is highly original or novel. Novelty in the context of the Art of Science Learning includes both projects that represent incremental change and those that represent revolutionary change. However, to be novel a project must represent more than importing an existing idea into a new location.							
This project has high potential to actually accomplish its intended objectives.							
This project has high potential to deliver compelling value to a substantial number of clearly defined customers.							
This team has clearly identified the revenue streams, key partners and other resources that will be needed to sustain the project over the long term.							

- **Please provide any supporting or clarifying information you would like to include to explain why you selected this response.** [text box after each of the above]

6. [For STEM Learning projects only] **For each of the statements below, please rate your level of agreement or disagreement:**

	1 strongly disagree	2	3	4	5	6	7 strongly agree
This team has a clear plan to ensure its project *aligns with the priorities* of relevant educational stakeholders.							
This team has a clear plan to ensure its project *obtains the support* of relevant educational stakeholders.							
This team's project is proven to be compelling to the students it aims to benefit.							

- **Please provide any supporting or clarifying information you would like to include to explain why you selected this response.** [text box after each of the above]

Thank you very much for participating in the evaluation of the Art of Science Learning San Diego Incubator! We appreciate your time. Please share below any additional thoughts, explanations, or clarifying comments:

INTRO TEXT

Welcome!

Thank you for taking the time to participate in this study. We are very interested in understanding your thoughts and opinions on topics related to the Art of Science Learning. I would like to encourage you to take your time and answer the survey questions both as openly and honestly as you can.

This survey should take approximately 30 minutes to complete. The questions in the survey are about you; there are no right or wrong answers. Your responses are one of the best ways for us to understand if the Incubator for Innovation is successfully reaching its goals.

Please be assured that all of your responses will be kept anonymous. None of the information you provide that could identify you individually will be included in the presentation of survey results.

Once again thank you for taking the time to share your thoughts and opinions with us.

QUESTIONS

"For the first set of questions, please read each phrase carefully and think about how they apply to you."

Scale used: Davis, (1980)

1. **On a scale from 1 (Strongly disagree) to 7 (Strongly agree), to what extent do you agree or disagree with the following statements?**
    a) I do not need any more colleagues
    b) sometimes use my dreams or daydreams as a source of new ideas
    c) only like tasks that have a high probability of success
    d) I keep something by my bed at night, to record ideas
    e) Occasionally I like to work on extremely difficult problems
    f) I do not like to work on problems that have no solution
    g) I enjoy working with the same group of people all the time
    h) I often read books and magazines outside of my core interest area
    i) I seek training in new areas
    j) I am not afraid of failure
    k) Daydreaming only wastes my time
    l) I do not share my ideas with others
    m) I make an effort to meet new people
    n) There are special places where I go to think

Scale used: Barkman & Machtmes, (2002)

2. Indicate how often each of the following applied to you in the last 30 days.

a) I try to watch other people's body language to help me understand what they are trying to say
b) I recognize when two people are trying to say the same thing, but in different ways
c) I don't hear everything a person is saying, because I am thinking about what I want to say
d) When talking to someone, I try to maintain eye contact
e) I change the way I talk to someone based on my relationship with them (e.g., friend, parent, teacher, etc.)
f) When I am listening to someone, I try to understand what they are feeling
g) I try to respond to what someone is saying, rather than just reacting to their tone of voice
h) I try to see the other person's point of view
i) I interrupt other people to say what I want to say before I forget it
j) I use my tone of voice to reinforce what I am trying to say
k) I use my own experiences to let my friends know that I understand what they are going through
l) I organize thoughts in my head before speaking
m) I rephrase what another person said, to make sure that I understood them
n) I use my hands to illustrate what I am trying to say
o) I use body language to help reinforce what I want to say
p) I find it difficult to get my point across
q) I find ways to redirect the conversation when people rattle on and on

Scale used: Norton, (1975)

3. On a scale from 1 (Strongly disagree) to 7 (Strongly agree), to what extent do youagree or disagree with the following statements?

a) Before any important job, I must know how long it will take
b) In a problem-solving group it is always best to systematically approach a problem
c) I don't need to finish a task before starting a new task
d) Usually, the more clearly defined rules a society has, the better off it is
e) Nothing gets accomplished in this world unless you stick to some basic rules
f) Almost every problem has a solution
g) I like to fool around with new ideas, even if they are a total waste of time
h) Personally, I tend to think that there is a right way and wrong way to do almost everything
i) In a decision-making situation in which there is not enough information to process the problem, I feel very uncomfortable
j) I do not like to get started in group projects unless I feel assured that the project will be successful

Scale used: Epstein, Schmidt, & Warfel, (2008)

4. **On a scale from 1 (Very untrue of me) to 7 (Very true of me), how well do the following statements describe you? Sometimes I don't feel very sorry for other people when they are having problems**
    a) I often have tender, concerned feelings for people less fortunate than me
    b) I sometimes try to understand my friends better by imagining how things look from their perspective
    c) I believe that there are two sides to every question and I try to look at them both
    d) Before criticizing somebody, I try to imagine how I would feel if I were in their place
    e) I would describe myself as a pretty soft-hearted person
    f) I am often quite touched by things that I see happen
    g) If I'm sure I'm right about something, I don't waste much time listening to other people's arguments
    h) people's misfortunes do not usually disturb me a great deal
    i) When I'm upset at someone, I usually try to "put myself in their shoes" for a while
    j) I try to look at everybody's side of a disagreement before I make a decision
    k) When I see someone being treated unfairly, I sometimes don't feel very much pity for them
    l) I sometimes find it difficult to see things from the "other person's" point of view
    m) When I see someone being taken advantage of, I feel kind of protective towards them

"The previous questions were all about you. Now we want to ask you more generally about your thoughts on collaboration, communication, and creativity."

5. **On a scale from 1 (Strongly disagree) to 7 (Strongly agree), to what extent do you agree or disagree with the following statements?**
    a) There is too much wasted time in the creative process
    b) Brilliant ideas come from single 'AHA!' moments, not from working through the creative process
    c) Emotions detract from effective communication
    d) It is always counterproductive when conflict arises during collaborative work
    e) A good communicator can communicate effectively the same way in every situation
    f) Collaboration is rarely worth the time it takes
    g) Not everyone is capable of creativity
    h) The less life experience you have the less you have to offer when collaborating with others
    i) People are more likely to produce effective solutions through competition, rather than through collaboration
    j) Individuals are more likely than groups to come up with truly original ideas
    k) A lot of people who think they are effective communicators just talk a lot
    l) To be creative you must be artistic
    m) Creativity is something done by individuals, not something that happens on a group level
    n) Communication is predominantly verbal
    o) People who are outgoing are naturally better communicators

"The next few questions ask you to craft a response related two of the Incubator for Innovation topics."

6. In the style of Twitter, tell us your definition of innovation in 140 characters or less.

7. One aim of the Incubator for Innovation is to develop innovative solutions to regional water challenges in San Diego.

7a. Briefly describe what you consider to be the biggest problem related to water in San Diego (and Southern California).

7b. If you were not participating in this Incubator for Innovation, how might you go about trying to think of a solution for this problem?.

"The next set of questions are background questions to better understand your connection with art and science."

8. To what extent would you say each of the following is true of you?

a) I am inquisitive
b) I am an innovator
c) I am artistic
d) I am scientific-minded
e) I am entrepreneurial
f) I am a leader
g) I am a teacher

9. In the preceding 12 months have you done any of the following arts activities?

a) Attended a live music, theater, or dance performance
b) Performed or practiced in a specific art form (e.g., dance, singing, classical music, etc.)
c) Attended an art museum or gallery
d) Took a class or lesson (whether in or out of school) in an art form or art subject
e) Emailed, posted, or shared artwork (your own or others; includes photos & music)
f) Used TV, radio, or the Internet to access art or arts programming
g) Attended a professional conference related to the arts
h) Read an arts-focused blog
i) Visited a crafts fair or a visual arts festival
j) Taught an art class or lesson

10. In the preceding 12 months have you done any of the following science activities?

a) Read a science-focused blog
b) Taught a science class or lesson
c) Attended a professional conference related to science
d) Attended a science museum
e) Performed a science experiment (informally or formally)
f) Used TV, radio, or the Internet to access science programming
g) Visited a science festival
h) Took a science class or lesson (whether in or out of school)
i) Emailed, posted, or shared scientific information (e.g., quote or article of interest, etc.)
j) Participated in a science café

"You are almost done! The final set of questions are demographic in nature that we collect for statistical purposes. Again, your responses will remain anonymous."

11. Which category includes your age.

a) 18 or under
b) 19-29
c) 30-39
d) 40-49
e) 50-59
f) 60-70
g) 71 or older

12. Are you...

a) Male
b) Female
c) Other

13. Which ethnic category do you most identify with? (Please check ALL that apply)

a) African American or Black
b) American Indian or Alaska Native
c) Asian
d) Caucasian or White
e) Hispanic or Latino
f) Native Hawaiian or other Pacific Islander
g) Other: (please specify)
h) Prefer not to answer

14. What is the highest level of education that you've completed? (Please check ONE)

a) Less than high school (I'm still enrolled in high school)
b) Less than high school (I'm no longer enrolled in high school)
c) High School/GED
d) Community college/technical training or certificate
e) College degree (BA/BS)
f) Graduate or Postgraduate degree

15. Which of the following best describes you? (Please check ONE)

a) Full-time student
b) Employed full time at one job
c) Employed full time, working multiple jobs
d) Employed part time

e) Unemployed
f) Self-employed
g) Out of the workforce (e.g., stay-at-home parent, disabled, etc.)
h) Retired

16. What is the primary field you work within? (Please check only one)

a) Anthropology
b) Arts & Culture
c) Business & management
d) Child development
e) Computer science
f) Economics
g) Education
h) English
i) Environmental science
j) Evaluation
k) Government
l) Health/public health
m) Human development
n) Human resources
o) Human services
p) Information systems
q) International relations/international development
r) Law/Criminal justice
s) Mathematics
t) Medicine
u) Organizational behavior
v) Philosophy
w) Physical science
x) Political science
y) Psychology
z) Public policy/public administration
aa) Social work
bb) Sociology
cc) Statistics
dd) Other: (Please describe)

17. Thank you very much for completing our survey! We appreciate your time. If there is anything else you would like to share with us at this time please do so below:

Scales incorporated in the Incubator Learner-Participant Survey

Creativity: Q1 a-n

- We were able to find a long form and a short form of the Epstein Creativity Competencies Inventory for Individuals (ECCI-i). After looking over both forms of the survey we decided to go with the short form of the scale because it maintained the same core features of the long form in a more accessible format, especially since we are combining the ECCI-i scale with multiple other scales. The one adjustment to the scale that we made was to swap some of the questions with false positive questions to maintain the internal validity of the scale.
    - Epstein Creativity Competencies Inventory for Individuals (ECCI-i); Mini-inventory full-scale reliability: $\propto = 0.67$ & 0.84; measures creativity competencies through capturing (i.e., preserves new ideas as they occur, finds places and times where new ideas can be observed easily, uses dreams & daydreams as sources of ideas); challenging (i.e., takes on difficult tasks, sets open-ended goals, manages fear and stress associated with failure effectively); broadening (i.e., seeks training, experience, and knowledge outside current areas of expertise); and surrounding (i.e., changes physical & social environments regularly, seeks out unusual stimuli).
    - Epstein, R., Schmidt, S. M., Warfel, R. (2008). Measuring and training creativity competencies: Validation of a new test. *Creativity Research Journal, 20*(1), 7-12.

Communication, Problem Solving, and Planning: Q2 a-r

- This set of questions came from a tool that was developed by a business consultant to assess an individual's communication, problem solving, planning, and many other skills within an organization. We took this original format and altered the questions to make them I statements to be rated on a five point strongly disagree/strongly agree scale. We also changed some of the wording to take out business heavy lingo.
    - Young, Rich. "IABC Communication Skills Assessment Tool." Retrieved at: www.iabc.com/education/pdf/IABCSelf-AssessmentTool.pdf

Collaboration: Q2 s-w

- This scale is based on individual's self-assessment of their collaborative preferences. It is not a collaboration skill assessment, or an assessment of how well they are collaborating with the team they are working with. This scale is meant to understand an individual's perspective on the value and importance of collaboration.
    - Citation: Ocker, R. J., Yaverbaum, G. J. (2004). Collaborative learning environments: Exploring student attitudes and satisfaction in face-to-face and asynchronous computer conferencing settings. *Journal of Interactive Learning Research,12*(4), p. 427-448.

Empathy scale: Q3 a-u

- The Interpersonal Reactivity Index (IRI) is a well-established and commonly used scale for measuring how empathic an individual is. We removed the F=fantasy scale from the questionnaire to minimize the total number of questions asked and because the questions were the most abstract and least relevant to this study.
    - Interpersonal Reactivity Index (IRI); Measuring empathy through the following subscales: PT=perspective-taking ($\propto = 0.79$); F=fantasy ($\propto = 0.82$); EC=empathic concern ($\propto = 0.80$); PD=personal distress ($\propto = 0.75$). [Note: we did not include the fantasy subscale because it had less relevance than the other sub-scales and we were wary of making the survey too long]
    - Citation: Davis, M. H. (1980). A multidimensional approach to individual differences in empathy. *JSAS Catalog of Selected Documents in Psychology, 10*, 85.

We also have potential scales we are considering for Wave 2 & Wave 3 administration of the Learner-Participant Survey that address teamwork and collaboration behaviors and team effectiveness, but we want to wait until incubator participants are working in teams to ask those questions.

Incubator Observation Protocol

Background

Slover Linett Audience Research is conducting a summative evaluation of the Art of Science Learning's (AoSL) Incubator for Innovation. The intended program outcomes of AoSL include: enhanced innovation skills and better understanding, by program participants, of the benefits of using arts-based techniques in STEM education and for civic problem solving; the development of innovative and impactful models for strengthening science education; and an increased awareness of the role of creativity in STEM innovation by the public who encounter the program through planned activities (e.g., engagement events, exhibitions, etc.).

Broadly speaking, the overarching purpose of the summative evaluation is to determine whether and to what extent the intended outcomes are achieved. The observations and in-context interviews, described within this protocol, support the overarching goal of the evaluation by offering first-hand observations and documentation of the implementation of the Incubator for Innovation and Fellows' engagement with the curriculum and innovation process. Qualitative data collection provides the opportunity to reveal a much richer story of what occurred within the program and consider possible descriptions of how these outcomes were achieved.

The data collected during these observations and in-context interviews will enable us to provide thick description of what is occurring within the Incubators with the aim of offering possible explanations for *why* certain outcomes were or were not achieved—and how to maximize impact in the future. For instance, we may learn from the survey of Fellows that they enter the program with a very low tolerance for ambiguity but at the end of the program are much more comfortable with ambiguity. The observations provide an opportunity to explore the ways in which Fellows appear to be uncomfortable with ambiguity and for what reasons, as well as aspects of the incubator experience that likely help contribute to this change.

Objectives

Our specific objectives for the observations and in-context interviews include:

1. To better understand how the implementation of the ABL innovation curriculum within the Incubators for Innovation influences Fellows' development and application of innovation skills and the extent to which each team successfully produces innovative outputs, in part, by:
    - Understanding how faculty use arts-based techniques to teach innovation skills
    - Understanding how Fellows learn through arts-based techniques
2. To better understand how the implementation of the ABL innovation curriculum within the Incubators for Innovation influences Fellows' engagement with the curriculum and the extent to which each team successfully produces innovative outputs, in part, by:
    - Understanding the cognitive, emotional, and social aspects of Fellows' participation in the Incubator for Innovation

3. To better understand Fellows' attitudes toward arts-based techniques as a way of developing innovation learning and skills more generally and attitudes toward using arts-based learning in STEM education and for civic problem-solving more specifically.

4. [Applicable to the San Diego observations and in-context interviews only] To identify specific strengths and weaknesses in the current implementation of the front-end curriculum that can inform implementation of the Worcester Incubator for Innovation.

Methods & Approach

The observations and in-context interviews will take place during individual site visits to each Incubator for Innovation (i.e., San Diego, Chicago, and Worcester). Site visits are planned for different phases of the year-long incubators so that we can observe a variety of incubator phases at multiple sites. Some of these site visits will be conducted by a single member of the evaluation team, while other visits will be conducted by two members of the evaluation team.

In our work, we have found methods based on anthropological research—notably ethnography—to be a valuable addition to the approach we take in our research and evaluation. The **participant-observation** and **in-context interviewing** methods used in this work will let us combine observations of actual behavior with real-world, loosely structured conversations that reveal attitudes and values directly, as well as indirectly. In addition, the adaptive nature of the qualitative methods allows us to remain open to discovering unanticipated findings and exploring unspecified lines of inquiry. For instance, we may find that Fellows are exhibiting a skill related to but distinct from the predefined core innovation skills the Incubators are intending to teach. This finding would be important to the program and the evaluation and is more readily and adequately captured from qualitative data than quantitative data. Qualitative data collection promotes a flexibility and nimbleness that is well-suited for evaluating complex intervention such as AoSL's Incubators for Innovation.

Like other qualitative methods, participant observation is concerned with understanding the nature of human phenomena instead of the prevalence and/or distribution of particular behaviors in the relevant population. Participant observation aims to understand both the explicit (what people can "know" and can actually articulate about their experiences, opinions, etc.) and implicit or tacit aspects of human knowledge and behavior. If explicit culture is something that we can communicate relatively easily, implicit aspects remain mostly outside of our awareness or consciousness.

Techniques we will use to observe what is explicit and implicit include: paying close attention to what Fellows and faculty members are doing (e.g., their actions, body posture, eye contact, etc.), what they are saying (e.g., its content, use of certain words, relationship to what others are saying, etc.), and how they are saying it (e.g., tone, volume, phrasing, when they decide to speak, etc.). Additionally, we will push ourselves to consider what is not being seen or heard. At times, the evaluator(s) will observe everyone, for example if the entire incubator is being addressed. At other times the evaluator(s) will observe one-on-one and small group interactions. For instance, if the Fellows break up into small groups for an activity, the evaluator(s) may shadow or even join a group to be able to better observe the group interactions.

While we will eavesdrop as part of our observations, the in-context interviewing will allow us to explore the information we aim to gather more directly and in more depth with individual Fellows and faculty members. The in-context interviews will range from quick questions that are geared toward having a person "think out loud" or give their opinion on something, while other questions will be more involved and asked at a time when a Fellow or

faculty member can give a more elaborated response. Our aim will be to talk to as many people as possible within the logistics of any one visit.

At the completion of each visit we will take our field notes and develop second order field notes from them. This is done to ensure that none of the details from that day are mixed up with other observations or lost completely. Second order notes are also a good opportunity to add a layer of interpretation to what was observed. After each site visit, the evaluation team will meet to debrief and discuss what was learned from that visit. Except for the initial visit, each debrief will include discussion of how what we saw and heard was similar to or different from previous observations.

Observation Schedule

San Diego

- Module 2: Opportunity Identification
- Module 5: Idea Selection
- Explore Pueblo Watershed

Chicago

- Module 5: Idea Selection
- Module 9: Design and Development

Worcester

- Module 7: Collaboration in Innovation
- Module 12: Launch

Public Engagement Observation Protocol

Background

Slover Linett Audience Research is conducting a summative evaluation of the Art of Science Learning's (AoSL) Incubator for Innovation. The intended program outcomes of AoSL include: enhanced innovation skills and better understanding, by program participants, of the benefits of using arts-based techniques in STEM education and for civic problem solving; the development of innovative and impactful models for strengthening science education; and **an increased awareness of the role of creativity in STEM innovation by the public who encounter the program through planned activities** (e.g., engagement events, exhibitions, etc.). Broadly speaking, the overarching purpose of the summative evaluation is to determine whether and to what extent the intended outcomes are achieved. The multiple methods employed during the multiple data collection phases of this evaluation are a means of exploring in-depth, these outcomes.

The observations and in-context interviews, described within this protocol, support the overarching goal of the evaluation by offering first-hand observations and documentation of the general public's interactions with Art of Science Learning at public engagement events across the three incubator sites. The data collected during the public engagement events will enable the research team to provide a thick description of members of the general public's interest in, engagement with, and perceptions of the AoSL.

Objectives

Our specific objectives for the public engagement observations and in-context interviews include:

1. To better understand what motivates members of the public (i.e., non-Fellows) to participate in AoSL public engagement events, in part by:
    - Understanding who from the public attends the public engagement events
    - Understanding how the public hears about the events and why they choose to attend them
2. To better understand how participation in the AoSL public engagement events influences the way in which the public participants think about creativity and STEM innovation, in part, by:
    - Understanding the level of awareness and the perceptions the public brings with them about incorporating arts-based learning activities into the innovation process and how those change based on their experiences during the event
    - Understanding how the Fellows' presence at the public engagement events and specifically, the public's interactions with the Fellows while at the events, influence the experience for the public participants

3. To better understand public participants' level of satisfaction with their participation in the public engagement events, in part by:

    - Understanding what the public participants' expectations are for each event and how each event falls short of, meets, or exceeds their expectations

    - Understanding which elements of the events people enjoy the most, which elements they found most confusing, which elements they seemed the most interested in, etc.

4. [Applicable to the San Diego observations and in-context interviews only] To identify specific strengths and weaknesses of the first community engagement event that can inform implementation of the Worcester community events.

Method & Approach

The public engagement observations and in-context interviews will take place at one public engagement event at each Incubator for Innovation site at different phases of the Incubator for Innovation. Whenever possible, these site visits will be conducted by two members of the evaluation team.

In our work, we have found methods based on anthropological research—notably ethnography—to be a valuable addition to the approach we take in our research and evaluation. The **participant-observation** and **in-context interviewing** methods used in this work will let us combine observations of actual behavior with real-world, loosely structured conversations that reveal attitudes and values directly, as well as indirectly. In addition, the adaptive nature of the qualitative methods allows us to remain open to discovering unanticipated findings and exploring unspecified lines of inquiry. Qualitative data collection promotes a flexibility and nimbleness that is well-suited for evaluating complex intervention such as AoSL's Incubators for Innovation.

Like other qualitative methods, participant observation is concerned with understanding the nature of human phenomena instead of the prevalence and/or distribution of particular behaviors in the relevant population. Participant observation aims to understand both the explicit (what people can "know" and can actually articulate about their experiences, opinions, etc.) and implicit or tacit aspects of human knowledge and behavior. If explicit culture is something that we can communicate relatively easily, implicit aspects remain mostly outside of our awareness or consciousness.

Techniques we will use to observe what is explicit and implicit include: paying close attention to what members of the public are doing (e.g., their actions, body posture, eye contact, etc.), what they are saying (e.g., its content, use of certain words, relationship to what others are saying, etc.), and how they are saying it (e.g., tone, volume, phrasing, when they decide to speak, etc.). Additionally, we will push ourselves to consider what is not being seen or heard. At times, the evaluator(s) will observe everyone, while at other times the evaluator(s) will observe one-on-one and small group interactions.

While we will eavesdrop as part of our observations, the in-context interviewing will allow us to explore the information we aim to gather more directly and in more depth with individual members of the public, Fellows and faculty members. The in-context interviews will range from quick questions that are geared toward having a person "think out loud" or give their opinion on something, while other questions will be more involved and asked

at a time when an individual can give a more elaborated response. Our aim will be to talk to as many people as possible within the logistics of any one visit.

At the completion of each visit we will take our field notes and develop second order field notes from them. This is done to ensure that none of the details from that day are mixed up with other observations or lost completely. Second order notes are also a good opportunity to add a layer of interpretation to what was observed. After each site visit, the evaluation team will meet to debrief and discuss what was learned from that visit. Except for the initial visit, each debrief will include discussion of how what we saw and heard was similar to or different from previous observations.

Observation Schedule

San Diego

- Play Day for Educator (July 2014)
- Innovation Launch (October 2014)

Chicago

- Scientific Images (October 2014)
- Innovation Launch (January 2015)

Worcester

- Innovation Launch (January 2015)

Appendix

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Creativity Scale

San Diego Incubator

To what extent do you agree or disagree with the following statements?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Creativity – composite score	**n=24**	**n=24**	**n=24**
Avg.	**5.27**	**5.20**	**5.29**
Occasionally I like to work on extremely difficult problems	n=24	n=24	n=24
Top 2	67%	63%	63%
Bottom 2	13%	8%	4%
I only like tasks that have a high probability of success (-)	n=24	n=24	n=24
Top 2	33%	42%	54%
Bottom 2	0%	4%	4%
I do not share my ideas with others (-)	n=24	n=24	n=24
Top 2	88%	79%	71%
Bottom 2	0%	4%	0%
I often read books and magazines outside of my core interest areas	n=24	n=24	n=24
Top 2	67%	50%	63%
Bottom 2	8%	8%	4%
I sometimes use my dreams or daydreams as a source of new ideas	n=24	n=24	n=24
Top 2	67%	75%	67%
Bottom 2	4%	4%	0%
I am not afraid of failure	n=24	n=24	n=24
Top 2	38%	42%	50%
Bottom 2	13%	4%	4%
Daydreaming only wastes my time (-)	n=24	n=24	n=24
Top 2	71%	88%	96% △
Bottom 2	0%	0%	0%
I do not like to work on problems that have no solution (-)	n=24	n=24	n=24
Top 2	58%	38%	54%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Bottom 2	4%	4%	0%
There are special places where I go to think	n=24	n=24	n=24
Top 2	21%	21%	29%
Bottom 2	21%	25%	25%
I keep something by my bed at night, to record ideas	n=24	n=24	n=24
Top 2	38%	29%	42%
Bottom 2	21%	33%	38%
I enjoy working with the same group of people all the time (-)	n=24	n=24	n=24
Top 2	13%	38%	25%
Bottom 2	13%	0%	8%
I do not need any more colleagues (-)	n=24	n=24	n=24
Top 2	88%	79%	71%
Bottom 2	0%	0%	0%
I seek training in new areas	n=24	n=24	n=24
Top 2	92%	83%	79%
Bottom 2	0%	4%	4%
I make an effort to meet new people	n=24	n=24	n=24
Top 2	50%	58%	58%
Bottom 2	4%	0%	0%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Chicago Incubator

To what extent do you agree or disagree with the following statements?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Creativity – composite score	**n=15**	**n=15**	**n=15**
Avg.	**5.35 △**	**5.03**	**5.23**
Occasionally I like to work on extremely difficult problems	n=15	n=15	n=15
Top 2	60%	53%	73%
Bottom 2	0%	0%	0%
I only like tasks that have a high probability of success (-)	n=15	n=15	n=15
Top 2	33%	33%	40%
Bottom 2	13%	13%	7%
I do not share my ideas with others (-)	n=15	n=15	n=15
Top 2	73%	93%	80%
Bottom 2	0%	0%	7%
I often read books and magazines outside of my core interest areas	n=15	n=15	n=15
Top 2	40%	27%	53%
Bottom 2	0%	7%	13%
I sometimes use my dreams or daydreams as a source of new ideas	n=15	n=15	n=15
Top 2	73%	53%	73%
Bottom 2	13%	7%	0%
I am not afraid of failure	n=15	n=15	n=15
Top 2	47%	40%	47%
Bottom 2	13%	27%	7%
Daydreaming only wastes my time (-)	n=15	n=15	n=15
Top 2	93%	67%	93%
Bottom 2	0%	7%	0%
I do not like to work on problems that have no solution (-)	n=15	n=15	n=15
Top 2	33%	40%	47%
Bottom 2	7%	13%	13%
There are special places where I go to think	n=15	n=15	n=15
Top 2	47%	53%	47%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

To what extent do you agree or disagree with the following statements?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Bottom 2	13%	20%	13%
I keep something by my bed at night, to record ideas	n=15	n=15	n=15
Top 2	20%	13%	27%
Bottom 2	40%	67%	53%
I enjoy working with the same group of people all the time (-)	n=15	n=15	n=15
Top 2	33%	47%	27%
Bottom 2	0%	7%	7%
I do not need any more colleagues (-)	n=15	n=15	n=15
Top 2	100%	67%	87%
Bottom 2	0%	0%	0%
I seek training in new areas	n=15	n=15	n=15
Top 2	73%	67%	80%
Bottom 2	0%	0%	0%
I make an effort to meet new people	n=15	n=15	n=15
Top 2	60%	40%	40%
Bottom 2	0%	0%	0%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Worcester Incubator

To what extent do you agree or disagree with the following statements?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Creativity – composite score	**n=26**	**n=26**	**n=26**
Avg.	**5.27**	**5.15**	**5.27**
Occasionally I like to work on extremely difficult problems	n=26	n=26	n=26
Top 2	73%	62%	77%
Bottom 2	4%	0%	4%
I only like tasks that have a high probability of success (-)	n=26	n=26	n=26
Top 2	23%	31%	35%
Bottom 2	0%	4%	8%
I do not share my ideas with others (-)	n=26	n=26	n=26
Top 2	85%	77%	65%
Bottom 2	0%	0%	12%
I often read books and magazines outside of my core interest areas	n=26	n=26	n=26
Top 2	62%	46%	42%
Bottom 2	4%	15%	0%
I sometimes use my dreams or daydreams as a source of new ideas	n=26	n=26	n=26
Top 2	73%	73%	77%
Bottom 2	0%	4%	4%
I am not afraid of failure	n=26	n=26	n=26
Top 2	58%	62%	62%
Bottom 2	12%	8%	12%
Daydreaming only wastes my time (-)	n=26	n=26	n=26
Top 2	85%	81%	77%
Bottom 2	0%	0%	0%
I do not like to work on problems that have no solution (-)	n=26	n=26	n=26
Top 2	35%	38%	46%
Bottom 2	8%	15%	8%
There are special places where I go to think	n=26	n=26	n=26
Top 2	50%	50%	46%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Bottom 2	15%	8%	4%
I keep something by my bed at night, to record ideas	n=26	n=26	n=26
Top 2	24%	23%	31%
Bottom 2	56%	58%	46%
I enjoy working with the same group of people all the time (-)	n=26	n=26	n=26
Top 2	27%	23%	15%
Bottom 2	8%	19%	12%
I do not need any more colleagues (-)	n=26	n=26	n=26
Top 2	73%	65%	77%
Bottom 2	0%	4%	4%
I seek training in new areas	n=26	n=26	n=26
Top 2	88%	77%	88%
Bottom 2	0%	0%	0%
I make an effort to meet new people	n=26	n=26	n=26
Top 2	50%	50%	62%
Bottom 2	4%	4%	0%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Communication Scale

San Diego Incubator

"Indicate how often each of the following applied to you in the last 30 days" *(On a scale of 1="Never" to 5="Always")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Communication – composite score	**n=24**	**n=24**	**n=23**
Avg.	**3.77**	**3.71**	**3.75**
I use my tone of voice to reinforce what I am trying to say	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	58%	50%	65%
% saying "1 - Never"	0%	0%	0%
I don't hear everything a person is saying, because I am thinking about what I want to say (-)	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	46%	54%	61%
% saying "1 - Never"	0%	0%	0 %
When talking to someone, I try to maintain eye contact	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	75%	79%	83%
% saying "1 - Never"	0%	0%	0%
I recognize when two people are trying to say the same thing, but in different ways	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	88%	79%	74%
% saying "1 - Never"	0%	0%	0%
I try to watch other people's body language to help me understand what they are trying to say	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	58%	63%	70%
% saying "1 - Never"	4%	0%	0%
I use my own experiences to let my friends know that I understand what they are going through	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	75% △	46%	74%△

▲=Significantly greater than all other categories
△= Significantly greater than one category

"Indicate how often each of the following applied to you in the last 30 days" *(On a scale of 1="Never" to 5="Always")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
% saying "1 - Never"	0%	0%	0%
I try to see the other person's point of view	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	96%	88%	87%
% saying "1 - Never"	0%	0%	0%
I change the way I talk to someone based on my relationship with them (e.g. friend, parent, teacher, etc.)	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	79%	75%	61%
% saying "1 - Never"	0%	0%	0%
I try to respond to what someone is saying, rather than just reacting to their tone of voice	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	%	%	%
% saying "1 - Never"	%	%	%
I interrupt other people to say what I want to say before I forget it (-)	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	58%	50%	65%
% saying "1 - Never"	0%	0%	0%
I find it difficult to get my point across (-)	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	46%	50%	39%
% saying "1 - Never"	0%	0%	0%
I use my hands to illustrate what I am trying to say	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	67%	63%	70%
% saying "1 - Never"	0%	0%	0%
I organize thoughts in my head before speaking	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	54%	46%	52%
% saying "1 - Never"	0%	0%	0%
I use body language to help reinforce what I want to say	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	58%	57%	61%
% saying "1 - Never"	0%	0%	0%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

"Indicate how often each of the following applied to you in the last 30 days" *(On a scale of 1="Never" to 5="Always")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
I rephrase what another person said, to make sure that I understood them	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	50%	29%	48%
% saying "1 - Never"	0%	0%	0%
I find ways to redirect the conversation when people rattle on and on	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	50%	46%	61%
% saying "1 - Never"	0%	4%	0%
When I am listening to someone, I try to understand what they are feeling	n=24	n=24	n=23
% saying "4 - Often" or "5 - Always"	54%	63%	61%
% saying "1 - Never"	0%	0%	0%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Chicago Incubator

"Indicate how often each of the following applied to you in the last 30 days" *(On a scale of 1="Never" to 5="Always")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Communication – composite score	**n=15**	**n=15**	**n=15**
Avg.	**3.83**	**3.68**	**3.88△**
I use my tone of voice to reinforce what I am trying to say	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	73%	47%	60%
% saying "1 - Never"	0%	0%	0%
I don't hear everything a person is saying, because I am thinking about what I want to say (-)	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	47%	33%	33%
% saying "1 - Never"	0%	0%	0%
When talking to someone, I try to maintain eye contact	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	80%	67%	93%
% saying "1 - Never"	0%	0%	0%
I recognize when two people are trying to say the same thing, but in different ways	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	60%	60%	73%
% saying "1 - Never"	0%	0%	0%
I try to watch other people's body language to help me understand what they are trying to say	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	80%	80%	80%
% saying "1 - Never"	0%	0%	0%
I use my own experiences to let my friends know that I understand what they are going through	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	53%	73%	73%
% saying "1 - Never"	0%	0%	0%
I try to see the other person's point of view	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	100%	100%	100%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

% saying "1 - Never"	0%	0%	0%
I change the way I talk to someone based on my relationship with them (e.g. friend, parent, teacher, etc.)	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	53%	60%	80%
% saying "1 - Never"	0%	0%	7%
I try to respond to what someone is saying, rather than just reacting to their tone of voice	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	73%	73%	80%
% saying "1 - Never"	0%	0%	0%
I interrupt other people to say what I want to say before I forget it (-)	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	53%	53%	53%
% saying "1 - Never"	0%	0%	0%
I find it difficult to get my point across (-)	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	60%	60%	60%
% saying "1 - Never"	0%	7%	0%
I use my hands to illustrate what I am trying to say	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	73%	60%	80%
% saying "1 - Never"	0%	0%	0%
I organize thoughts in my head before speaking	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	47%	60%	60%
% saying "1 - Never"	0%	0%	0%
I use body language to help reinforce what I want to say	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	60%	60%	67%
% saying "1 - Never"	0%	0%	0%
I rephrase what another person said, to make sure that I understood them	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	73%	47%	53%
% saying "1 - Never"	0%	7%	0%
I find ways to redirect the conversation when people rattle on and on	n=15	n=15	n=15
% saying "4 - Often" or "5 - Always"	20%	27%	67% △

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

% saying “1 - Never”	0%	7%	0%
When I am listening to someone, I try to understand what they are feeling	n=15	n=15	n=15
% saying “4 - Often” or “5 - Always”	87%	87%	80%
% saying “1 - Never”	0%	0%	0%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Worcester Incubator

"Indicate how often each of the following applied to you in the last 30 days" *(On a scale of 1="Never" to 5="Always")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Communication – composite score	**n=26**	**n=26**	**n=26**
Avg.	**3.85**	**3.81**	**3.83**
I use my tone of voice to reinforce what I am trying to say	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	62%	65%	69%
% saying "1 - Never"	0%	0%	0%
I don't hear everything a person is saying, because I am thinking about what I want to say (-)	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	46%	46%	46%
% saying "1 - Never"	0%	0%	4%
When talking to someone, I try to maintain eye contact	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	85%	69%	81%
% saying "1 - Never"	0%	0%	0%
I recognize when two people are trying to say the same thing, but in different ways	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	73%	85%	88%
% saying "1 - Never"	0%	0%	0%
I try to watch other people's body language to help me understand what they are trying to say	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	81%	81%	81%
% saying "1 - Never"	0%	0%	0%
I use my own experiences to let my friends know that I understand what they are going through	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	50%	54%	62%
% saying "1 - Never"	0%	0%	0%
I try to see the other person's point of view	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	100%	100%	88%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

% saying "1 - Never"	0%	0%	0%
I change the way I talk to someone based on my relationship with them (e.g. friend, parent, teacher, etc.)	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	81%	69%	77%
% saying "1 - Never"	0%	0%	0%
I try to respond to what someone is saying, rather than just reacting to their tone of voice	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	85%	92%	81%
% saying "1 - Never"	0%	0%	0%
I interrupt other people to say what I want to say before I forget it (-)	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	58%	42%	50%
% saying "1 - Never"	0%	0%	0%
I find it difficult to get my point across (-)	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	62%	46%	46%
% saying "1 - Never"	0%	4%	0%
I use my hands to illustrate what I am trying to say	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	62%	73%	73%
% saying "1 - Never"	0%	0%	0%
I organize thoughts in my head before speaking	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	65%	73%	54%
% saying "1 - Never"	0%	0%	0%
I use body language to help reinforce what I want to say	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	50%	54%	58%
% saying "1 - Never"	0%	0%	0%
I rephrase what another person said, to make sure that I understood them	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	58%	46%	73%△
% saying "1 - Never"	0%	0%	4%
I find ways to redirect the conversation when people rattle on and on	n=26	n=26	n=26
% saying "4 - Often" or "5 - Always"	31%	35%	31%

▲=Significantly greater than all other categories
△= Significantly greater than one category

% saying “1 - Never”	0%	0%	4%
When I am listening to someone, I try to understand what they are feeling	n=26	n=26	n=26
% saying “4 - Often” or “5 - Always”	88%	85%	80%
% saying “1 - Never”	0%	0%	0%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Tolerance of Ambiguity Scale

San Diego Incubator

"To what extent do you agree or disagree with the following statements?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Tolerance for Ambiguity – composite score	**n=24**	**n=24**	**n=23**
Avg.	**4.16**	**4.38**	**4.28**
Almost every problem has a solution (-)	n=24	n=24	n=23
Top 2	0%	4%	0%
Bottom 2	75%	58%	57%
I like to fool around with new ideas, even if they are a total waste of time	n=24	n=24	n=23
Top 2	50%	29%	35%
Bottom 2	4%	13%	9%
Nothing gets accomplished in this world unless you stick to some basic rules (-)	n=24	n=24	n=23
Top 2	29%	29%	22%
Bottom 2	13%	8%	13%
Usually, the more clearly defined rules a society has, the better off it is (-)	n=24	n=24	n=23
Top 2	25%	21%	22%
Bottom 2	21%	8%	17%
Personally, I tend to think that there is a right way and wrong way to do almost everything (-)	n=24	n=24	n=23
Top 2	46%	54%	52%
Bottom 2	17%	4%	0%
I don't need to finish a task before starting a new task	n=24	n=24	n=23
Top 2	58%	42%	43%
Bottom 2	8%	8%	9%
Before any important job, I must know how long it will take (-)	n=24	n=24	n=23

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Top 2	38%	33%	22%
Bottom 2	25%	8%	13%
In a problem-solving group it is always best to systematically attack a problem (-)	n=24	n=24	n=23
Top 2	17%	25%	22%
Bottom 2	25%	17%	4%
I do not like to get started in group projects unless I feel assured that the project will be successful (-)	n=24	n=24	n=23
Top 2	42%	50%	43%
Bottom 2	8%	0%	9%
In a decision-making situation in which there is not enough information to process the problem, I feel very uncomfortable (-)	n=24	n=24	n=23
Top 2	25%	25%	17%
Bottom 2	21%	29%	26%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Chicago Incubator

"To what extent do you agree or disagree with the following statements?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Tolerance for Ambiguity – composite score	**n=15**	**n=15**	**n=15**
Avg.	**4.59**	**4.60**	**4.44**
Almost every problem has a solution (-)	n=15	n=15	n=15
Top 2	20%	20%	27%
Bottom 2	40%	7%	13%
I like to fool around with new ideas, even if they are a total waste of time	n=15	n=15	n=15
Top 2	53%	33%	60%
Bottom 2	0%	0%	7%
Nothing gets accomplished in this world unless you stick to some basic rules (-)	n=15	n=15	n=15
Top 2	20%	27%	33%
Bottom 2	13%	0%	7%
Usually, the more clearly defined rules a society has, the better off it is (-)	n=15	n=15	n=15
Top 2	13%	20%	20%
Bottom 2	7%	7%	33%
Personally, I tend to think that there is a right way and wrong way to do almost everything (-)	n=15	n=15	n=15
Top 2	80%	53%	53%
Bottom 2	7%	0%	0%
I don't need to finish a task before starting a new task	n=15	n=15	n=15
Top 2	80%	40%	60%
Bottom 2	7%	7%	7%
Before any important job, I must know how long it will take (-)	n=15	n=15	n=15
Top 2	33%	47%	13%
Bottom 2	0%	0%	13%
In a problem-solving group it is always best to systematically attack a	n=15	n=15	n=15

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

problem (-)			
Top 2	13%	27%	27%
Bottom 2	0%	20%	27%
I do not like to get started in group projects unless I feel assured that the project will be successful (-)	n=15	n=15	n=15
Top 2	40%	27%	40%
Bottom 2	0%	0%	7%
In a decision-making situation in which there is not enough information to process the problem, I feel very uncomfortable (-)	n=15	n=15	n=15
Top 2	7%	7%	20%
Bottom 2	13%	13%	27%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Worcester Incubator

"To what extent do you agree or disagree with the following statements?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Tolerance for Ambiguity – composite score	**n=26**	**n=26**	**n=24**
Avg.	**4.43**	**4.30**	**4.48**
Almost every problem has a solution (-)	n=26	n=26	n=24
Top 2	8%	4%	13%
Bottom 2	38%	46%	50%
I like to fool around with new ideas, even if they are a total waste of time	n=26	n=26	n=24
Top 2	50%	42%	67%
Bottom 2	0%	0%	0%
Nothing gets accomplished in this world unless you stick to some basic rules (-)	n=26	n=26	n=24
Top 2	15%	23%	25%
Bottom 2	8%	19%	13%
Usually, the more clearly defined rules a society has, the better off it is (-)	n=26	n=26	n=24
Top 2	12%	31%	21%
Bottom 2	12%	15%	17%
Personally, I tend to think that there is a right way and wrong way to do almost everything (-)	n=26	n=26	n=24
Top 2	38%	42%	46%
Bottom 2	4%	8%	0%
I don't need to finish a task before starting a new task	n=26	n=26	n=24
Top 2	65%	58%	67%
Bottom 2	8%	4%	4%
Before any important job, I must know how long it will take (-)	n=26	n=26	n=24
Top 2	46%	19%	25%
Bottom 2	8%	8%	8%
In a problem-solving group it is always best to systematically attack a	n=26	n=26	n=24

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

problem (-)			
Top 2	15%	12%	4%
Bottom 2	31%	23%	29%
I do not like to get started in group projects unless I feel assured that the project will be successful (-)	n=26	n=26	n=24
Top 2	27%	31%	25%
Bottom 2	8%	0%	4%
In a decision-making situation in which there is not enough information to process the problem, I feel very uncomfortable (-)	n=26	n=26	n=24
Top 2	23%	19%	21%
Bottom 2	15%	19%	25%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Empathy Scale

San Diego Incubator

"How well do the following statements describe you?" *(On a scale form 1="Very untrue of me" to 7="Very true of me")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Empathy – composite score	**n=24**	**n=24**	**n=20**
Avg.	**5.36**	**5.26**	**5.24**
I often have tender, concerned feelings for people less fortunate than me	n=24	n=24	n=20
Top 2	58%	63%	60%
Bottom 2	0%	8%	0%
I sometimes find it difficult to see things from the "other person's" point of view (-)	n=24	n=24	n=20
Top 2	29%	38%	45%
Bottom 2	8%	13%	0%
Sometimes I don't feel very sorry for other people when they are having problems (-)	n=24	n=24	n=20
Top 2	46%	54%	55%
Bottom 2	4%	13%	5%
I try to look at everybody's side of a disagreement before I make a decision	n=24	n=24	n=20
Top 2	54%	42%	45%
Bottom 2	4%	4%	0%
When I see someone being taken advantage of, I feel kind of protective towards them	n=24	n=24	n=20
Top 2	71% △	46%	75%
Bottom 2	0%	4%	0%
I sometimes try to understand my friends better by imagining how things look from their perspective	n=24	n=24	n=20

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

"How well do the following statements describe you?" *(On a scale form 1="Very untrue of me" to 7="Very true of me")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Top 2	58%	50%	35%
Bottom 2	8%	0%	0%
Other people's misfortunes do not usually disturb me a great deal (-)	n=24	n=24	n=20
Top 2	58%	75%	45%
Bottom 2	0%	4%	10%
If I'm sure I'm right about something, I don't waste much time listening to other people's arguments (-)	n=24	n=24	n=20
Top 2	42%	38%	25%
Bottom 2	4%	0%	5%
When I see someone being treated unfairly, I sometimes don't feel very much pity for them (-)	n=24	n=24	n=20
Top 2	79%	75%	70%
Bottom 2	0%	4%	5%
I am often quite touched by things that I see happen	n=24	n=24	n=20
Top 2	67%	67%	55%
Bottom 2	0%	0%	0%
I believe that there are two sides to every question and I try to look at them both	n=24	n=24	n=20
Top 2	46%	58%	60%
Bottom 2	0%	0%	0%
I would describe myself as a pretty soft-hearted person	n=24	n=24	n=20
Top 2	50%	54%	45%
Bottom 2	0%	0%	0%
When I'm upset at someone, I usually try to "put myself in their shoes" for a while	n=24	n=24	n=20
Top 2	33%	33%	30%
Bottom 2	0%	4%	10%
Before criticizing somebody, I try to imagine how I would feel if I were in	n=24	n=24	n=20

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

"How well do the following statements describe you?" *(On a scale form 1="Very untrue of me" to 7="Very true of me")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
their place			
Top 2	38%	29%	40%
Bottom 2	0%	0%	0%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Chicago Incubator

"How well do the following statements describe you?" *(On a scale form 1="Very untrue of me" to 7="Very true of me")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Empathy – composite score	**n=15**	**n=15**	**n=14**
Avg.	**5.61**	**5.43**	**5.65**
I often have tender, concerned feelings for people less fortunate than me	n=15	n=15	n=14
Top 2	80%	67%	79%
Bottom 2	0%	0%	0%
I sometimes find it difficult to see things from the "other person's" point of view (-)	n=15	n=15	n=14
Top 2	40%	53%	57%
Bottom 2	0%	0%	0%
Sometimes I don't feel very sorry for other people when they are having problems (-)	n=15	n=15	n=14
Top 2	53%	53%	50%
Bottom 2	0%	7%	0%
I try to look at everybody's side of a disagreement before I make a decision	n=15	n=15	n=14
Top 2	60%	53%	50%
Bottom 2	0%	0%	0%
When I see someone being taken advantage of, I feel kind of protective towards them	n=15	n=15	n=14
Top 2	87%	53%	71%
Bottom 2	0%	7%	0%
I sometimes try to understand my friends better by imagining how things look from their perspective	n=15	n=15	n=14
Top 2	67%	53%	71%
Bottom 2	0%	0%	0%
Other people's misfortunes do not usually disturb me a great deal (-)	n=15	n=15	n=14

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Top 2	67%	67%	79%
Bottom 2	0%	0%	0%
If I'm sure I'm right about something, I don't waste much time listening to other people's arguments (-)	n=15	n=15	n=14
Top 2	60%	47%	57%
Bottom 2	0%	7%	0%
When I see someone being treated unfairly, I sometimes don't feel very much pity for them (-)	n=15	n=15	n=14
Top 2	87%	80%	86%
Bottom 2	0%	0%	0%
I am often quite touched by things that I see happen	n=15	n=15	n=14
Top 2	73%	53%	79%
Bottom 2	0%	0%	0%
I believe that there are two sides to every question and I try to look at them both	n=15	n=15	n=14
Top 2	67%	53%	57%
Bottom 2	0%	0%	0%
I would describe myself as a pretty soft-hearted person	n=15	n=15	n=14
Top 2	60%	47%	36%
Bottom 2	0%	0%	0%
When I'm upset at someone, I usually try to "put myself in their shoes" for a while	n=15	n=15	n=14
Top 2	33%	33%	43%
Bottom 2	0%	0%	0%
Before criticizing somebody, I try to imagine how I would feel if I were in their place	n=15	n=15	n=14
Top 2	47%	33%	57%
Bottom 2	0%	0%	0%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Worcester Incubator

"How well do the following statements describe you?" *(On a scale form 1="Very untrue of me" to 7="Very true of me")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Empathy – composite score	**n=25**	**n=26**	**n=23**
Avg.	**5.25**	**5.31**	**5.38**
I often have tender, concerned feelings for people less fortunate than me	n=25	n=26	n=23
Top 2	48%	54%	52%
Bottom 2	8%	0%	4%
I sometimes find it difficult to see things from the "other person's" point of view (-)	n=25	n=26	n=23
Top 2	32%	54%	57%
Bottom 2	0%	0%	4%
Sometimes I don't feel very sorry for other people when they are having problems (-)	n=25	n=26	n=23
Top 2	36%	27%	35%
Bottom 2	12%	0%	13%
I try to look at everybody's side of a disagreement before I make a decision	n=25	n=26	n=23
Top 2	60%	54%	52%
Bottom 2	0%	0%	0%
When I see someone being taken advantage of, I feel kind of protective towards them	n=25	n=26	n=23
Top 2	60%	58%	61%
Bottom 2	4%	4%	4%
I sometimes try to understand my friends better by imagining how things look from their perspective	n=25	n=26	n=23
Top 2	52%	46%	61%
Bottom 2	0%	0%	0%
Other people's misfortunes do not usually disturb me a great deal (-)	n=25	n=26	n=23

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Top 2	44%	54%	57%
Bottom 2	4%	0%	4%
If I'm sure I'm right about something, I don't waste much time listening to other people's arguments (-)	n=25	n=26	n=23
Top 2	40%	46%	43%
Bottom 2	12%	8%	0%
When I see someone being treated unfairly, I sometimes don't feel very much pity for them (-)	n=25	n=26	n=23
Top 2	56%	62%	70%
Bottom 2	0%	0%	0%
I am often quite touched by things that I see happen	n=25	n=26	n=23
Top 2	52%	50%	65%
Bottom 2	8%	0%	4%
I believe that there are two sides to every question and I try to look at them both	n=25	n=26	n=23
Top 2	68%	81%	65%
Bottom 2	0%	0%	0%
I would describe myself as a pretty soft-hearted person	n=25	n=26	n=23
Top 2	44%	46%	48%
Bottom 2	0%	4%	4%
When I'm upset at someone, I usually try to "put myself in their shoes" for a while	n=25	n=26	n=23
Top 2	40%	31%	43%
Bottom 2	0%	4%	13%
Before criticizing somebody, I try to imagine how I would feel if I were in their place	n=25	n=26	n=23
Top 2	28%	31%	61%
Bottom 2	0%	0%	4%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Composite Scores: Wave 1 Comparisons Between those who did and did not Complete the Program

San Diego Incubator

	All	Completed program	Didn't complete program
	n=100	n=48	n=52
Creativity Scale	5.44	5.35	5.52
Communication Scale	3.83	3.79	3.86
Tolerance of Ambiguity Scale	4.27	4.18	4.36
Empathy Scale	5.40	5.38	5.43

Chicago Incubator

	All	Completed program	Didn't complete program
	n=89-90	n=24	n=65-66
Creativity Scale	5.34	5.28	5.37
Communication Scale	3.84	3.76	3.87
Tolerance of Ambiguity Scale	4.32	4.58 ▲	4.23
Empathy Scale	5.50	5.60	5.46

Worcester Incubator

	All	Completed program	Didn't complete program
	n=100-101	n=45-46	n=53-55
Creativity Scale	5.27	5.24	5.30
Communication Scale	3.85	3.82	3.88
Tolerance of Ambiguity Scale	4.22	4.35	4.12
Empathy Scale	5.39	5.30	5.47

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Attitudes Scales

San Diego Incubator

Attitudes – Creativity "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Not everyone is capable of creativity	n=24	n=24	n=20
Top 2	13%	0%	5%
Bottom 2	67%	67%	70%
Individuals are more likely than groups to come up with truly original ideas	n=24	n=24	n=20
Top 2	4%	8%	5%
Bottom 2	63%	38%	30%
Creativity is something done by individuals, not something that happens on a group level	n=24	n=24	n=20
Top 2	0%	0%	5%
Bottom 2	75%	71%	50%
To be creative you must be artistic	n=24	n=24	n=20
Top 2	4%	4%	0%
Bottom 2	79%	79%	70%
There is too much time wasted in the creative process	n=24	n=24	n=20
Top 2	0%	0%	0%
Bottom 2	79%	88%	80%
Brilliant ideas come from single 'AHA!' moments, not from working through the creative process	n=24	n=24	n=20
Top 2	0%	4%	0%
Bottom 2	63%	67%	55%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Attitudes – Creativity "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	All	Completed program	Didn't complete program
Not everyone is capable of creativity	n=100	n=48	n=52
Top 2	7%	6%	8%
Bottom 2	63%	60%	65%
Individuals are more likely than groups to come up with truly original ideas	n=100	n=48	n=52
Top 2	7%	6%	8%
Bottom 2	60%	56%	63%
Creativity is something done by individuals, not something that happens on a group level	n=100	n=48	n=52
Top 2	1%	2%	0%
Bottom 2	76%	69%	83%
To be creative you must be artistic	n=100	n=48	n=52
Top 2	7%	4%	10%
Bottom 2	71%	71%	71%
There is too much time wasted in the creative process	n=100	n=48	n=52
Top 2	0%	0%	0%
Bottom 2	85%	81%	88%
Brilliant ideas come from single 'AHA!' moments, not from working through the creative process	n=100	n=48	n=52
Top 2	2%	2%	2%
Bottom 2	69%	60%	77%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Attitudes – Communication "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
A lot of people who think they are effective communicators just talk a lot	n=24	n=24	n=20
Top 2	25%	38%	25%
Bottom 2	21%	17%	5%
A good communicator can communicate effectively the same way in every situation	n=24	n=24	n=20
Top 2	13%	4%	20%
Bottom 2	46%	67%	35%
People who are outgoing are naturally better communicators	n=24	n=24	n=20
Top 2	17%	8%	20%
Bottom 2	21%	25%	15%
Emotions detract from effective communication	n=24	n=24	n=20
Top 2	4%	8%	20%
Bottom 2	38%	21%	45%
Communication is predominantly verbal	n=24	n=24	n=20
Top 2	4%	4%	10%
Bottom 2	50%	58%	55%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Attitudes – Communication "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	All	Completed program	Didn't complete program
A lot of people who think they are effective communicators just talk a lot	n=100	n=48	n=52
Top 2	23%	23%	23%
Bottom 2	14%	15%	13%
A good communicator can communicate effectively the same way in every situation	n=100	n=48	n=52
Top 2	14%	8%	19%
Bottom 2	46%	46%	46%
People who are outgoing are naturally better communicators	n=100	n=48	n=52
Top 2	17%	23%	12%
Bottom 2	28%	19%	37% ▲
Emotions detract from effective communication	n=100	n=48	n=52
Top 2	7%	8%	6%
Bottom 2	38%	40%	37%
Communication is predominantly verbal	n=100	n=48	n=52
Top 2	8%	10%	6%
Bottom 2	56%	48%	63%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Attitudes – Collaboration "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
It is always counterproductive when conflict arises during collaborative work	n=24	n=24	n=20
Top 2	4%	8%	5%
Bottom 2	54%	58%	50%
People are more likely to produce effective solutions through competition, rather than through collaboration	n=24	n=24	n=20
Top 2	0%	4%	0%
Bottom 2	50%	50%	50%
The less life experience you have the less you have to offer when collaborating with others	n=24	n=24	n=20
Top 2	0%	4%	5%
Bottom 2	67%	46%	45%
Collaboration is rarely worth the time it takes	n=24	n=24	n=20
Top 2	0%	4%	0%
Bottom 2	96%	83%	75%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Attitudes – Collaboration "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	All	Completed program	Didn't complete program
It is always counterproductive when conflict arises during collaborative work	n=100	n=48	n=52
Top 2	9%	8%	10%
Bottom 2	60%	52%	67%
People are more likely to produce effective solutions through competition, rather than through collaboration	n=100	n=48	n=52
Top 2	3%	2%	4%
Bottom 2	54%	52%	56%
The less life experience you have the less you have to offer when collaborating with others	n=100	n=48	n=52
Top 2	2%	0%	4%
Bottom 2	54%	56%	52%
Collaboration is rarely worth the time it takes	n=100	n=48	n=52
Top 2	1%	2%	0%
Bottom 2	89%	88%	90%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Chicago Incubator

Attitudes – Creativity "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Not everyone is capable of creativity	n=15	n=15	n=14
Top 2	0%	0%	7%
Bottom 2	67%	80%	79%
Individuals are more likely than groups to come up with truly original ideas	n=15	n=15	n=14
Top 2	0%	0%	7%
Bottom 2	67%	53%	64%
Creativity is something done by individuals, not something that happens on a group level	n=15	n=15	n=14
Top 2	0%	0%	0%
Bottom 2	87%	87%	86%
To be creative you must be artistic	n=15	n=15	n=14
Top 2	0%	0%	7%
Bottom 2	93%	80%	86%
There is too much time wasted in the creative process	n=15	n=15	n=14
Top 2	7%	0%	0%
Bottom 2	73%	60%	86%
Brilliant ideas come from single 'AHA!' moments, not from working through the creative process	n=15	n=15	n=14
Top 2	0%	0%	0%
Bottom 2	67%	53%	71%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Attitudes – Creativity "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	All	Completed program	Didn't complete program
Not everyone is capable of creativity	n=89	n=24	n=65
Top 2	3%	4%	3%
Bottom 2	72%	67%	74%
Individuals are more likely than groups to come up with truly original ideas	n=89	n=24	n=65
Top 2	3%	4%	3%
Bottom 2	51%	58%	48%
Creativity is something done by individuals, not something that happens on a group level	n=89	n=24	n=65
Top 2	3%	0%	5%
Bottom 2	74%	88% ▲	69%
To be creative you must be artistic	n=89	n=24	n=65
Top 2	2%	0%	3%
Bottom 2	75%	83%	72%
There is too much time wasted in the creative process	n=89	n=24	n=65
Top 2	2%	0%	3%
Bottom 2	81%	79%	82%
Brilliant ideas come from single 'AHA!' moments, not from working through the creative process	n=89	n=24	n=65
Top 2	0%	0%	0%
Bottom 2	70%	71%	69%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Attitudes – Communication "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
A lot of people who think they are effective communicators just talk a lot	n=15	n=15	n=14
Top 2	13%	40%	64%△
Bottom 2	0%	7%	7%
A good communicator can communicate effectively the same way in every situation	n=15	n=15	n=14
Top 2	7%	0%	7%
Bottom 2	60%	53%	71%
People who are outgoing are naturally better communicators	n=15	n=15	n=14
Top 2	13%	7%	14%
Bottom 2	40%	33%	50%
Emotions detract from effective communication	n=15	n=15	n=14
Top 2	0%	0%	21%
Bottom 2	60%	67%	36%
Communication is predominantly verbal	n=15	n=15	n=14
Top 2	0%	0%	0%
Bottom 2	80%	53%	79%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Attitudes – Communication "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	All	Completed program	Didn't complete program
A lot of people who think they are effective communicators just talk a lot	n=89	n=24	n=65
Top 2	19%	8%	23%
Bottom 2	17%	17%	17%
A good communicator can communicate effectively the same way in every situation	n=89	n=24	n=65
Top 2	16%	4%	20%▲
Bottom 2	53%	58%	51%
People who are outgoing are naturally better communicators	n=89	n=24	n=65
Top 2	13%	13%	14%
Bottom 2	47%	46%	48%
Emotions detract from effective communication	n=89	n=24	n=65
Top 2	6%	0%	8%▲
Bottom 2	42%	50%	38%
Communication is predominantly verbal	n=89	n=24	n=65
Top 2	1%	0%	2%
Bottom 2	69%	75%	66%

▲=Significantly greater than all other categories
△= Significantly greater than one category

Attitudes – Collaboration "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
It is always counterproductive when conflict arises during collaborative work	n=15	n=15	n=14
Top 2	7%	0%	7%
Bottom 2	60%	93%△	57%
People are more likely to produce effective solutions through competition, rather than through collaboration	n=15	n=15	n=14
Top 2	0%	0%	0%
Bottom 2	73%	80%	71%
The less life experience you have the less you have to offer when collaborating with others	n=15	n=15	n=14
Top 2	0%	0%	7%
Bottom 2	73%	73%	50%
Collaboration is rarely worth the time it takes	n=15	n=15	n=14
Top 2	0%	0%	0%
Bottom 2	100%	80%	86%

▲=Significantly greater than all other categories
△= Significantly greater than one category

Attitudes – Collaboration "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	All	Completed program	Didn't complete program
It is always counterproductive when conflict arises during collaborative work	n=89	n=24	n=65
Top 2	10%	4%	12%
Bottom 2	60%	71%	55%
People are more likely to produce effective solutions through competition, rather than through collaboration	n=89	n=24	n=65
Top 2	3%	0%	5%
Bottom 2	56%	58%	55%
The less life experience you have the less you have to offer when collaborating with others	n=89	n=24	n=65
Top 2	3%	0%	5%
Bottom 2	54%	67%	49%
Collaboration is rarely worth the time it takes	n=89	n=24	n=65
Top 2	2%	0%	3%
Bottom 2	84%	96%▲	80%

▲=Significantly greater than all other categories
△= Significantly greater than one category

Worcester Incubator

Attitudes – Creativity "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
Not everyone is capable of creativity	n=26	n=26	n=23
Top 2	4%	8%	0%
Bottom 2	69%	69%	65%
Individuals are more likely than groups to come up with truly original ideas	n=26	n=26	n=23
Top 2	4%	8%	0%
Bottom 2	50%	42%	43%
Creativity is something done by individuals, not something that happens on a group level	n=26	n=26	n=23
Top 2	0%	0%	0%
Bottom 2	73%	69%	78%
To be creative you must be artistic	n=26	n=26	n=23
Top 2	0%	0%	0%
Bottom 2	73%	85%	87%
There is too much time wasted in the creative process	n=26	n=26	n=23
Top 2	0%	0%	0%
Bottom 2	81%	58%	78%
Brilliant ideas come from single 'AHA!' moments, not from working through the creative process	n=26	n=26	n=23
Top 2	4%	0%	0%
Bottom 2	65%	50%	70%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Attitudes – Creativity "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	All	Completed program	Didn't complete program
Not everyone is capable of creativity	n=99	n=46	n=53
Top 2	2%	2%	2%
Bottom 2	59%	63%	55%
Individuals are more likely than groups to come up with truly original ideas	n=99	n=46	n=53
Top 2	4%	2%	6%
Bottom 2	45%	48%	43%
Creativity is something done by individuals, not something that happens on a group level	n=99	n=46	n=53
Top 2	2%	0%	4%
Bottom 2	75%	72%	77%
To be creative you must be artistic	n=99	n=46	n=53
Top 2	1%	0%	2%
Bottom 2	77%	74%	79%
There is too much time wasted in the creative process	n=99	n=46	n=53
Top 2	1%	2%	0%
Bottom 2	71%	72%	70%
Brilliant ideas come from single 'AHA!' moments, not from working through the creative process	n=99	n=46	n=53
Top 2	4%	2%	6%
Bottom 2	68%	72%	64%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Attitudes – Communication "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
A lot of people who think they are effective communicators just talk a lot	n=26	n=26	n=23
Top 2	36%	35%	57% △
Bottom 2	0%	8%	4%
A good communicator can communicate effectively the same way in every situation	n=26	n=26	n=23
Top 2	15%	4%	4%
Bottom 2	50%	50%	70%
People who are outgoing are naturally better communicators	n=26	n=26	n=23
Top 2	0%	4%	4%
Bottom 2	42%	27%	61% △
Emotions detract from effective communication	n=26	n=26	n=23
Top 2	0%	19%	4%
Bottom 2	38%	31%	52%
Communication is predominantly verbal	n=26	n=26	n=23
Top 2	4%	0%	0%
Bottom 2	65%	69%	74%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Attitudes – Communication "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	All	Completed program	Didn't complete program
A lot of people who think they are effective communicators just talk a lot	n=99	n=46	n=53
Top 2	30%	36%	25%
Bottom 2	8%	4%	11%
A good communicator can communicate effectively the same way in every situation	n=99	n=46	n=53
Top 2	14%	9%	19%
Bottom 2	57%	52%	60%
People who are outgoing are naturally better communicators	n=99	n=46	n=53
Top 2	13%	7%	19%
Bottom 2	32%	43%	23%
Emotions detract from effective communication	n=99	n=46	n=53
Top 2	6%	0%	11% △
Bottom 2	34%	41% △	28%
Communication is predominantly verbal	n=99	n=46	n=53
Top 2	6%	2%	7%
Bottom 2	60%	67%	53%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Attitudes – Collaboration "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 2 (completed)	Wave 3 (completed)
It is always counterproductive when conflict arises during collaborative work	n=26	n=26	n=23
Top 2	4%	4%	0%
Bottom 2	54%	85% △	70%
People are more likely to produce effective solutions through competition, rather than through collaboration	n=26	n=26	n=23
Top 2	0%	0%	0%
Bottom 2	62%	54%	48%
The less life experience you have the less you have to offer when collaborating with others	n=26	n=26	n=23
Top 2	4%	0%	9%
Bottom 2	50%	50%	43%
Collaboration is rarely worth the time it takes	n=26	n=26	n=23
Top 2	4%	4%	0%
Bottom 2	77%	81%	61%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Attitudes – Collaboration "To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	All	Completed program	Didn't complete program
It is always counterproductive when conflict arises during collaborative work	n=99	n=46	n=53
Top 2	8%	4%	11%
Bottom 2	44%	46%	43%
People are more likely to produce effective solutions through competition, rather than through collaboration	n=99	n=46	n=53
Top 2	1%	0%	2%
Bottom 2	53%	54%	51%
The less life experience you have the less you have to offer when collaborating with others	n=99	n=46	n=53
Top 2	5%	2%	8%
Bottom 2	58%	65%	51%
Collaboration is rarely worth the time it takes	n=99	n=46	n=53
Top 2	2%	2%	2%
Bottom 2	81%	76%	85%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Team member self-perceptions (Waves 1 & 3 only)

San Diego Incubator

"To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 3 (completed)
I am inquisitive	n=24	n=20
Top 2	88%	95%
Bottom 2	0%	5%
I am an innovator	n=24	n=20
Top 2	67%	60%
Bottom 2	0%	0%
I am artistic	n=24	n=20
Top 2	67%	80%
Bottom 2	4%	0%
I am scientific-minded	n=24	n=20
Top 2	54%	70%
Bottom 2	0%	5%
I am entrepreneurial	n=24	n=20
Top 2	54%	55%
Bottom 2	8%	10%
I am a leader	n=24	n=20
Top 2	50%	60%
Bottom 2	4%	10%
I am a teacher	n=24	n=20
Top 2	38%	60% ▲
Bottom 2	8%	%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

"To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	All	Completed program	Didn't complete program
I am inquisitive	n=100	n=48	n=52
Top 2	93%	90%	96%
Bottom 2	0%	0%	0%
I am an innovator	n=100	n=48	n=52
Top 2	72%	67%	77%
Bottom 2	1%	0%	2%
I am artistic	n=100	n=48	n=52
Top 2	66%	69%	63%
Bottom 2	5%	6%	4%
I am scientific-minded	n=100	n=48	n=52
Top 2	68%	67%	69%
Bottom 2	4%	0%	8%▲
I am entrepreneurial	n=100	n=48	n=52
Top 2	57%	52%	62%
Bottom 2	4%	6%	2%
I am a leader	n=100	n=48	n=52
Top 2	61%	58%	63%
Bottom 2	1%	2%	0%
I am a teacher	n=100	n=48	n=52
Top 2	57%	35%	77%▲
Bottom 2	5%	6%	4%

▲=Significantly greater than all other categories
△= Significantly greater than one category

Chicago Incubator

"To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 3 (completed)
I am inquisitive	n=15	n=15
Top 2	93%	87%
Bottom 2	0%	0%
I am an innovator	n=15	n=15
Top 2	33%	53%
Bottom 2	0%	7%
I am artistic	n=15	n=15
Top 2	67%	73%
Bottom 2	0%	0%
I am scientific-minded	n=15	n=15
Top 2	53%	73%
Bottom 2	0%	0%
I am entrepreneurial	n=15	n=15
Top 2	33%	33%
Bottom 2	0%	13%
I am a leader	n=15	n=15
Top 2	40%	60%
Bottom 2	7%	0%
I am a teacher	n=15	n=15
Top 2	87%	80%
Bottom 2	0%	%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

"To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	All	Completed program	Didn't complete program
I am inquisitive	n=88	n=24	n=64
Top 2	88%	92%	86%
Bottom 2	0%	0%	0%
I am an innovator	n=88	n=24	n=64
Top 2	49%	38%	53%
Bottom 2	1%	0%	2%
I am artistic	n=88	n=24	n=64
Top 2	64%	67%	63%
Bottom 2	5%	4%	5%
I am scientific-minded	n=88	n=24	n=64
Top 2	59%	58%	59%
Bottom 2	7%	0%	9% ▲
I am entrepreneurial	n=88	n=24	n=64
Top 2	40%	25%	45%
Bottom 2	6%	0%	8% ▲
I am a leader	n=88	n=24	n=64
Top 2	55%	50%	56%
Bottom 2	2%	4%	2%
I am a teacher	n=88	n=24	n=64
Top 2	65%	71%	63%
Bottom 2	7%	8%	6%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Worcester Incubator

"To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	Wave 1 (completed)	Wave 3 (completed)
I am inquisitive	n=26	n=23
Top 2	100%	100%
Bottom 2	0%	0%
I am an innovator	n=26	n=23
Top 2	38%	48%
Bottom 2	0%	0%
I am artistic	n=26	n=23
Top 2	50%	57%
Bottom 2	0%	9%
I am scientific-minded	n=26	n=23
Top 2	54%	70%
Bottom 2	0%	4%
I am entrepreneurial	n=26	n=23
Top 2	27%	35%
Bottom 2	15%	17%
I am a leader	n=26	n=23
Top 2	54%	74% ▲
Bottom 2	0%	4%
I am a teacher	n=26	n=23
Top 2	62%	48%
Bottom 2	4%	21% ▲

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

"To what extent do you agree or disagree with the following statement?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	All	Completed program	Didn't complete program
I am inquisitive	n=98	n=46	n=52
Top 2	90%	96%	85%
Bottom 2	1%	0%	2%
I am an innovator	n=98	n=46	n=52
Top 2	49%	43%	54%
Bottom 2	1%	0%	2%
I am artistic	n=98	n=46	n=52
Top 2	54%	61%	48%
Bottom 2	6%	4%	8%
I am scientific-minded	n=98	n=46	n=52
Top 2	52%	46%	58%
Bottom 2	3%	4%	2%
I am entrepreneurial	n=98	n=46	n=52
Top 2	38%	35%	40%
Bottom 2	11%	13%	10%
I am a leader	n=98	n=46	n=52
Top 2	56%	61%	52%
Bottom 2	2%	2%	2%
I am a teacher	n=98	n=46	n=52
Top 2	61%	59%	63%
Bottom 2	4%	2%	6%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Project self-assessments (Wave 3 only)

"To what extent do you *agree* or *disagree* with the following statements?" *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*	San Diego	Chicago	Worcester
My team's project addresses a clear problem or opportunity related to transportation/nutrition/water	n=30	n=17	n=26
Top 2	73%	82%	73%
Bottom 2	7%	0%	0%
My team's project demonstrates a strong grasp of actual conditions related to the problem or opportunity it is designed to address	n=30	n=17	n=26
Top 2	73%	71%	69%
Bottom 2	10%	6%	8%
My team's project addresses significant unmet needs	n=30	n=17	n=26
Top 2	60%	53%	58%
Bottom 2	10%	0%	8%
My team's project is a highly original or novel	n=30	n=17	n=26
Top 2	53%	29%	54%
Bottom 2	17%	12%	0%
My team's project has high potential to fruitfully address the problem or opportunity it is designed to address	n=30	n=17	n=26
Top 2	87%	76%	62%
Bottom 2	0%	0%	0%
My team's project has high potential to deliver compelling value to a substantial number of clearly defined customers	n=30	n=17	n=26
Top 2	57%	53%	58%
Bottom 2	0%	6%	4%
My team has clearly identified the revenue streams and other capital resources that will be needed to sustain our project over the long term	n=30	n=17	n=26
Top 2	7%	0%	8%
Bottom 2	43%	53%	35%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

My team has clearly identified the key partners that will be needed to sustain our project over the long term	n=30	n=17	n=26
Top 2	17%	24%	42%
Bottom 2	27%	35%	12%
Is your team's project primarily educational (i.e., STEM Learning)?	n=30	n=17	n=26
Yes	50%	65%	19%
No	50%	45%	81%
[IF YES] For each of the statements below, please rate your level of agreement or disagreement. *(On a scale from 1="Strongly disagree" to 7="Strongly agree")*			
My team has a clear plan to ensure our project obtains the support of relevant educational regulators	n=15	n=11	n=5
Top 2	20%	36%	60%
Bottom 2	27%	18%	0%
My team's project is proven to be compelling to the students it aims to benefit	n=15	n=11	n=5
Top 2	67%	36%	100% △
Bottom 2	13%	0%	0%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Demographics

San Diego Incubator

Demographics	Wave 1		
	Wave 1 (all)	Wave 1 (not completed)	Wave 1 (completed)
Age	n=100	n=52	n=48
18 or under	15%	15%	15%
19-29	15%	12%	19%
30-39	28%	37% ▲	19%
40-49	17%	15%	19%
50-59	13%	10%	17%
60-70	10%	12%	8%
71 or older	2%	0%	4%
Average age	*39 years*	*38 years*	*40 years*
Gender	n=100	n=52	n=48
Female	56%	52%	60%
Male	44%	48%	40%
Ethnicity	n=100	n=52	n=48
Caucasian or White	58%	46%	71%▲
Hispanic or Latino	25%	33%	17%
Asian	7%	8%	6%
African American or Black	6%	10%	2%
American Indian or Alaska Native	3%	6%	0%
Native Hawaiian or other Pacific Islander	0%	0%	0%
Other: (Please specify)	5%	10% ▲	0%
Prefer not to answer	6%	2%	10%
Education	n=100	n=52	n=48
Less than high school (I'm still enrolled in high school)	14%	14%	15%
Less than high school (I'm no longer enrolled in high school)	0%	0%	0%
High School/GED	4%	8% ▲	0%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Community college/technical training or certificate	4%	4%	4%
College degree (BA/BS)	29%	25%	33%
Graduate or Postgraduate degree	49%	50%	48%
Employment	n=100	n=52	n=48
Full-time student	22%	25%	19%
Employed full time at one job	27%	23%	31%
Employed full time, working multiple jobs	14%	15%	13%
Employed part time	7%	10%	4%
Unemployed	2%	4%	0%
Self-employed	22%	19%	25%
Out of the workforce (e.g. stay-at-home parent, disabled)	0%	0%	0%
Retired	6%	4%	8%
Primary field you work within	n=70	n=35	n=35
Arts & Culture	24%	29%	20%
Education	20%	20%	20%
Business & Management	9%	6%	11%
Environmental Science	6%	5%	6%
Government	4%	9%	0%
Human development	4%	6%	3%
Health/public health	1%	0%	3%
Computer Science	1%	0%	3%
Mathematics	1%	0%	3%
Physical Science	1%	0%	3%
Public Policy/public administration	1%	3%	0%
Other	26%	23%	29%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

San Diego Incubator

"In the preceding 12 months have you done any of the following **arts** activities?" *(Yes or No; Check all that apply)*	Wave 1		
	Wave 1 (all)	Wave 1 (not completed)	Wave 1 (completed)
	n=100	n=52	n=48
Emailed, posted, or shared artwork (your own or others; includes photos & music)	85%	90%	79%
Used TV, radio, or the internet to access art or arts programming	89%	87%	92%
Attending a live music, theater, or dance performance	94%	92%	96%
Took a class or lesson (whether in or out of school) in an art form or art subject	58%	54%	63%
Performed or practiced in a specific art form (e.g., dance, singing, classical music, etc.)	68%	63%	73%
Attended a professional conference related to the arts	42%	44%	40%
Attended an art museum or gallery	92%	90%	94%
Read an arts-focused blog	70%	65%	75%
Visited a crafts fair or a visual arts festival	86%	88%	83%
Taught an art class or lesson	41%	42%	40%

"In the preceding 12 months have you done any of the following **science** activities?" *(Yes or No; Check all that apply)*	Wave 1		
	Wave 1 (all)	Wave 1 (not completed)	Wave 1 (completed)
	n=100	n=52	n=48
Read a science-focused blog	74%	73%	75%
Taught a science class or lesson	40%	42%	38%
Used TV, radio, or the internet to access science programming	92%	96%	88%
Attended a professional conference related to science	48%	48%	48%
Visited a science festival	44%	46%	42%
Took a science class or lesson (whether in or out of school)	56%	54%	58%
Participated in a science café	13%	17%	8%
Emailed, posted, or shared scientific information (e.g., quote or article of interest, etc.)	85%	87%	83%
Performed a science experiment (informally or formally)	61%	58%	65%
Attended a science museum	78%	77%	79%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Chicago Incubator

Demographics	Wave 1		
	Wave 1 (all)	Wave 1 (not completed)	Wave 1 (completed)
Age	n=88	n=64	n=24
18 or under	17%	17%	17%
19-29	30%	34%	17%
30-39	18%	19%	17%
40-49	17%	16%	21%
50-59	15%	11%	25%
60-70	3%	3%	4%
71 or older	0%	0%	0%
Average age	*35 years*	*33 years*	*39 years*
Gender	n=88	n=64	n=24
Female	68%	61%	88% ▲
Male	30%	36% ▲	13%
Other	2%	3%	0%
Ethnicity	n=88	n=64	n=24
Caucasian or White	52%	50%	58%
Hispanic or Latino	18%	22%	8%
Asian	10%	13%	4%
African American or Black	18%	17%	21%
American Indian or Alaska Native	3%	5%	0%
Native Hawaiian or other Pacific Islander	1%	0%	4%
Other: (Please specify)	3%	5%	0%
Prefer not to answer	2%	2%	4%
Education	n=88	n=64	n=24
Less than high school (I'm still enrolled in high school)	17%	17%	17%
Less than high school (I'm no longer enrolled in high school)	0%	0%	0%
High School/GED	5%	3%	8%
Community college/technical training or certificate	9%	13% ▲	0%
College degree (BA/BS)	24%	23%	25%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Graduate or Postgraduate degree	46%	44%	50%
Employment	n=88	n=64	n=24
Full-time student	26%	30%	17%
Employed full time at one job	39%	34%	50%
Employed full time, working multiple jobs	9%	8%	8%
Employed part time	11%	13%	8%
Unemployed	3%	3%	4%
Self-employed	11%	11%	13%
Out of the workforce (e.g. stay-at-home parent, disabled)	0%	0%	0%
Retired	1%	2%	0%
Primary field you work within	n=61	n=42	n=19
Education	43%	38%	53%
Arts & Culture	18%	19%	16%
Business & Management	5%	5%	5%
Computer Science	3%	0%	11%
Environmental Science	2%	2%	0%
Government	2%	2%	0%
Health/public health	2%	2%	0%
Physical Science	2%	2%	0%
English	1%	0%	5%
Human development	0%	0%	0%
Mathematics	0%	0%	0%
Public Policy/public administration	0%	0%	0%
Other	23%	29%	11%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Chicago Incubator

"In the preceding 12 months have you done any of the following **arts** activities?" *(Yes or No; Check all that apply)*	Wave 1		
	Wave 1 (all)	Wave 1 (not completed)	Wave 1 (completed)
	n=88	n=64	n=24
Emailed, posted, or shared artwork (your own or others; includes photos & music)	82%	83%	79%
Used TV, radio, or the internet to access art or arts programming	89%	91%	83%
Attending a live music, theater, or dance performance	98%	98%	96%
Took a class or lesson (whether in or out of school) in an art form or art subject	53%	55%	50%
Performed or practiced in a specific art form (e.g., dance, singing, classical music, etc.)	65%	63%	71%
Attended a professional conference related to the arts	40%	44%	29%
Attended an art museum or gallery	89%	86%	96%
Read an arts-focused blog	60%	64%	50%
Visited a crafts fair or a visual arts festival	83%	86%	75%
Taught an art class or lesson	40%	36%	50%

"In the preceding 12 months have you done any of the following **science** activities?" *(Yes or No; Check all that apply)*	Wave 1		
	Wave 1 (all)	Wave 1 (not completed)	Wave 1 (completed)
	n=88	n=64	n=24
Read a science-focused blog	83%	86%	75%
Taught a science class or lesson	48%	45%	54%
Used TV, radio, or the internet to access science programming	89%	91%	83%
Attended a professional conference related to science	48%	44%	58%
Visited a science festival	40%	39%	42%
Took a science class or lesson (whether in or out of school)	64%	66%	58%
Participated in a science café	13%	16%	4%
Emailed, posted, or shared scientific information (e.g., quote or article of interest, etc.)	84%	86%	79%
Performed a science experiment (informally or formally)	77%	75%	83%
Attended a science museum	84%	84%	83%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Worcester Incubator

Demographics	Wave 1		
	Wave 1 (all)	Wave 1 (not completed)	Wave 1 (completed)
Age	n=97	n=52	n=45
18 or under	19%	21%	16%
19-29	35%	39%	31%
30-39	13%	12%	16%
40-49	10%	12%	9%
50-59	12%	12%	13%
60-70	9%	6%	13%
71 or older	1%	0%	2%
Average age	*35 years*	*33 years*	*37 years*
Gender	n=97	n=52	n=45
Female	55%	52%	58%
Male	45%	48%	42%
Ethnicity	n=97	n=52	n=45
Caucasian or White	80%	69%	93%▲
Hispanic or Latino	9%	15%▲	2%
Asian	8%	13%▲	2%
African American or Black	1%	2%	0%
American Indian or Alaska Native	0%	0%	0%
Native Hawaiian or other Pacific Islander	0%	0%	0%
Other: (Please specify)	4%	6%	2%
Prefer not to answer	3%	2%	4%
Education	n=97	n=52	n=45
Less than high school (I'm still enrolled in high school)	17%	21%	11%
Less than high school (I'm no longer enrolled in high school)	1%	2%	0%
High School/GED	8%	8%	9%
Community college/technical training or certificate	7%	14%▲	0%
College degree (BA/BS)	32%	33%	31%
Graduate or Postgraduate degree	35%	23%	49%▲

▲=Significantly greater than all other categories
△= Significantly greater than one category

Employment	n=97	n=52	n=45
Full-time student	31%	39%	22%
Employed full time at one job	40%	35%	47%
Employed full time, working multiple jobs	7%	4%	11%
Employed part time	5%	6%	4%
Unemployed	0%	0%	0%
Self-employed	12%	14%	11%
Out of the workforce (e.g. stay-at-home parent, disabled)	0%	0%	0%
Retired	4%	4%	4%
Primary field you work within	n=63	n=30	n=33
Education	33%	40%	27%
Arts & Culture	13%	13%	12%
Business & Management	13%	10%	15%
Government	3%	0%	6%
Law/Criminal Justice	3%	0%	6%
Health/public health	3%	0%	6%
Child development	2%	0%	3%
Economics	2%	0%	6%
English	2%	3%	0%
Environmental Science	2%	0%	3%
Human Services	2%	0%	3%
Information Systems	2%	3%	0%
International relations/international development	2%	3%	0%
Statistics	2%	3%	0%
Computer Science	0%	0%	0%
Human development	0%	0%	0%
Mathematics	0%	0%	0%
Physical Science	0%	0%	0%
Public Policy/public administration	0%	0%	0%
Other	19%	23%	15%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category

Worcester Incubator

"In the preceding 12 months have you done any of the following **arts** activities?" *(Yes or No; Check all that apply)*	Wave 1		
	Wave 1 (all)	Wave 1 (not completed)	Wave 1 (completed)
	n=98	n=52	n=46
Emailed, posted, or shared artwork (your own or others; includes photos & music)	80%	73%	87%
Used TV, radio, or the internet to access art or arts programming	86%	81%	91%
Attending a live music, theater, or dance performance	89%	81%	98% ▲
Took a class or lesson (whether in or out of school) in an art form or art subject	47%	42%	52%
Performed or practiced in a specific art form (e.g., dance, singing, classical music, etc.)	60%	56%	65%
Attended a professional conference related to the arts	19%	19%	20%
Attended an art museum or gallery	84%	73%	96% ▲
Read an arts-focused blog	54%	50%	59%
Visited a crafts fair or a visual arts festival	76%	69%	83%
Taught an art class or lesson	24%	17%	33%

"In the preceding 12 months have you done any of the following **science** activities?" *(Yes or No; Check all that apply)*	Wave 1		
	Wave 1 (all)	Wave 1 (not completed)	Wave 1 (completed)
	n=98	n=52	n=46
Read a science-focused blog	65%	75% ▲	54%
Taught a science class or lesson	30%	33%	26%
Used TV, radio, or the internet to access science programming	91%	94%	87%
Attended a professional conference related to science	28%	23%	33%
Visited a science festival	21%	23%	20%
Took a science class or lesson (whether in or out of school)	55%	62%	48%
Participated in a science café	10%	12%	9%
Emailed, posted, or shared scientific information (e.g., quote or article of interest, etc.)	82%	87%	76%
Performed a science experiment (informally or formally)	69%	71%	67%
Attended a science museum	58%	58%	59%

▲ =Significantly greater than all other categories
△ = Significantly greater than one category