



World Biotech Tour

Powered by **BIOGEN FOUNDATION &
ASSOCIATION OF SCIENCE-TECHNOLOGY CENTERS**

**Findings from an
International Science Center
and Museum Program**

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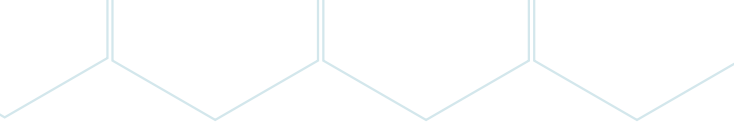
Foreword

Effective communication with the public about biotechnology's role in current and future scientific breakthroughs is critical for addressing many of the world's most pressing science-based issues. The World Biotech Tour (WBT) project was developed to promote science literacy worldwide and to increase the impact, visibility, and importance of biotechnology in improving standards of living, quality of life, and a better future for the world's population. These are global problems that must be addressed on a global level.

To achieve greater awareness about biotechnology in communities around the world, the Biogen Foundation and the Association of Science-Technology Centers (ASTC) partnered to create the WBT. The project leveraged the unique position of science centers and museums as trusted



Students from 12 countries in the 2015–2017 World Biotech Tour represent the Ambassador program at the Science Centre World Summit 2017 in Tokyo. Photo courtesy of ASTC.



public institutions for addressing complex scientific issues in their communities. Science centers and museums can promote public problem solving around vexing issues such as climate change, health and medicine, and preparing a technology ready workforce. With a worldwide member network of over 700 science centers, museums, and related institutions, ASTC estimates that in 2016 there were 120 million visits to ASTC science centers and museum members worldwide. If we are to reasonably create policy and technology that effectively addresses critical issues, we need a global, scientifically literate public and creative innovators working with the scientific community on addressing these challenges.

Why Science Centers and Museums?

The WBT utilized the many proven science engagement models that science centers and museums deploy to connect with their diverse audiences. Access to information alone (a.k.a. the deficit model) is not enough. People's daily experiences and interactions play a huge role in what information audiences are receptive to, which issues they take action on, and which behaviors they may be willing to change. This set of beliefs is influenced by the societal norms established in the area where they live, family values, friends, and many more facets of life experienced around the world. In essence, people and communities can be complicated and diverse, and as such they require different ways to engage with science that they can process and understand. To access a wide spectrum of audiences with different learning styles, the project requirements were designed to utilize several proven methods of public engagement and different kinds of experiences that many have come to expect from informal learning organizations. While the three most prominent components of the tour were the (1) Lab-in-a-Box kits, (2) Youth Ambassadors, and (3) biotechnology festivals, participating science centers and museums were required to implement additional components that are listed below with descriptions of how they supported the project's goals.

- **Biotechnology festival**

To access multigenerational learners, including families and people who would not commonly visit a science center

- **Ambassador Program**

To build an international cohort of science advocates and encourage youth to consider studies and careers in science, technology, engineering, and mathematics (STEM)

- **Lab-in-a-Box (LIAB) kits** (hands-on biotechnology activities that included museum-created activities)

To create a shared and customized WBT experience at each science center/museum

- **Science cafés and forums** (dialogue events)

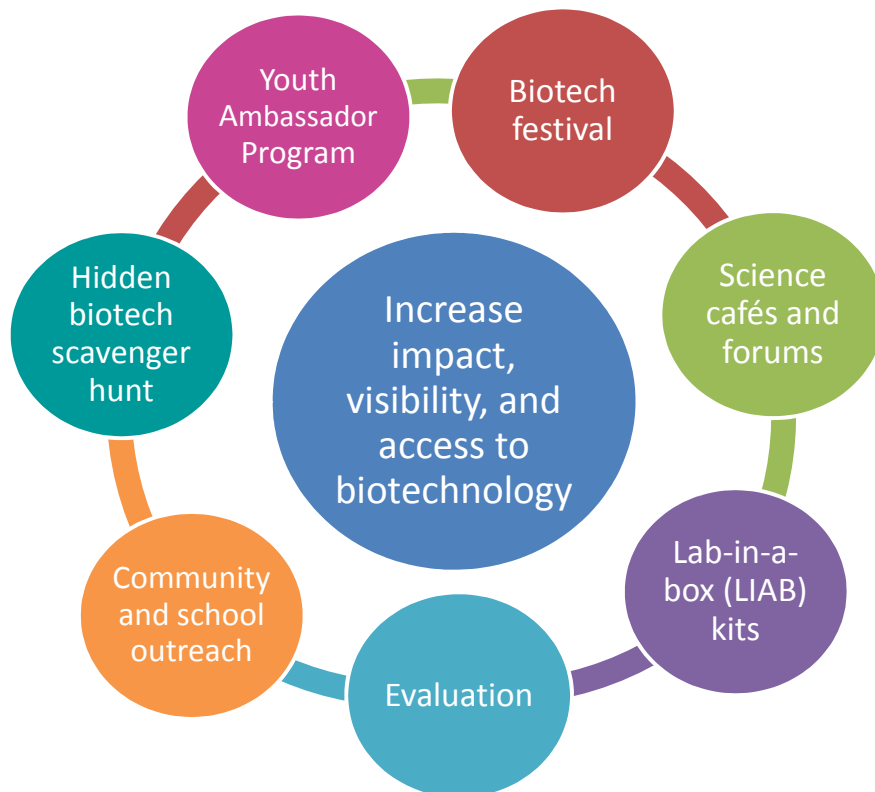
To promote open conversations about topics that affect the local and global community and encourage questioning and critical thinking with scientists and researchers, including doubts and even fears of future implications of biotechnology



- **Hidden biotech scavenger hunt** (facility-based events)
To train museum professionals to find the biotechnology topics in their existing exhibitions and programming
- **Community and school outreach** (pop-up events outside the science center)
To access people who would not normally visit a science event
- **Evaluation** (internal science center reports and external evaluator reports)
To learn from and quickly implement changes to future WBT events and better understand the development and execution of an international, multi-year science center program

A majority of the requirements listed involved live, in-person, public science events with an explicit biotechnology focus. These kinds of events are designed to engage the public with science in a face-to-face social context, and that social context is at least as meaningful as the messages and content delivered. Due to the fluidity of the project as it traveled from country to country, the creativity and commitment the science centers had in interpreting the requirements produced several unexpected, yet positive, outcomes.

Components of the World Biotech Tour



Locally Grown

It was important to spotlight the global influence of biotechnology while still celebrating the unique local connections and innovations the community contributes to the field. To balance this, ASTC's approach was to create a common skeletal framework for the science centers to build upon. By setting milestones rather than providing a detailed execution plan, each science center had flexibility on how they accomplished the requirements. This customizable plan gave WBT science centers and museums the opportunity to showcase the relevant biotechnology topics that are important to their individual communities and use different informal learning techniques that are most relevant to their audiences. The WBT was customized to fit the culture and style of each region and science center without losing the essence of the project—it doesn't matter where you live in the world, we can all benefit from biotechnology.

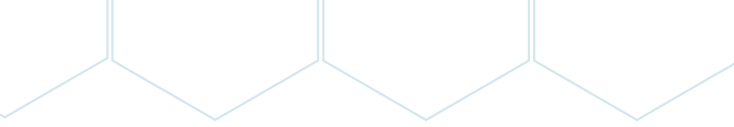
While developing the project, ASTC understood that many science centers, big and small, struggle with limited resources. A grant of \$25,000 USD was awarded to science centers that were selected through a competitive application process to assist with the majority of the costs to execute the tour. Science centers also pledged to raise additional funds if needed. Many went above and beyond our expectations in developing new and unique events and being resourceful with what they had. However, there were some limitations to the flexibility of the project. For there to be fluid communication among institutions, English was designated as the official language of the WBT. However, science centers were encouraged to translate materials to accommodate their visitors. While English did not cause any issues in the development and operational side of the project it proved to be an obstacle in the youth program.

ASTC Support

ASTC assisted with resources by providing the Lab-in-a-Box kits containing all the materials needed for five activities that science centers could use to build their repertoire of hands-on biotech activities. These were especially useful to science centers that did not already have biotech programming. The kits could also be donated to schools and community organizations. Requiring science centers to use the kits also fostered the global shared experience.

The activities in the Lab-in-a-Box were informed by a development committee made up of museum professionals and representatives from the Biogen Foundation and Biogen's Community Lab, a state-of-the-art laboratory classroom in Cambridge, Massachusetts, and Research Triangle Park, North Carolina, where local middle- and high-school students engage in hands-on biotechnology experiments and interact with scientists and other biotech professionals. The museum professionals included Elin Roberts from the International Centre for Life in New Castle upon Tyne, England, United Kingdom; Thomas McKenna from the Connecticut Science Center in Hartford, United States; and David Sittenfeld and Susan Heilman from the Museum of Science, Boston, Massachusetts, United States. Individuals were selected because of





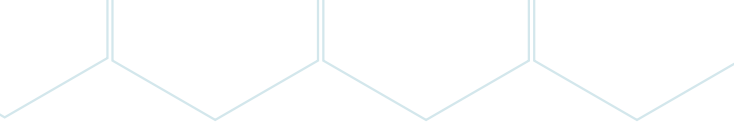
their expertise with hands-on science activity kits, especially with a biotechnology focus. Areas of focus for the kits were selected to create a set of activities that served as introductions to the topics and skills used in biotechnology, such as micropipetting, sample preparation, microscopy, and bioethics. Different engagement styles were also considered in the design of the kits, such as using game design, scientific tools, art mediums, and dialogue. Based on feedback from the participating science centers, new and improved activities were added in subsequent years that introduced more innovative topics and hands-on components. It was a requirement that most of the activities could be recreated with materials that were easily accessible, that they were safe for all ages, and that the activity documents and instructions would be offered for free on the project website (<http://www.worldbiotechtour.org/activities>).

An important feature of the project was its ability to evolve each year, while still meeting the main goals of the project, based on feedback and experiences from the science museums, partners, and participants. This was most prevalent in the Ambassador program because of the cultural and institutional differences of how museums interacted with local youth in their regions. As the Ambassador program became more significant throughout the project, ASTC was able to modify the original design of the WBT to shift the attention to the students, especially for their presence at the Science Centre World Summit 2017 event in Tokyo. Major modifications included an increase in the number of Ambassadors originally allowed to attend the event and a more significant program prepared in Tokyo, in coordination with the summit organizers, so that the Ambassadors Program and the students could be introduced on a global stage. The response from the summit attendees was very positive and increased interest in youth programs in general, global youth programs that connect young people around the world, and the capability of ASTC working with science museums to manage them.

What Is this Report?

The following summative report of the three-year project is an effort to discuss the main successes and challenges, highlight lessons learned, and suggest recommendations to assist science museum and informal science education professionals in developing similar future programs or improving current programs. It was also important for ASTC to take the opportunity with such a multi-faceted project to collect data that would be useful for the science center and museum field. In particular, observations were made on how science museums interpreted the same project requirements in different regions around the world, the unique methods used to communicate about a complex topic, the needs and barriers of developing a youth program, and how all these components were connected across an international network. This required a thorough evaluation plan that covered multiple sites and countries. A careful review was conducted on the two-pronged evaluation method used in the project that included reporting from within the participating science museums and external evaluation from local evaluators. Collecting evaluation from the two perspectives has provided valuable information about the





development, resources, and management required to execute this kind of program from the museum side and how those efforts impacted the interaction and feedback from the public-facing side through impartial evaluation. We recognize that for a complex program like the WBT there are better formats for evaluation that are discussed in the report.

International informal-science programs may not be a new concept in the science center arena, but as we move forward as a field, it may be worth considering more of these programs on different science topics and possibly on a larger scale. The WBT helps our understanding of how international programs are relevant to science centers and their local initiatives. May this report serve as a tool for science centers, museums, evaluators, and other science advocates in creating successful international programs that continue to connect people around the world through the wonder and awe of science.

Carlin Hsueh and Walter Staveloz

Association of Science-Technology Centers (ASTC)

International Relations Department

Executive Summary

The Association of Science-Technology Centers (ASTC) aims to help member institutions inform and educate the public about science through a global lens. The World Biotech Tour (WBT) was a three-year initiative designed to not only promote a greater understanding of biotechnology through public outreach and programming led by science centers and museums, but also as an opportunity for ASTC to collect useful data on the resources required and challenges encountered at different science museums around the world when implementing a long-term, multi-country program. The WBT involved students, teachers, researchers, science communication professionals, and the general public at 12 science centers and museums (“Hosts”) in 12 different countries: Australia, Belgium, Brazil, Canada, Finland, Italy, Japan, Poland, Portugal, South Africa, Spain, and Thailand. Participating organizations varied in size between thousands of visitors per year to hundreds of thousands of visitors at a single event. These variations, including their geographical locations, allowed a culturally unique visitor experience through activities developed and hosted at each site throughout the active tour year (January–November). The program, supported by the Biogen Foundation and ASTC, ran from 2015 to 2017 and included the following required components.

- Three-day biotechnology festival
- Ambassador Program
- Lab-in-a-Box (LIAB) kits
- Science cafés and forums
- Hidden biotech scavenger hunt
- Community and school outreach
- Evaluation

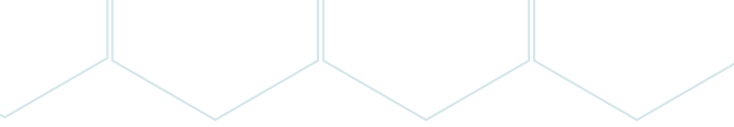
Using the English-written reports submitted by the 12 participating science centers and museums and the reports from the third-party evaluators contracted at each location to observe the project, this meta-study report on the project aims to understand the factors that hinder or facilitate science centers and museums’ participation and achievement in a long-term international project promoting a specific science theme—biotechnology.

Key Findings by Component

Lab-in-a-Box (LIAB)

All 12 Hosts used the LIAB activities, with one Host using them as part of a teacher training program. Seven of the Hosts only used LIAB activities at their festivals while five used them at their festival and in other settings. The most popular LIAB activity was Pipette by Numbers, followed by Take a Cellfie, and Virus Slayer. On the second year of the Tour, a new activity was





developed (Paramecium Symphony). The least popular activity was Let's Talk. Overall, LIABs received very positive feedback from Hosts.

Ambassador Program

High-school students were recruited to serve as Ambassadors. The types of students attracted to the Ambassador program have outside time pressures, regardless of their level of academic achievement, overall interest in science, or socio-economic level.

Although reaching new audiences through the WBT was a primary goal of the project, there was no evidence found from seven of the 12 Hosts that the Ambassador Program attracted new audiences. The five Hosts that indicated they were successful in reaching new audiences did so by partnering with other organizations to reach those audiences.

The strengths and weaknesses identified in the evaluation reports and Host reports state that the strengths of the Ambassador Program include (1) the development of presentation and communication skills by the Ambassadors, (2) increasing the Ambassadors' appreciation for and knowledge of biotechnology, and (3) the opportunities provided for the Ambassadors to connect with Ambassadors from other countries and potentially travel to Tokyo for the Science Centre World Summit 2017. The weaknesses of the Ambassador Program include (1) the necessity of proficient conversational English to participate in the international exchanges online and through social media, (2) the amount of time invested by the Ambassadors and mentors, and (3) communication between mentors and Ambassadors and between mentors and Hosts.

Biotechnology Festival

Festival events focused primarily on family or youth audiences. In addition, all used the LIAB activities as part of their event and 10 had Ambassadors present at least one component of the WBT festival. In many cases, these two elements were combined, as Ambassadors were tasked with leading the LIAB activities during the festival.

Festivals were considered successful at creating an enjoyable experience that helped participants learn about biotechnology. Participants provided positive feedback for three festival requirements: LIAB, Science Café, and Meet-a-Scientist. The Scavenger Hunt received mixed reviews. According to Hosts, weaknesses of the festivals included (1) lack of good signage, (2) lack of media and production, and (3) lack of consistent "take-home messages" for participants with regard to biotechnology content.

One of the most notable impacts on science center Hosts seems to be the introduction of biotechnology programming that can be sustained long after the life of the WBT project.

Local Partnerships and Hosts

Each Host engaged partners from different sectors during the WBT, including research institutes, industries, schools, universities, public authorities, media, and other science centers and museums. Biogen affiliates that had offices near a Host engaged with Hosts in multiple ways,



from offering mentors, to tours in Biogen labs, to providing judges for final events and giving lectures to the public. In three cases, Biogen assisted partners in local media and press coverage.

Suggestions and Recommendations by Component

LIAB

Shortcomings identified by evaluators and Hosts were that the activities were all very staff-intensive and in many cases required facilitators that were knowledgeable about biotechnology. Proposals for future themes for LIABs focused on linking biotechnology with issues of local interest and themes that trigger discussions of the impacts of biotechnology in our daily lives. Hosts also made suggestions for improving and expanding the use of LIABs. These suggestions include (1) to use the activities in future teacher trainings (something that some Hosts already did), (2) to enlarge the activities to become regular workshops offered by the museums for families and school classes, and (3) to enrich the content in the activities and focus on future scenarios about biotechnology.

Ambassador Program

Recommendations to improve the Ambassador Program include (1) selecting a smaller number of Ambassadors and striving for socio-economic diversity within each cohort; (2) providing training for Ambassadors to improve their English communication skills; (3) providing additional support for Ambassadors beyond skill development, such as time management and career/personal counseling; (4) recruiting mentors earlier, clearly communicating expectations with them, and creating ground rules for communicating with their Ambassador; and (5) when attempting to reach new audiences, Hosts should partner with organizations that already have a track record with those specific audiences.

Biotechnology Festival

Three themes emerged across the recommendations made by evaluators: Signage and placement of activities within the infrastructure of the science museum, more use of social media when promoting events, and improve main messages of the event for festival attendees to “take away” from the event. Some of the Hosts and attendees noted the success of taking festival events outside of the science museum and into the community and recommend that science museums continue to add unique features to their events including art and cultural activities.

Local Partnerships and Hosts

Suggestions on how partnerships could be strengthened for future iterations of the WBT include (1) investing time and resources on building collaborations, (2) providing more project details and requirements to Hosts in advance, and (3) requiring partnerships with organizations that reach different audiences than those typically reached by the Host.



Conclusions

Hosts shared similar motivations and expectations for participating in the WBT. The international scope of the project was considered an asset and a motivating factor for choosing to participate. Hosts indicated that their participation in the project provided the opportunity for their science center/museum to reach out to policy makers or media and to reinforce their visibility in the country. They also appreciated having the opportunity to initiate discussions around biotechnology and related research.

Final Reflections on WBT Components

The results from the meta-evaluation document the success of the program's implementation model, in that each of the key components were transferred across and implemented in 12 science centers around the world. The WBT included training more than 100 Ambassadors, the use of five biotechnology labs in numerous locations, and weeks of festival programming. Though exact numbers are not available, the WBT reached hundreds of thousands of participants in its first three years.

Lab-in-a-Box activities became a great resource for Hosts and were well-received by participants. They were often used by Ambassadors to improve their science communication skills. Perhaps not surprisingly, Hosts plan to continue using the WBT kits beyond the life of their tour.

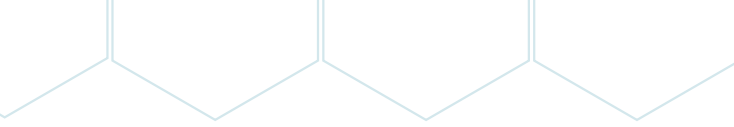
The importance of the Ambassador Program within the WBT changed over time. The Hosts rarely mentioned Ambassadors when describing their preliminary motivations to participate in the WBT. This changed during each tour stop as Hosts and evaluators alike recognized the impact the program had on everyone involved. Across the three years of the project, the Ambassador Program evolved to become the flagship component of the WBT. This program seemed to fill an important niche for Hosts by providing a new and meaningful touchpoint with local youth and industry professionals.

Final Reflections on the WBT Model and Evaluation

In its first iteration, the WBT was designed to allow for maximum flexibility in its implementation, so that Hosts could adapt the program as needed to meet their local resources and culture. This seems an appropriate choice for a new initiative that deploys this type of new programming model, as it provides formative information about the how Hosts choose to implement each element of WBT. On the other hand, this flexibility makes it difficult to draw program-wide conclusions.

Local WBT evaluations were multi-method and tended to focus directly on programmatic elements of the initiative. This approach is appropriate for the first year of a new project, as it has the greatest potential to help document the value of WBT components at the local level. However, the focus on programmatic elements does not necessarily serve ASTC and Biogen's larger goals of understanding the broad value of the program.





Though the summative evaluation cannot document the full list of anticipated results, learning from the flexible nature of both the program and evaluation design should help the program's leadership team develop additional supports and constraints for future WBT programs. Similarly, the evaluation methods used to collect data on specific components seemed to converge around particular topics. ASTC and Biogen might consider creating a small set of common measures that could be translated and required as part of future evaluations.

A third party evaluator recommended that it would be beneficial to standardize and harmonize, to some extent, the evaluation tools and criteria to build a longitudinal database and a historical knowledge. Also, it can be useful in monitoring the evolution of certain aspects over time. The data can then be used by future ASTC evaluation teams. ASTC should propose a methodological framework that specifies the aspects that should be minimally assessed by any WBT evaluation teams. This recommendation captures best practices from the multisite evaluation (MSE) literature by offering ASTC and Biogen suggestions for specific supports that would streamline the evaluation process. One potential solution: the negotiated centralized evaluation model. The model includes three stages: (1) creating local evaluations, (2) creating the central evaluation team, and (3) negotiating and collaborating on the participatory MSE.

As designed and implemented, the WBT was successful in achieving many positive outcomes and has created a strong foundation on which to build. The findings in this report, lessons learned, and experience gained during this initial effort can help inform the planning of future iterations of WBT and other collaborative informal science learning efforts of international scope.

Project Background

The World Biotech Tour (WBT) was a three-year initiative originally designed to promote a greater understanding of biotechnology through public outreach and other programs lead by science centers and museum. The WBT involved students, teachers, scientists, science center professionals, and the general public across six continents at 12 science centers and museums in 12 different countries: Australia, Belgium, Brazil, Canada, Finland, Italy, Japan, Poland, Portugal, South Africa, Spain, and Thailand. It was required that each science center and museum (Host) participating in the WBT would provide a culturally unique visitor experience through activities developed and hosted at each site throughout the active tour year (January–November). The program, coordinated by the Association of Science-Technology Centers (ASTC) and supported by the Biogen Foundation, ran from 2015 to 2017 and included seven required components (Appendix A), the three most prominent being:

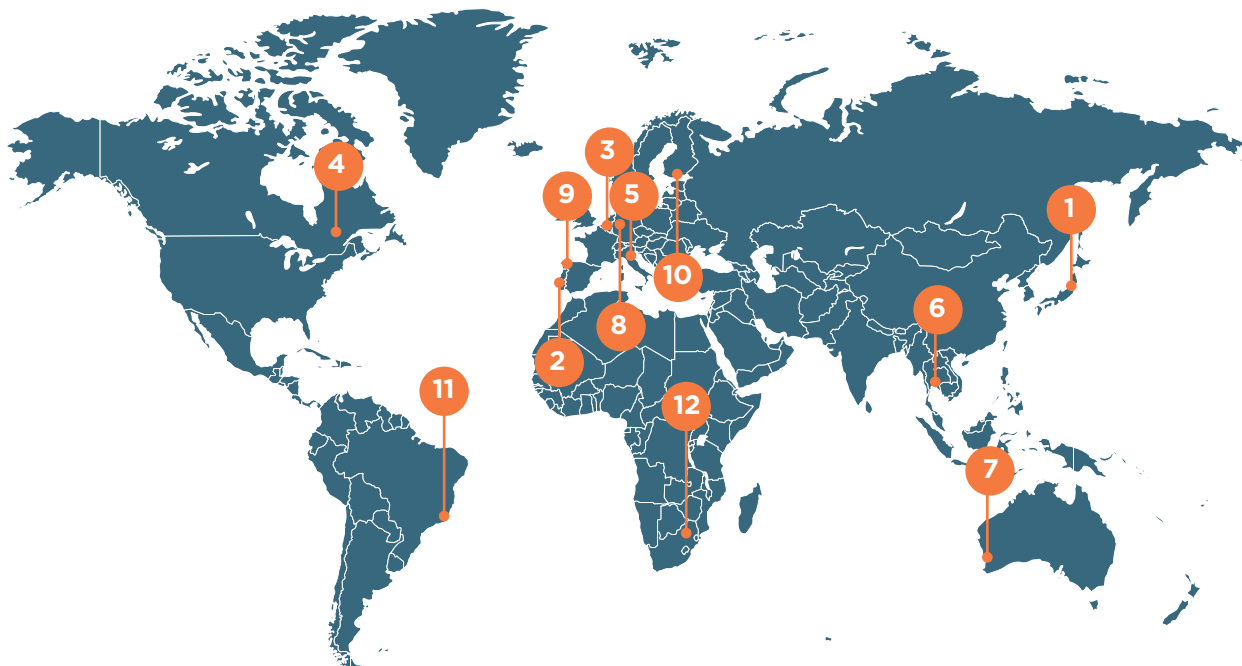


A WBT Ambassador displays a sample she collected from the St. Lawrence River in Montreal, Canada, while explaining her biotechnology project on bioremediation. Photo courtesy of Montréal Science Centre.

- 1 **Lab-in-a-Box (LIAB).** Educational kits that include hands-on activities for each WBT site. WBT Host museums could use these activities at any WBT event and supplement them with their own biotech activities as necessary.
- 2 **Youth Ambassadors.** High-school students were recruited by each Host, trained for several months in science communication, and mentored by STEM professionals. These Ambassadors gave presentations on biotechnology topics in their communities and schools while also interacting with Ambassadors from other countries via online exchanges. Each Host selected one Ambassador to participate in the Science Centre World Summit 2017 in Tokyo.
- 3 **Biotechnology Festival.** Each Host was required to organize a biotechnology-themed science festival to highlight the importance of biotechnology in our daily lives. Each festival included hands-on activities, speakers, and activities to engage different audiences.

Biotechnology solves problems in many fields, including health, medicine, agriculture, and energy, and offers a wide variety of interesting career options. A strong pathway for future scientists is needed to help continue innovation in this field, which will impact the lives of millions worldwide, as well as the health of our planet. The goal of the WBT is to raise awareness about the future of biotechnology and engage the general public—most importantly, students—by discussing, investigating, and exploring relevant topics.





The map shows the locations of the 12 science centers and museums that participated in the World Biotech Tour from 2015 through 2017.

Participating Science Centers and Museums

The World Biotech Tour (WBT) Hosts were selected through a competitive application process described in detail in a later section of this report.

For the rest of this report, the individual participating science centers/museums are identified either by their full name or the parenthetical abbreviated name and country.

2015 WBT Science Centers:

- 1 Miraikan—The National Museum of Emerging Science and Innovation**
Tokyo, Japan
- 2 Pavilion of Knowledge-Ciência Viva (Ciência Viva)**
Lisbon, Portugal
- 3 Technopolis, the Flemish Science Centre**
Mechelen, Belgium

2016 WBT Science Centers:

- 4 Montréal Science Centre**
Montreal, Canada
- 5 National Museum of Science and Technology Leonardo da Vinci (MUST)**
Milan, Italy
- 6 National Science Museum Thailand**
Pathum Thani, Thailand
- 7 Scitech**
Perth, Australia

2017 WBT Science Centers:

- 8 Copernicus Science Centre**
Warsaw, Poland
- 9 Domus-Museos Científicos Coruñeses (Domus)**
A Coruña, Spain
- 10 Heureka, the Finnish Science Centre**
Vantaa, Finland
- 11 Museu da Vida-Fiocruz**
Rio de Janeiro, Brazil
- 12 Sci-Bono Discovery Centre**
Johannesburg, South Africa

Selection of Hosts

For the first year of the tour (2015), Hosts were appointed directly by ASTC based on their proximity to a Biogen office, the active partnerships and projects already existing within the organization, and the Host's willingness to work closely with ASTC for this pilot year of the project.

In the next two years of the tour (2016 and 2017), ASTC used several dissemination channels to inform members and nonmembers about the call for applications. A combination of social media promotion, physical meetings, mailing lists, and webinars informed museums across the world about the opportunity to participate in the WBT. Recruitment efforts from ASTC increased from 2016 to 2017.

Below is a list of all the means of communication used for the call for applications and the numbers reached:

- Two webinars, one each in 2016 and 2017, attracted 49 registrations combined.
- Emails were sent to 105 and 97 ASTC members outside the United States in 2016 and 2017, respectively.

Percentage of Facebook recruitment posts' total reach, out of total followers through the WBT page during the application periods: 76% over seven posts in two months for 2016 Host applications; 133% over six posts in two months for 2017 Host applications.



The Montréal Science Centre held their WBT festival on the main floor of the science center so that all members of the public could access the event free of cost. Photo by Carlin Hsueh.

- Twitter recruitment posts via the WBT account: 2,602 impressions over three posts for 2016 Host applications; 4,861 impressions over six posts for 2017 Host applications.
- Announcements made through print, exhibit hall booth promotion, and on-stage presentation at the ASTC Annual Conferences, which had 1,635 participants from 40 countries in 2014; 1,663 participants from 47 countries in 2015; 1,552 participants from 43 countries in 2016; and 1,677 participants from 46 countries in 2017.
- Session presentation at the European network of science centres and museums (Ecsite) Annual Conference in 2017. While the number of people present at the session is unknown, the conference had 1,058 participants from 52 countries attend.

Museums and science centers that were interested in applying to be a WBT Host completed an application that included a list of criteria, a template, and a submission form (Appendix B). Baseline criteria in the application to become a WBT Host included a science museum's experience in executing a science festival, producing biotechnology-themed exhibitions and events, developing and managing a youth program, international programs that include exchanges and communications with organizations outside of their countries, and ability to provide the appropriate resources and staffing needed to meet the project requirements listed in the Project Description (Appendix A). ASTC adapted the application form from 2016 to 2017 to clarify certain elements of the project. The slight differences included the following:

- Clarification was given by ASTC that Hosts would be able to adapt their plan to their local situation while still maintaining its global significance.
- The age range for Ambassadors was lowered from 15–18 to 14–18¹.
- A question was added to ask potential Hosts about their experience with organizing engagement activities on science and society issues for the public, such as science cafés.
- A brief explanation was requested from the organizations of why they wished to host the tour.

Entirely different sets of organizations applied to host the tour in each year. The overall results of this process were as follows:

- For the 2016 tour, applications were submitted by 15 organizations based in 10 countries. Four Hosts were selected out of the 15 (27% acceptance rate), representing Asia, Europe, Australia, and North America.
- For the 2017 tour, applications were submitted by nine organizations based in nine countries. Five Hosts out of the nine applying were selected (56% acceptance rate), representing Africa, South America, and Europe.

¹ The lower age range was extended from 15 to 14 years of age due to a request from a Host that wanted to include younger high-school students in their program. (ASTC)

Evaluation Methods

Summative Evaluation of the WBT

This report serves as the summative evaluation document for the WBT. During the three-year run of the WBT, each of the 12 Hosts engaged an external evaluator to assess activities of the WBT at each specific site. Each evaluator submitted a work plan to describe the work, as well as preliminary and final reports to share results. Staff from participating Hosts also submitted reports throughout the project, including progress reports at the project midpoint and a final report (Appendix C) at the conclusion of WBT activities at their site.

ASTC appointed a three-person evaluation team to conduct the summative evaluation. The evaluation team used a meta-evaluation approach, conducting a secondary analysis of the two reporting requirements that were completed by each WBT Host: (1) Progress and final reports that were submitted by each Host, using a template provided by ASTC, and (2) Evaluation reports from each Host's local evaluation team. The evaluation team collected additional data as needed, through interviews and conversations with Hosts, ASTC, and the Biogen Foundation.

This report synthesizes data collected from these various sources to evaluate the overall performance of the WBT and describe lessons learned that can be applied to future global programming.

Local Evaluation of the WBT Program

Evaluation of WBT was conducted by a local evaluation team that was proposed by the Hosts and hired by ASTC to report on program progress and visitor reactions to WBT events. Hosts were provided with overall guidance about the evaluation, and then each potential evaluator submitted a statement of work as part of the selection process. The guidelines stated the following:

Another purpose of the WBT is to evaluate how a global project is received and how people react to the biotechnology theme. The data collected from each year will be used to improve the following year's program. Evaluation at the end of each year is essential for the future success of the program. We've built a flexible framework for the project so that each host site can execute the program within the comfort and capacity of their location and culture. This also means that the evaluation of each site must be custom to that location, which is why we are contracting evaluators at each site to observe and comment on how the program functions at that location. We encourage a collaborative relationship between the museum and evaluator so that communication about events and activities can be timely, allowing enough notice for the evaluator to arrange a representative to attend.

SOURCE: WBT PROJECT GUIDELINES

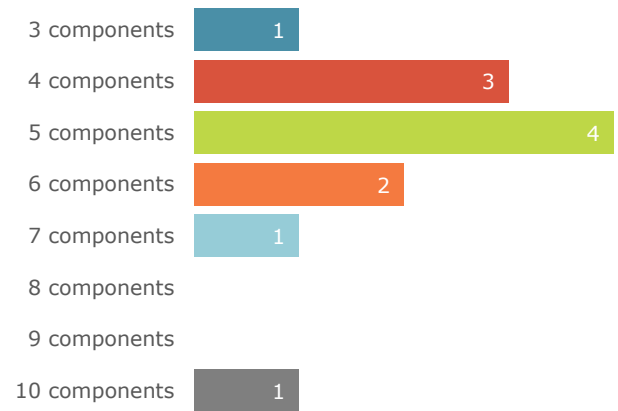
Additional evaluation requirements included the following: a focus on the Ambassador Program, with a suggested pre-post interview design; usability and end-user evaluation of the Lab-in-a-Box (LIAB); evaluation of the ways that the WBT helped Hosts make new connections with local groups; support from ASTC and Biogen; and any unanticipated results from implementing the project.

With regard to the evaluation requirements, all Hosts evaluated the Ambassador Program (12 of 12), and most evaluated LIAB (10 of 12). A total of 10 Hosts collected data to describe those who attended the WBT, and nine made conclusions about whether and how the program helped Hosts work with new audiences. The new audience(s) of interest varied based on the WBT component; these results are described in more detail in each of the sections that follow.

Hosts also evaluated several components beyond these baseline requirements, with the total number of components evaluated ranging from three to 10 (see Figure 1). Additional evaluation activities focused on the biotechnology festival and its related requirements, media campaigns for WBT, and the impact of the WBT on science centers. Evaluation of specific activities created for the WBT was also conducted.

Looking across the three years of the project, the scope and rigor of the evaluations grew over time. The earlier evaluations were less reliant on data from participants to help evaluate WBT components, and instead relied on the independent judgment of the evaluation team. Later evaluations, by contrast, often collected data from multiple participant groups to understand the value of WBT.

Figure 1. The number of WBT activities evaluated ranged from three to 10, with most evaluating four or five components.



Lab-in-a-Box (LIAB) Activities

ASTC, in collaboration with a group of museum experts and the Biogen Foundation, designed a set of hands-on activities that were provided in boxes/kits to each science center/museum site. ASTC offered these activities to Hosts for use at any of the WBT events. The activities covered the basic foundations of biotechnology research, the excitement of biotech innovation, and the impact biotechnology has in our lives.

The activities were not intended to cover the entire breadth of biotechnology, but instead were a way to scaffold the key messages of biotechnology and the spirit of the WBT. The LIAB consisted of facilitation guides, as well as the material needed to execute the activities. Each center was encouraged to develop their own activities and presentations to augment the LIAB activities and to make their WBT event unique to their country's site. Hosts used these activities in several ways, adapted them, and performed them in different settings and with different facilitators. The LIAB resources are available for download at the WBT website (<http://www.worldbiotechtour.org/activities>): Take a Cellfie, Pipette by Numbers, Virus Slayer, Let's Talk, and Paramecium Symphony.



The Ambassadors at Scitech in Perth, Australia, work together to try and solve the Lab-in-a-Box (LIAB) activity called the Virus Slayer during the World Biotech Tour festival at the science center. Photo courtesy of Scitech.

Development of the LIAB Activities

In 2014, ASTC invited four museum professionals, a Biogen Foundation representative, a Biogen Community Labs supervisor, and a consultant to develop the first ideas for the LIAB activities. The goal of this group was to brainstorm a set of three activities based on a list of proposed criteria that ASTC and the Biogen Foundation had prepared.

Following the brainstorming, ASTC made the final decision about the activities that would be included in the box and developed each into concrete activities. The development committee then reviewed the activities and provided feedback before they were shared with WBT Hosts. In 2015, four activities were provided: Take a Cellfie, Pipette by Numbers, Virus Slayer, and Let's Talk.

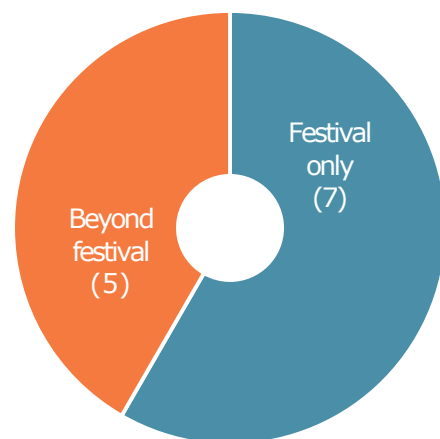
Feedback from the Hosts after the first year of the tour indicated interest in a more “edgy” activity for the public. As the Let's Talk activity was not popular in all the 2015 locations of the tour, ASTC decided to create a new activity to be added to the toolkit. A local Do-It-Yourself (DIY) bio group based in Baltimore, Maryland, was invited to assist in the development of a new concept that would add another conversational element to the LIAB kit. The activity was eventually co-created by ASTC and a new media artist close up, and the activity description and guides were again sent to the development committee, followed by a process of review and feedback. This new activity was the Paramecium Symphony. All five LIAB activities were made available to Hosts for the remainder of the program.

Overall Implementation of the LIAB Activities

All 12 Hosts used the LIAB activities and used at least one directly with the public in various circumstances (Festivals, schools, and more). As shown in Figure 2, this number includes seven who used LIAB within the context of their festival only, and five that used LIAB within the context of their festival and in at least one additional context.

One Host, MUST (Italy), implemented only the Take a Cellfie activity in their public events, deciding that the other activities did not fit the museum's educational approach and style. Even though the LIAB was not used at this site as originally expected, the Host did use the activities as training materials in professional development courses for teachers.

Figure 2. All Hosts used at least one LIAB during their festival, and five used them in at least one additional context as well.





A young festival-goer at Miraikan's World Biotech Tour festival uses a micropipette to deposit dots of paint on a numbered canvas in the Pipette by Numbers LIAB activity. Photo by Carlin Hsueh.

Some Hosts went beyond using the activities as a part of the WBT by designing their own educational resources based on the LIAB kits. Copernicus Science Centre (Poland), for example, used LIAB as the basis for developing their own educational activities around the theme of biotechnology, including plans² to modify Let's Talk as a role-playing activity for teachers to use in their classrooms.

Evaluation of LIAB

All 12 WBT programs used at least one of the LIAB kits created for the WBT program. Ten evaluations included a focus on the LIAB.

Four evaluations of LIAB relied on a single method to gather data on the program, while the other six were multi-method in design. Two used a single method that relied on surveys with participants while two evaluations relied on observation of the activities.

- Survey data were collected from festival participants in one case, and from students and teachers at participating schools in the other. In both instances, the surveys were used to document satisfaction with the activities and perceived learning.
- All observation data were collected as the labs were used in the context of the biotechnology festival. Observations tended to focus on the number of people who completed each lab and how engaged they seemed to be with the activities.

² At the time of this report, Copernicus Science Centre's plans to modify Let's Talk were not executed yet. (ASTC)

Survey and observation methods were also common among those who used multiple evaluation approaches, with six additional evaluations using surveys and seven more using observation to evaluate their LIAB. These evaluations used between two and four methods to evaluate LIAB overall. Most documented those who interacted with the labs and/or how the labs were used, four evaluations focused on satisfaction, and four focused on perceived learning from the labs. Other constructs included in one evaluation each were: activity efficacy, participant attitudes, participant awareness, and feeling inspired. Multi-method evaluations of the LIAB tended to collect data from a broader range of audiences, including participants and students who completed the lab activities, Ambassadors who helped deliver the labs to participants, mentors, and science center staff.

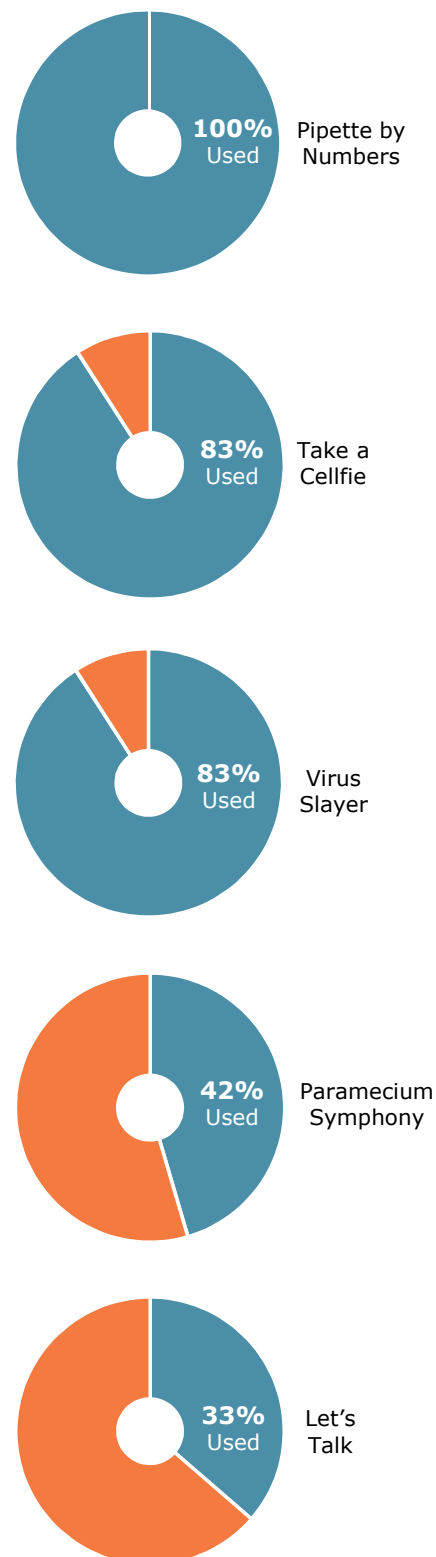
Host Preferences for LIAB Activities

As shown in Figure 3, the extent to which each LIAB activity was used varied. The one activity that every Host used was Pipette by Numbers. Virus Slayer and Take a Cellfie were also very popular activities. Despite the fact that Paramecium Symphony was only offered to Hosts in the second and third years of the tour, it proved popular and was selected by five Hosts out of the nine. Let's Talk was the least-used activity.

The use of specific activities depended on a series of factors. For example, some activities involved fragile equipment and were technically difficult to operate in an open environment, which was the case for Virus Slayer and Paramecium Symphony. Despite these difficulties, the activities were both very popular with the Hosts.

The time and the space required to conduct certain activities, such as Let's Talk, limited their use by many Hosts.

Figure 3. The percentage of Hosts that used each LIAB with the public varied by activity.



Some activities required very experienced facilitators on the topic of biotechnology, such as Let's Talk or Virus Slayer, which made their implementation demanding for some Hosts.

The common characteristics of LIABs that Hosts found appealing were the popularity with different age groups and ease of implementation in different settings.

Facilitators

All Hosts who used the LIAB activities with the public assigned the role of the facilitators to their museum/science center educators (see Figure 4). In addition to educators taking this role, it was noticed that Ambassadors also played the role of the facilitators (60% of WBT sites) following short trainings on the use of LIABs with different audiences. This became an opportunity for the Ambassadors to practice their science communication skills in front of different audiences and to prepare for their final presentations, if the Host planned one, where one Ambassador was selected to represent their country in Tokyo.

Locations

When it came to the implementation of LIABs, 10 Hosts used them inside their venues. In 11 cases, Hosts used them at the biotechnology festivals they organized or participated in. In two countries, Lab-in-a-Box activities were also implemented when visiting schools.

Weak and Strong Points of the Individual LIABs

All Hosts and evaluation reports indicated positive feedback from audiences concerning enjoyment, engagement, and interest in the LIAB activities overall. In several instances, both Hosts and evaluators noticed shortcomings linked to specific LIAB activities. It has been noted that these are not weak points mentioned by all Hosts but appeared occasionally from one site or another.

The one frequent theme was that LIABs are in general staff-intensive activities that in most cases needed experienced facilitators to deliver them effectively to the public:

"The activities were most successful when fully explained by a staff member and done in small groups or one-on-one."

Figure 4. The LIAB activities were presented mostly by science center staff and the Ambassadors.

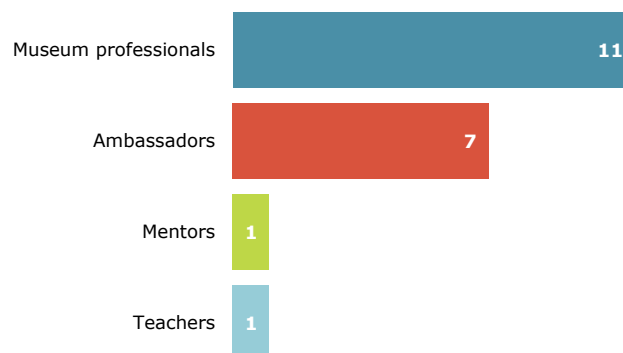
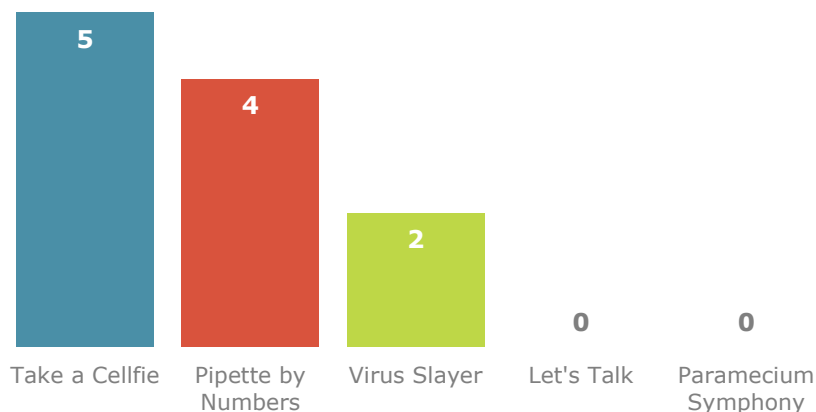


Figure 5. Looking ahead, Hosts plan to continue using three of the five LIAB activities.



“If the facilitator lacks familiarity with the major controversies and impacts of biotechnology, the activity may be experienced as boring and fail [to] fulfill its role of critical education.”

In many cases, Hosts adapted LIABs to fit their needs, used local materials, and created versions that would fit the contexts in which they were implemented (in a museum or science center, at a festival, or in a school).

Future Use of LIAB activities—Looking Ahead

All Hosts that used LIAB activities expressed their intention to use them again in the future. (See Figure 5 for the specific activities that Hosts plan to use in the future.) In some cases, they plan to continue using all the activities and in other cases only a subset. Hosts plan to use them in different contexts, such as in future summer camps for students, in teacher trainings, in their travelling exhibitions, or as part of their regular workshops and outreach activities.

“We want to apply Pipette by Numbers in our Enjoy Science Career exhibition, a mobile exhibition about STEM education.”

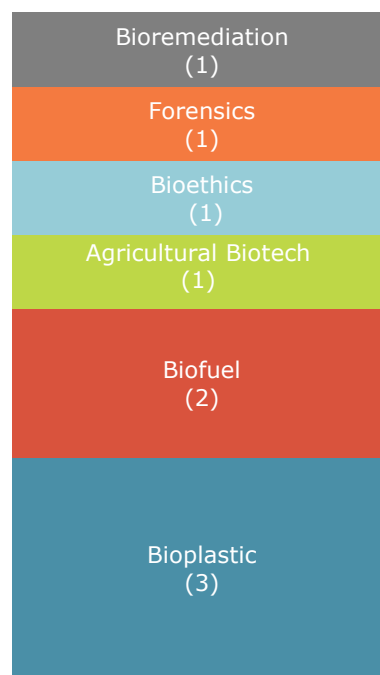
“We will have the Lab-in-a-Box activities on the road with the “Ciência Móvel,” the science truck of Museum of Life. Therefore, WBT project will be able to serve students and teachers of the cities in the Southeast of Brazil.”

In three cases [Miraikan (Japan), Ciência Viva (Portugal), and Sci-Bono (South Africa)], Hosts explicitly mentioned that other science centers and museums in their country were also using or intend to use the LIAB activities. For example, in Miraikan (Japan), the Nagano City Youth Science Museum, the Saku Children’s Science Dome for the Future, the Kashihara Children’s Science Museum, the Tachibana Astronomical Observatory, and the Yamanashi Prefectural

Science Center will be using the Take a Cellfie activity. Virus Slayer has been used by the Pavilion of Knowledge-Ciência Viva in Portugal as part of their travelling exhibition called *Viral*. Finally, the Sci-Bono Discovery Centre that hosted the tour in South Africa has already shared the LIAB activities with two more museums, Sci-Enza and the Cape Town Science Centre.

Hosts also indicated that they would be interested in having additional activities to use in the future, and they proposed several themes for future LIABs (see Figure 6). The suggestions usually linked biotechnology with issues of local interest. The intention was either to connect with research from the biotechnology industry at a national or local level or to encourage discussion of pressing environmental issues in the country. Many Hosts hoped to incorporate the discussion of biotechnology impacts in our daily lives in future educational activities.

Figure 6. Hosts recommended the following topics for new LIAB activities that might be created by ASTC in the future.



Overall Weak Points of LIAB Activities

The issue of timekeeping was a negative aspect of the LIAB activities mentioned by one Host. Most of the activities required that the public engage for more than 15 minutes, creating problems at venues such as festivals where attendees tended to stay for only a limited amount of time before moving on to the next stand. Another negative point has been the lack of sufficient guidelines for the facilitators of the activities, with the need for translation or audio material noted. The fragile equipment associated with some LIAB activities was also an obstacle for one Host. As mentioned above, most activities also required a knowledgeable facilitator who could answer often complicated questions on biotechnology, making it difficult to assign the facilitator role to nonexperts. Finally, the fact that most of the activities required that a facilitator be physically next to the activity made the whole process quite staff intensive.

Overall Suggestions for Improvement from Hosts

Hosts gave a number of suggestions to improve the existing LIAB activities and extend their use to different contexts. The most popular suggestions were each proposed by three Hosts: (1) to use the activities in future teacher trainings (something that some Hosts already did), (2) to enlarge the activities to become regular workshops offered by the museums for families and

school classes, and (3) to enrich the content in the activities and focus on future scenarios about biotechnology.

To make the experience even more rewarding for the audiences, two Hosts each proposed: (1) to prepare giveaways, (2) to enrich the guidelines from ASTC for the facilitators, (3) to ensure the technology in the LIABs is stable and reliable, and (4) to customize even further the kits to match local interest and needs. One Host suggested adapting the activities to cater to larger groups of people and for the activities to last even longer and become workshops offered regularly by the Host organization, including: (1) providing activities that can be implemented with material easily found/replaced locally, (2) providing activities that will cater to different age groups, (3) having some activities that promote collaboration and others that can be accomplished individually, and (4) providing activities that promote ethical discussions about biotechnology.



A Thai Ambassador demonstrates how to use the salad-spinner centrifuge in the Take a Cellfie activity at the National Science Museum's festival in Pathum Thani, Thailand. Photo courtesy of National Science Museum Thailand.

Ambassador Program

Each Host recruited a group of high-school students to serve as Ambassadors. They were paired with mentors (either scientists or science educators), received science communication training, and participated in research projects throughout the year-long WBT project. Research projects included scientific learning experiences in laboratories and addressing different science communication modes. They were also provided opportunities to interact with Ambassadors from other countries through online exchanges and social media platforms Yammer and Facebook. Their time as Ambassadors included them giving presentations about biotechnology topics in their schools and communities. Eleven of 12 Hosts recruited individuals to serve as Ambassadors. One Host, MUST (Italy), chose to recruit entire classes of students to serve as Ambassadors:

“The museum intended instead to offer this memorable educational experience to all kinds of young people, and hoped, [by] involving whole classes, to reach kids who normally would not have been reached by such a project, being marginalized and/or indifferent.”



Ambassadors from different regions in Portugal pose for a group photo after being selected to be in the World Biotech Tour at the Pavilion of Knowledge-Ciência Viva science center in Lisbon. Photo courtesy of Ciência Viva.

This divergence in the recruitment and selection process also led to a much larger group of Ambassadors. MUST (Italy) recruited 73 Ambassadors for the WBT while the other 11 Hosts each recruited between 5 and 19 Ambassadors. MUST (Italy) also divided Ambassador tasks among the 73 students, making it difficult to determine how many stayed involved throughout the project. Due to these differences, MUST (Italy) has been removed from the following analysis of Ambassador recruitment and retention.

Ambassador Recruitment and Retention

Hosts employed recruitment strategies that fell into one of four categories: (1) Open recruitment for any students, regardless of academic standing or socioeconomic circumstances; (2) Recruitment of students who have demonstrated interest in science; (3) Recruitment of students who are advanced academically; and (4) Recruitment of students who are from disadvantaged communities. Several Hosts used selection criteria that favored highly motivated and academically successful students. However, the focus of this section relates to the type of audience approached and invited to apply.

As shown in Table A, 11 Hosts selected 116 Ambassadors, with 94 (81%) of those serving throughout the course of the WBT at their specific site. Ambassador retention was high regardless of the recruitment strategy employed, ranging from 75% to 90% depending on the strategy. Interestingly, the reasons given for Ambassadors leaving the program struck a similar theme regardless of the strategy by which they were recruited. Time demands of life outside the Ambassador Program was most often cited as the reason why Ambassadors could not remain actively involved for the duration of the WBT:

“Originally, there were nine Ambassadors, but four of them had to quit, mostly because [of] having so many hobbies and other activities.” (Targeted: Advanced)

“Competing priorities seemed to pose a challenge in keeping learners involved in the programme.” (Targeted: Disadvantaged communities)

“Despite a careful choice, Ambassadors were still very occupied teenagers. Although general participation was very high, some had to miss meetings.” (Targeted: Science-inclined)



Ambassadors at Sci-Enza in Pretoria, South Africa, work with their mentors on their biotech projects. Photo courtesy of Sci-Enza.

Table A. Ambassadors were recruited through a range of methods that resulted in different success rates with regard to retention.

Type of Recruitment Strategy	Site	# of Ambassadors Recruited	# of Ambassadors Served Throughout	Percent Retention
Open (*Italy removed)	Belgium	7	7	
	Japan	5	5	
	Poland	8	6	
Total	3	20	18	90%
Targeted: Science-inclined	Montreal	10	6	
	Portugal	10	10	
	Spain	13	8	
	Thailand	19	17	
Total	4	52	41	79%
Targeted: Advanced	Australia	7	7	
	Finland	9	5	
Total	2	16	12	75%
Targeted: Disadvantaged communities	Brazil	15	13	
	South Africa	13	10	
Total	2	28	23	82%
Total (all Ambassadors)	11	116	94	81%

Many of the obstacles Hosts encountered with recruiting Ambassadors were external factors and unrelated to the WBT. For instance, the Super Science High School (SSH) program is a popular initiative in Japan with significant content overlap with the WBT Ambassador Program; therefore, Ambassador applications were limited to schools not participating in the more established SSH. As for obstacles related to the WBT, inadequate time allotted to promote the Ambassador Program was cited as a limitation to recruiting. Conflicts with local school calendars and other commitments were also mentioned as factors.

Evaluation of the Ambassador Program



An Ambassador at the Montréal Science Centre shows off her gut probiotic miniature golf game during the WBT festival in Montreal, Canada. Photo courtesy of the Montréal Science Centre.

All 12 Hosts evaluated their Ambassador Program. Evaluations of the Ambassador Program were typically multi-method and informed by data collected from several stakeholder groups. Surveys, interviews, and observations were used most often. Surveys and interviews were typically conducted with Ambassadors and their mentors. Observations focused on the implementation of the Ambassador Program and a range of Ambassador presentations.

Ambassadors contributed to the evaluation conducted by all WBT Hosts. The number of methods used to collect data from Ambassadors ranged from one to three per evaluation. Ten evaluations interviewed Ambassadors directly. Six evaluations also collected survey data from Ambassadors, and seven observed their work. The data collected from Ambassadors focused most often on their learning related to biotechnology. Changes in their attitudes, career interests, skills, and their satisfaction with the program were evaluated by approximately one-quarter of the evaluations.

Mentors contributed data to seven evaluations of the Ambassador Program. In each case, qualitative methods were used to gather data from mentors, including six that interviewed mentors and one that conducted mentor focus groups. One evaluation also gathered mentor data through a survey. Mentors helped document key aspects of the Ambassador Program and shared their satisfaction with the program, as well as their perspectives on the impact the program had on Ambassadors' attitudes, knowledge, and skills.

Festival-goers, Ambassadors' parents, teachers, and science center staff also provided input on the Ambassador Program.

Unique Attributes

Hosts and local evaluators made numerous observations about the unique nature of the Ambassador Program. Most of the statements can be categorized into one of three themes, as represented in Display 1 below. Each of these unique attributes is noteworthy and should be considered important to the overall success of the Ambassador Program.

The “teen as science communicator” theme not only provides tremendous opportunities for the Ambassadors to grow in their confidence, knowledge, and skills, but also influences how the Hosts think about engaging with this particular age group. The international dimensions (exchanges, potential trip to Tokyo, global reach of the WBT) were strong recruiting tools and added depth to the overall experience of the Ambassadors. The relationship with Biogen went far beyond a typical sponsor/recipient relationship. Hosts utilized local Biogen staff to engage with the Ambassadors. This encouraged more widespread ownership of the WBT by Biogen and also exemplified varied career paths of biotechnology.

Display 1. Categories of unique Ambassador Program attributes as described by Hosts.



Biogen
Involvement

“We started a close collaboration with [Biogen Portugal’s] CEO, Sérgio Teixeira. Sérgio was present in the Biotechnology Meeting (9th of January), where he could welcome the participants, together with Ciência Viva President, Rosalia Vargas. Sérgio Teixeira also took part of the jury in the event Talking Biotech (31st of January), being co-responsible for the selection of the 10 Portuguese Ambassadors.”



Youth as Science
Communicators

“The Ambassador Program has led to new paradigm in engaging science to the public. The relationship between scientist as mentors and the students as communicators is very interesting and valuable. Obtaining new ideas from youth on what and how science can be communicated also exceeded our expectation. We also see interest and value reflected from the youth when they communicate science.”



International
Connections

“The international connection made available through the Ambassador Program was very rewarding for the students. High-school students enjoyed being part of something that was bigger than their city and this is an opportunity not often provided to them or the science center.”

Communicating with New Audiences

For seven Hosts, there was no evidence found that the Ambassador Program attracted new audiences to the WBT events. All five Hosts that indicated they were successful in reaching new audiences did so by partnering with other organizations to reach those audiences. For instance, MUST (Italy) provided programs at the Indro Montanelli Public Gardens, and Technopolis (Belgium) worked with the Flemish Institute for Biotechnology (VIB) to provide programs at a local hospital. Ciência Viva (Portugal) provided programs and activities at a public market. Ambassadors in the Montréal Science Centre (Canada) and Museu da Vida (Brazil) provided programs at schools that are not typically served by the Hosts.

It should not be discounted, however, that the Ambassadors themselves represent a new audience for most Hosts. Although some Hosts do provide programs for high-school audiences, none offered anything approaching the depth of engagement that the Ambassador Program provided. The impact of this kind of engagement is summarized nicely by an Ambassador in Poland:

“The program encouraged me to stay interested in what the CSC [Copernicus Science Centre] is doing. Before I thought this museum is addressed mostly to kids, but it turned out that they have also [a]n interesting offer for teenagers and adults.... Now I look regularly at their Facebook page and website, and I check if they are doing something that might be interesting for me.”

“Now I look regularly at their Facebook page and website, and I check if they are doing something that might be interesting for me.”



A Polish Ambassador (right) explains her biotech project to students at the Copernicus Science Centre's WBT festival in Warsaw. Photo courtesy of Copernicus Science Centre.

Mentors

Professional scientists served as mentors to the Ambassadors for 10 of the Hosts. The other two Hosts, Miraikan (Japan) and Copernicus Science Centre (Poland), utilized their science communication staff to provide mentoring for the Ambassadors. Both scenarios appear to have worked well for the most part, although challenges arose with some of the scientists serving as mentors.

The scientists serving as mentors generally reported that they had little, if any, experience working with youth. Several stated in interviews that the time required of them to mentor the Ambassadors was underestimated by the Host during their recruitment. Some Ambassadors and Hosts also reported that the scientist-mentors were not responsive to inquiries because of their schedules. No such criticism appears in the reports of the two Hosts that utilized their staff as mentors.

Biotech Lens

The Ambassador Program helped some Hosts view their current and/or future programming through a biotechnology lens. Evidence of this impact appears in the reports from four Hosts [Ciência Viva (Portugal), Sci-Bono (South Africa), Domus (Spain), and the National Science Museum (Thailand)]. The most explicit statement came from the National Science Museum (Thailand):

“This event will not be terminal. The NSM [National Science Museum], a subsidiary of the Thai government, is planning to perform this type of activity annually, albeit not with the assistance of the ASTC. This program has shown to be effective and the government would like to continue this intervention in order to develop and encourage prospective scientists by selecting youth from high schools.”

One of the remaining eight Hosts [(MUST (Italy))] related that biotechnology had been a major part of their programming for several years prior to the WBT. No evidence was found in the reports indicating whether or not the Ambassador Program influenced the other seven Hosts in this way.

Plans to Use Ambassadors Beyond the Project

As shown in Figure 7, eight of the Hosts planned to use the Ambassadors in other future programs, three Hosts did not plan to use the Ambassadors beyond the WBT, and one Host was undecided when the final report was completed.

Figure 7. Most Hosts planned to continue the Ambassador Program after the WBT.





An Ambassador shows festival-goers at Museu da Vida in Rio de Janeiro, Brazil, how to transfer a sample of cheek cells from a microcentrifuge tube using a pipette in the Take a Cellfie Lab-in-a-Box activity. Photo courtesy of Museu da Vida.

How the Hosts plan to use the Ambassadors varies widely. Some Hosts plan to use them in regular programming for children, at schools, or during special events. Others plan to reconvene the group less frequently, ranging from once per year to a few times per year. Even the three Hosts not planning to engage the Ambassadors beyond the WBT intend to stay connected with them in some way:

“Scitech does not have any formal plans to use the Ambassadors in future, mainly because they are all in different school years and living at various distances from the center. However as some have applied to be volunteers we will continue to develop their science communication skills and continue a relationship with them in a new capacity.”

Regardless of the Ambassadors’ future involvement with them, Hosts frequently voiced the need to be sensitive to where the students were in their academic journeys. Plans to involve or not involve the Ambassadors usually depended on their availability as perceived by the Hosts.

Expectations for Ambassador Program

It is evident from the evaluation reports and the Host reports that most Hosts had clear expectations and that those expectations changed over time. Eight of the 12 Hosts stated that expectations were clear and/or specified clear expectations for the project. In some cases, the Hosts did not mention the Ambassador Program when describing initial goals of their participation in the WBT, and initially underestimated the impact of the Ambassadors. However, the changing expectations were typically about the significance of the Ambassador Program.

"[Ambassadors] consider the scientific knowledge they have acquired of great importance to their professional future, as demonstrated in their choices of university programs. Most of the Ambassadors who went on to college in September 2015 chose biotechnology-related programs."

Hosts, evaluators, mentors, and Ambassadors also agreed that these experiences gave the Ambassadors a higher level of overall confidence. In addition, the international component was mentioned very often as a strength and a positive aspect of the program. It encouraged students to apply to become Ambassadors and kept them engaged throughout the year.

Display 3 clearly shows what WBT participants consider as weaknesses of the Ambassador Program. The most commonly stated weakness and criticism of the Ambassador Program relates to the social media platforms used to promote communication among the Ambassadors. The social networking tool Microsoft Yammer was not used effectively during the first two years of the WBT. Several Hosts and evaluators suggested using a different social media platform more familiar to the Ambassadors, such as Facebook, to promote better participation. However, even when the WBT switched to Facebook for the third year, very few Ambassadors used it.

Some evaluators suggested that Ambassadors did not participate in social media because of their lack of comfort with the English language. This was also mentioned often as a limitation in interactions with Ambassadors from other countries. Display 3 illustrates that "English," "language," and "exchanges" were mentioned frequently as weaknesses of the Ambassador Program. Mentors were also cited often as a weakness, most frequently because of their unresponsiveness to the Ambassadors and the lack of time they had available to provide mentorship, or by the mentors themselves when describing their inability to meet what they perceived to be unrealistic expectations.

Other Hosts made modifications in the program execution phase of the Ambassador Program. Miraikan (Japan) was preparing to host the Science Centre World Summit 2017 and "as a result, efforts were concentrated on the Ambassador Program." Some Hosts integrated the Ambassadors into other science center programs, while others utilized other activities, events, and venues within their communities for the Ambassadors to engage with audiences.

The flexibility permitted by ASTC encouraged this broad adaptation from the Hosts, allowing them to respond to needs and opportunities available to them.

Suggestions/Recommendations

Hosts, evaluators, and the Biogen Foundation made numerous suggestions for improving future iterations of the Ambassador Program. Some clearly actionable suggestions are listed below:

- Select a smaller number of Ambassadors to deepen the engagement and enhance their experience. Strive for socioeconomic diversity.

- Provide training for Ambassadors to improve their English communication skills.
- Provide additional support for Ambassadors beyond skill development. Coaching in time management and career/personal counseling will maximize chances for their success.
- Recruit mentors from the beginning of the project. Clearly communicate expectations and time commitment. Create ground rules for communicating with their Ambassador.
- To reach new audiences, Hosts should partner with organizations that already have a track record with those specific audiences.

Adapting Program Requirements

Most Hosts modified the Ambassador Program in some way, either to adapt it to their centers, the communities they serve, or both. It started as early as the decision to participate, when Museu da Vida (Brazil) was motivated to take part in the Ambassador Program writing: “Few initiatives aiming to engage the public in scientific research, mainly cutting-edge research subjects linked to controversies in Brazil. Especially high-school students from public schools, mainly the poorest sectors of the society.” Some Hosts chose to adapt the recruitment process: Ciência Viva (Portugal) used its newsletter mailing list to identify potential Ambassadors, and MUST (Italy) chose to recruit entire classes of students “to reach kids who normally would not have been reached by such a project, being marginalized and/or indifferent.”



Ambassadors guide students through the Take a Cellfie activity at Museu da Vida’s WBT festival in Rio de Janeiro. Photo by João Laet.

Three-day Biotechnology Festival

As part of WBT, each Host was required to offer a three-day biotechnology-themed science festival designed to provide hands-on learning about the importance of biotechnology and how it affects our daily lives. Each was expected to include the following minimum requirements: a Hidden Biotech Scavenger Hunt to guide visitors in exploring the hidden biotech in the museum's existing exhibits; a Science Café, in which guest speakers hosted open forum discussions with the public on biotechnology; Meet-a-Scientist events, in which scientists presented activities to the public about their research; use of the Lab-in-a-Box (LIAB) hands-on activities; and Host-developed activities and presentations to complement each of the above and to make the WBT event culturally unique.

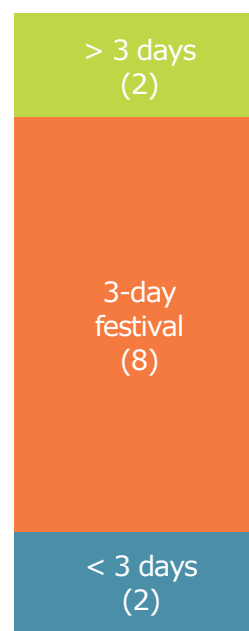
ASTC suggested a three-day schedule, with each day focused on a different audience, a different venue, or both. It was proposed that the first day include activities hosted at the science center/museum geared towards school groups and students; the second include activities hosted at the museum geared towards families and the general public; and the third day move the activities outside of the museum to a venue in the community.

All sites (100%) hosted a festival as part of their World Biotech Tour. As shown in Figure 8, 10 Hosts either met or exceeded the three-day requirement. The two festivals that fell short of this goal were each two days in length. The two that exceeded the expected three-day event were four and nine days long.

Eight of the 12 festivals chose to set their own schedule for programming, rather than following the suggested schedule from ASTC. The four that did follow the suggested format each hosted school and family festival days at their museum and then included at least one day of community programming outside of the museum as well.

Perhaps not surprisingly, the most common venue was the Host museum/center. All 12 Hosts implemented at least one festival program at their facility. However, community events provided an opportunity to offer programming in new venues, often with the hope of reaching new audiences. Indeed, festival events were hosted at a range of venues, with six hosting at least one festival program at a second venue. Secondary venues included schools, as well as several informal and unexpected learning venues: a research facility, a public library, a government facility, local streets, a popular food market, and a shopping mall.

Figure 8. Most Hosts met or exceeded the requirement to hold a three-day festival.



Nine Hosts created one or more standalone events to meet their biotechnology festival requirement, though three elected to integrate their WBT festival with other established events such as existing festivals or local science weeks.

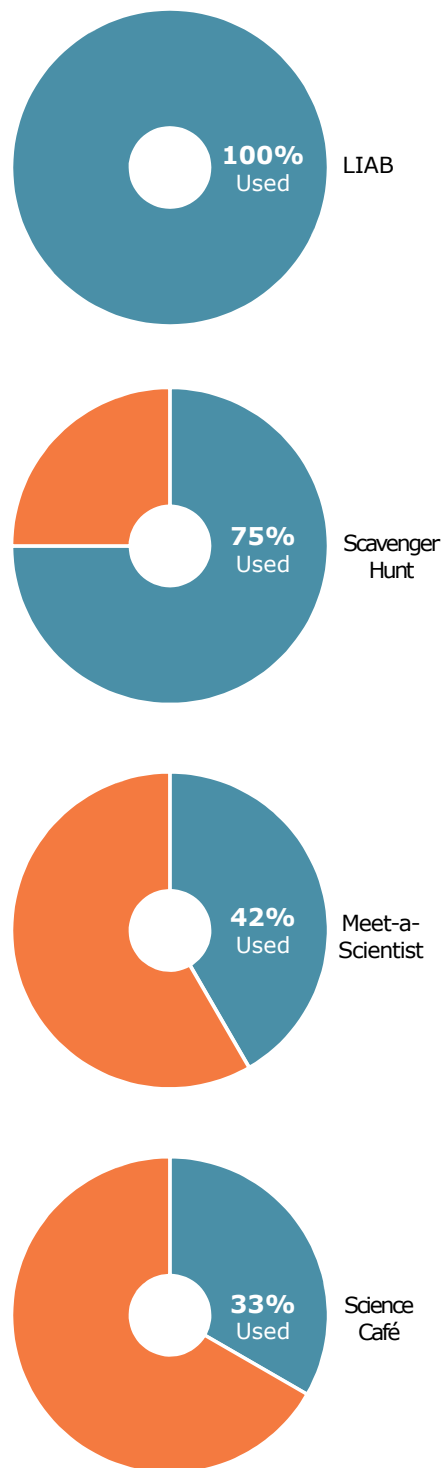
Regardless of festival length, the requirements from ASTC helped ensure that WBT festivals were similar in format. All festival events, for example, focused primarily on family or youth audiences. Similarly, all used the LIAB activities as part of their event, and 10 had Ambassadors present for at least one component of the WBT festival. In many cases, these two elements were combined, as Ambassadors were tasked with leading the LIAB activities during the festival. Hosts adhered to the specific requirements of the festival to varying degrees (as shown in Figure 9). One Host met all four requirements, while most included three of the four. One-quarter of the Hosts included one or two requirements in their festival.

LIAB activities were staged within the context of every festival, and some used the activities in other contexts, as well. Festival-based LIAB activities were hosted at the museum and targeted toward youth and families. In addition, one Host used LIAB activities as part of a festival program that was hosted at a local research facility.

The Hidden Biotech Scavenger Hunt was implemented by most Hosts. To create their Scavenger Hunt, museum staff were asked to revisit their existing exhibits to identify “hidden” biotech and then to guide festival participants through the same process by developing a hunt through the center’s exhibits to look for hidden biotechnology.

Nine Hosts held a Scavenger Hunt. Of those, eight took place as part of the festival. Scavenger Hunts were targeted toward students and families. As specified in the requirements, Scavenger Hunts were hosted at the

Figure 9. The percentage of Hosts that used each component of the festival varied.



museum most often. Two Hosts also created additional programs that were hosted outside of the museum; these included a local research facility and a street fair.

Fewer Hosts met the requirement for including a Science Café as part of their festival. Science Cafés were expected to bring together those who work in local biotech fields and the public to discuss the current advances and discoveries in biotechnology.

A total of five Hosts included at least one Science Café as part of their WBT program. Three cafés were held during the festival, and the other two were hosted separately. Four of the five were hosted at the museum. The fifth Host took advantage of the opportunity and used the cafés to expand programming to a venue beyond the confines of the museum itself, by holding their cafés at a government facility. By extension, these off-site cafés targeted a wider range of audiences than those hosted at museums; the audiences for the off-site cafés included government officials, researchers, entrepreneurs, teachers, and students.

The final festival requirement was called Meet-a-Scientist. This program was designed to provide the public with the chance to work alongside a real biotech scientist via activity stations at the museum. Five Hosts included this component in their festival.

Festival Evaluation

All 12 Hosts included a festival as part of their WBT programming, and nine of the 12 evaluated at least one component of their event. Festival evaluations tended to be dynamic, in that they often included multiple methods, audiences, and constructs. For example, the number of methods used per site to evaluate the festival ranged from one to eight. Surveys and interviews were used most often to gather feedback directly from participants. WBT evaluators also collected a range of data about the event itself through observation, timing and tracking studies, and mystery shopping.

The most frequently evaluated construct among festival evaluations was audience characteristics, such as demographic variables and prior experience with biotechnology; all festival evaluations gathered these data. Most WBT evaluations also measured attendance and other process variables to describe the event, participant knowledge of biotechnology, and participant



A World Biotech Tour evaluator (right) observes Ambassadors (in green shirts) facilitating WBT activities at MUST's pop-up event in the Giardini Indro Montanelli, a public park in Milan, Italy, as part of the nationwide "Meet me Tonight" event. Photo by Carlin Hsueh.

satisfaction with the event. Fewer sites evaluated whether participants felt inspired, their awareness of biotechnology, participant skill gains, or the efficacy of particular festival activities; even so, between one and four evaluations focused on each of these topics.

Data were collected from participants at the festival, as well as from those who helped implement the event.

- Participant audiences included adults only, families, children, and students. Families were the most common evaluation audience, followed by students; these groups were included in five and three evaluations, respectively. Each of the remaining participant audiences were included in one or two evaluations.
- Evaluation audiences who helped organize and then evaluate the event included Host staff, scientists, Ambassadors, and other event partners. Of these audiences, Ambassadors were included in three festival evaluations and all other groups were included in one or two evaluations.

Strengths and Weaknesses of the Festivals

Conclusion statements from the evaluation reports were culled to document the successes of the festival overall, and each specific festival component. Nine of the 12 evaluation reports included conclusion statements related to the success of the festival overall that were based on ratings or comments from participants. Five focused on the learning that occurred as the result of the festival and five on the public's satisfaction with the event overall. All provided statements about the success of the festival with regard to these constructs, though one evaluation report qualified the results by stating that the results were "good" but not "very good," compared to results the science center achieved with other events they conducted unrelated to the WBT. Two concluded that the festival increased the public's interest in biotechnology, and one concluded that the festival increased awareness of biotechnology. Local evaluators concluded in their reports:

"[WBT] has positively impacted visitor perception of biotechnology and its different fields of applications. The WBT



The Ambassadors from MUST (Italy) present their original biotech projects on biodegradable plastics to the public during the WBT festival in Milan, Italy. Photo courtesy of MUST (Italy).

“The WBT enabled the visitors to “demystify,” discover, and learn new things about the subject of biotechnology.”

enabled the visitors to “demystify,” discover, and learn new things about the subject of biotechnology. With the possible career opportunities in mind and the multiple fields related to biotechnology, more than half of the visitors (55%) are enthusiastic to encourage their children and their acquaintances to study and choose biotechnology.”

“Over 85% of the participants declared that they learned something new during the presentations. The presentations were, in general, comprehensible for the participants: 71% of them declared that they understood them very well. Participants declared that they would recommend similar presentations to family or friends (86% of all answers).”

“The majority positive responses regarding science and biotechnology suggest that the WBT activities were mostly successful in making science accessible for family and community audiences.... Their assessment of biotechnology and science was largely positive after participating in the activities. This result suggests that these activities were successful in getting people interested in biotechnology.”

Ten evaluation reports included data to describe the public who participated in the festival, and four commented specifically on the extent to which the festival helped engage new audiences. Three collected data to document participants' prior knowledge with biotechnology topics, and concluded that the festival was effective at introducing this content to new audiences. The fourth focused on bringing new audiences to the science center, concluding that the festival had been a success in that regard.

Feedback from participants was also quite positive with regard to specific festival requirements.

- Two of the five Hosts that included a Science Café as part of their festival also evaluated their event by collecting data from participants. One concluded that the café was easy for participants to understand, and that it was rated highly. The other noted that the café was effective at raising awareness of biotechnology.
- Three of the five Hosts that included Meet-a-Scientist at their festival also evaluated this requirement. All included a conclusion statement about this requirement. One focused heavily on the characteristics of the audience who attended a series of these events, and also noted that the lecture series was received positively by participants. The other two conclusion statements noted that interest in Meet-a-Scientist was high and that the program was successful at raising participants' awareness of biotechnology.
- Four of the nine Hosts that created a Hidden Biotech Scavenger Hunt evaluated this

festival requirement.³ Two included positive conclusion statements related to this component.

By comparison, the number of weaknesses and recommendations related to the festival were few. Three themes emerged across the recommendations made by evaluators. Seven noted the need for better signage in relation to festival booths or better placement of festival activities within the science center. Recommendations seemed to align with best practices in exhibit design, which is likely a strength for all WBT Hosts. Even so, evaluators made the following recommendations for Hosts to consider when adding a limited-time engagement to their venue and programming:

“Provide sufficient information on all activities. More and better information should be given on the Scavenger Hunt, as now only few people know it existed.”

“Runners of the laboratory activities noted that as labs are typically separate spaces, there should be an adequate amount of advertising in several locations around the science center in order to lure more visitors to the labs.”

“Publicity and advertising in large science centers can be very effective, but there is a danger that information about the project may be buried underneath the large amount of information at the center, and it seems as though this happened to a certain extent.... No distinction was made between this event and other permanent exhibitions or special events.”



Attendees at Copernicus Science Centre's Road to Life lecture series in Warsaw, Poland, had the opportunity to participate in a Science Café where the public could engage in dialogue with scientists currently involved in biotech research. Photo courtesy of Copernicus Science Centre.

³ The fifth evaluator relied on a mobile app used during the Scavenger Hunt to collect data from participants; unfortunately the app did not save the data, and so participant ratings were not available.

“The only critiques of the event were spacing of the event and pacing of large groups.”

“The infrastructure of the building, however, ended up creating separations between areas of the WBT exhibition, resulting in different evaluations by the researchers participating in the festival.... The outcome was an asymmetrical perception of the relative importance of what was being offered at stands located in different areas.... Low numbers of visitors or long periods without visitors may be linked to the peripheral location of the stand—people tend to concentrate in central areas.”

“The only critiques of the event were spacing of the event and pacing of large groups. The WBT exhibits were placed in a narrow area; space constraints were evident when larger groups of schools visited the event and students were massed around the event. To further compound the space limitations, multiple groups often converged on the LIAB exhibits, likely because of their interest in the activities.”

Six evaluations included recommendations concerning media and promotion related to the event. Of these, two focused on the need for better coverage of WBT over social media. Two also discussed the challenge of integrating the WBT with other existing events. Integrating with existing events was considered beneficial for reaching new audiences, but also a strategy that resulted in a trade-off with regard to being able to promote the event effectively. Evaluators’ conclusions are illustrated in the following:

“The WBT festival was associated with two larger events.... The advantage was that WBT communication was present in all their communication programs, yet one should also consider that media are very busy when such large events occur.”

“Some suggestions with respect to the execution of the program and the organisation can be made: (1) to establish more promotional support material to strengthen the impact of the initiative and improve interaction, such as:



Hosts created printed and digital materials for their WBT events using ASTC-provided graphics and messaging around the WBT. Photo by Carlin Hsueh.

posters, leaflets, roll-ups, descriptive posters of the festival, etc.; (2) promotion of online virality through the shared result of an activity. Practical example: make the contest of the “most beautiful Cellfie” and its voting through an online application spread by social networks. The objective of this is to move the initiative beyond the physical scene and direct impact and to extend its impact to the online environment with a greater scope.”

Five noted relative weaknesses in relation to participants’ understanding of biotechnology and the “take away messages” that the WBT festival hoped to achieve in relation to this topic. Some shared general concern about this topic, while others identified specific audiences that they believed would benefit from using a more differentiated approach to deliver festival content. Evaluators concluded:

“The School Biotech Festival and the WBT Family Weekend were also successful in that visitors enjoyed them but did not always appreciate the focus on biotechnology.”

“The evaluation evidence indicates that there were no consistent “take away” messages for audiences to understand about biotechnology. This could be a key point to address in future WBT engagement: ensure that there are at least one or two headline messages that are very clearly communicated. These messages should then be evident in the post-visit responses of audiences attending.”

The only festival requirement that garnered several recommendations was the Scavenger Hunt. Four evaluators made recommendations for this component. Three of the four focused on making the activity more visible to participants, as noted in one of the comments above. Two noted that this activity was among the least successful at the festival, in that it was rated with a full continuum of high and low scores.



The Pavilion of Knowledge, in partnership with TimeOut Lisboa, hosted a WBT pop-up event with biotech activities related to food, eating, and taste at Mercado da Ribeira, a popular public market and food place in the heart of Lisbon, Portugal. Photo by Carlin Hsueh.

Unique Festival Components

In addition to the common elements described above, a subset of activities was created specifically for the festival. These unique components included creative examples of festival programming that might provide inspiration or tried-and-true models for future Hosts.

Following ASTC's suggestion to include a community day in a remote location as part of their festival, Portugal's Pavilion of Knowledge-Ciência Viva chose to host one festival day in the middle of a local food market. The venue was described by the evaluator as follows:

"Mercado da Ribeira is a food market with an iron interior and a large dome, located near the Tagus River, in Lisbon. In 2014, Mercado da Ribeira was transformed into one of the major fashion food halls of Lisbon, offering food and traditional local products. The market has 30 restaurants and 500 sets, offering a family, fashion, and cosmopolitan environment attended mostly by young people and tourists.... Five stands were moved from PdC [Pavilion of Knowledge] to be installed at the center of the market.... The location of the stands at the center of the hall promoted a high visibility effect of the initiative."

The evaluator also made the following conclusion about this event:

"Regarding their evaluation of the experiments and the fact they were being performed in a market, the majority of the visitors we interviewed evaluated as very positive the fact that science had left the confined space of the laboratory, and the importance of having science communication activities in unexpected places.... Regarding the activities WBT took to the market, those best evaluated were "Test Your Taste Buds" and "Algae and Kefir Ice Cream." Test Your Taste Buds was in fact very well contextualized within the environment. It was a quick experiment, with an easy explanation, and it proved to be useful given the reasons that drive people to visit the place, eating."

Two sites created graffiti walls as part of their WBT. With regard to Domus's (Spain) graffiti wall, the evaluator concluded, "This activity was located outside the Domus. It was not an interactive activity but an activity for attraction."

...the fact that science had left the confined space of the laboratory, and the importance of having science communication activities in unexpected places.



Festival attendees at Domus's WBT festival in A Coruña, Spain, contribute to a biotech-themed graffiti wall at the science center. Photo courtesy of Domus.



Domus (Spain) hosted a science show about biotechnology with a local scientist during the WBT festival in A Coruña, Spain. Photo courtesy of Domus.

Domus also created a science show for the WBT, which was described by the evaluator as follows:

“A show of scientific disclosure specially aimed at secondary students. David Ballesteros, in charge of giving the conference, explained the concepts in an educational way combining the spectacular nature of the show with high level of rigour in contents... The spectacle was very closely related to biotechnology, something that was given full marks (excellent), as they looked at scientific topics in a simple and fun way... The spectacle was appropriate for the public attending as the majority of them were “bachillerato students” who could understand all the concepts dealt with in the activity. For this reason, this aspect was very highly evaluated with an average of 3.75 out of 4... The reasons that this aspect scored so highly were that the show had a great participative interest as various volunteers were invited to the stage and that, despite having theoretical parts in which younger attendees lost interest, this interest was recovered in the practical part of the explanation.”

Finally, the WBT also contributed to the development of a biotechnology-focused traveling exhibition that was developed by Scitech in Australia. Named *Bionic Me*, the exhibition was designed and created by Scitech and produced by Imagine Exhibitions, Inc. As described on the Imagine Exhibitions web site,

“Bionic Me explores the inventive and ingenious medical and industrial breakthroughs that have helped humans change the world. With a mix of hands-on and full-body experiences, Bionic Me focuses on technology that takes its inspiration from the natural world, in order for humans to overcome difficulties and enhance their lives.”

The exhibition was launched at Scitech in November 2016 and remained there through April 2017 before travelling to the Connecticut Science Center in the United States and to the Oil and Gas Discovery Centre in Brunei. This exhibition might serve as a resource for future WBT sites.

Ways that the Festivals Benefited the Science Center

One of the most notable impacts on science center Hosts seems to be the introduction of biotechnology programming that can be sustained long after the life of the WBT project. Eleven Hosts commented on ways that WBT helped to integrate biotechnology into their programming. While many examples were specific, the following global perspective was also shared:

From the very beginning, the project’s main coordinator pointed out her personal desire for the project to become permanent, given its educational potential and the engagement of young people in scientific topics. In this sense, actions were carried out to publicize the project.... This provided a great visibility for the WBT... favoring the development of negotiations for the continuity of the project with local financing.



Museum staff at Sci-Bono Discovery Centre in Johannesburg, South Africa, celebrate the WBT festival by posing in a group photo with ASTC’s Walter Staveloz, Director of International Relations, who attended festival events in Johannesburg and Pretoria. Photo courtesy of Sci-Bono Discovery Centre.

With regard to program requirements, all 11 plan to continue using the LIAB activities at their museum. Five shared multiple ways that they plan to continue using LIAB. In addition to using them in the museum, this group had plans to create teacher professional development around the materials; to create traveling kits for primary schools; to integrate the materials into camp, outreach, mobile learning labs, and holiday and other special event programs; and to share kit materials with other local science centers. Examples of specific plans to sustain other WBT festival elements were rare, though one site also plans to continue using another program requirement, their Hidden Biotech Scavenger Hunt.

Instead, Hosts shared several ways that they plan to continue with new programming that they created or received from partners as the result of WBT. These included a continued partnership with a local Biogen branch office (affiliate) to create online presentations for young students, a task series, science picnics, a new platform for sharing activities on the museum floor called Minute of Science, and an annual Biotech Day at the museum. Some Hosts will also continue to use the Phenylthiocarbamide (PTC) kits provided by Biogen. Other individual programming includes an Ambassador's landmine detection kit and a Let's Talk activity and related professional development course for teachers.



Hosts were able to adapt and add new activities to their WBT festivals to fit their audiences, such as Scitech's family-friendly activity of making cake in a cup to show the biotechnology behind baking. Photo courtesy of Scitech.

Local Partnerships and Hosts

The science centers and museums that hosted the WBT in the 12 locations across the globe were all well-established organizations with strong local and national networks of partners. Policy makers, as well as schools, research institutes, industry, media, and non-governmental organizations (NGOs) are natural partners for science centers and museums. The tour Hosts varied in their sizes, visions, budgets, and cultures; therefore, the types of partnerships they established varied from country to country.

In the case of the WBT, Hosts certainly used their existing networks of partners while creating new ones in many cases in order to fulfill the objectives of the project.

Types of Partners

It is prevalent throughout the reports that all Hosts managed to engage a number of partners in order to organize different elements of the tour. As would have been expected from the nature of this project, all Hosts had to engage research institutes and universities to assist them in finding mentors, to provide access to the festivals they organize, to offer speakers for the final events, and more. All Hosts also worked with schools in order to either invite them to their festivals, to recruit the Ambassadors, or to implement the Lab-in-a-Box activities. In certain cases, Hosts collaborated with public authorities at either the local or national level in order to organize Science Cafés, events in their museums, or outdoor activities. Partnering with broadcasters in some cases resulted in co-organization of events and promotion of aspects of the tour on a national level. Finally, in three countries Hosts recruited other science centers and

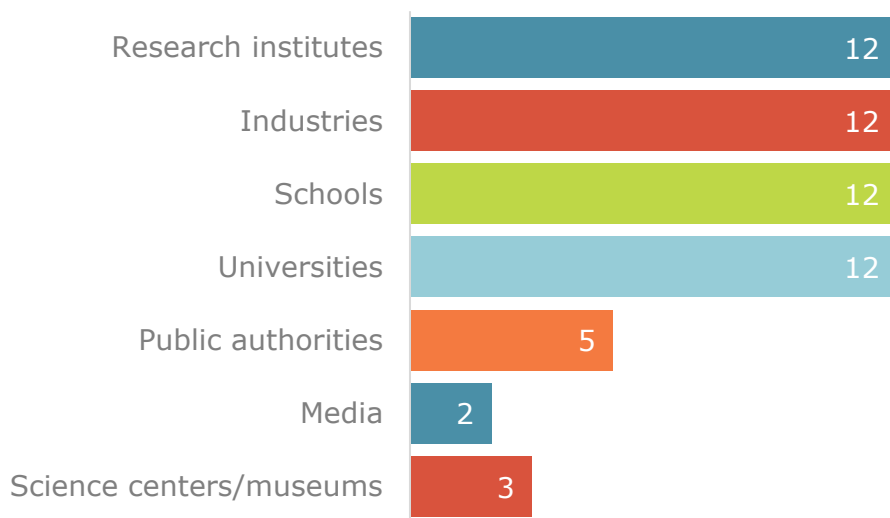


Figure 10. Hosts worked with a range of partners to create and host WBT programming.

museums in their country to co-organize elements of the tour [Sci-Bono (South Africa), Miraikan (Japan), and Museu da Vida (Brazil)]. Figure 10 shows the types of partners Hosts worked with during the tour.

Whether Hosts formed new partnerships while hosting the tour is not explicit in their reports. It is alluded to in many of the reports that in several cases the partnerships already existed (e.g., between science centers, or with several universities or schools), but there were also cases in which partnerships were clearly created due to the tour (such as the U.S. Embassy partnership in South Africa). The South African Host noted, “Through our partnerships, some of whom approached us and some we actively approached, the WBT has taught and given us yet another model that we could run our future programmes in.” The partnership with the Biogen Foundation and local Biogen affiliate was also something new for all organizations.

Biogen Local Branches

Biogen had local branches (affiliates) in ten of the 12 countries that hosted the tour. In two cases [National Science Museum (Thailand) and Sci-Bono (South Africa)], Biogen had no local branch. In all the countries where Biogen had an office, Hosts established a connection with them.

The Biogen branches varied, as in some cases the branch had a research and development department and in other cases only a sales department. According to the executive director of the Biogen Foundation, this variation posed a challenge for the local Biogen offices:

“Most of them have anywhere between 10 and 40 people, and they’re sales offices, so they might have a medical liaison who knows what they’re talking about, but for the most part they’re commercial people.”

The types of engagement fostered through local partnership with Biogen varied considerably. In many cases, Biogen staff was invited to serve on the jury that was brought together to select the Ambassador who would travel to Tokyo (that was the case for six out of the 12 Hosts). In at least ten cases, Biogen staff participated in the festivals or participated as part of the tour by giving



Biogen Brazil employee volunteers explain the PTC taste test activity at their booth during the Museu da Vida's WBT festival in Rio de Janeiro. Photo by João Laet.

lectures and interacting with the public. In three cases, Biogen offices assisted Hosts through their press offices and media connections, while in one case the branch invited Ambassadors to visit its labs and also provided mentors for the Ambassador Program.

From the Biogen Foundation's perspective, this level of engagement was valued by the local offices once they were involved with the WBT. The Foundation, however, felt as if approaching their local affiliates to get involved was a lot to ask:

"When we would call the affiliates up and say, "Hey, we're coming to Italy, we're so excited. By the way, you wouldn't happen to have 20, you know, volunteers and, and a ton of, ton of time over the next 10 months?" I mean, I always felt awful making that phone call."

Regardless, the local connections made between the Hosts and Biogen were a unique and valuable component of the WBT. It promoted Biogen in countries where the company has locations and provided the Hosts with resources and support from a source much more local than Cambridge, Massachusetts, United States, where Biogen is headquartered.

Sustainability of Partnerships

It is prevalent throughout the reports that biotechnology is a topic that all Hosts are very interested to continue engaging. For this reason, a number of the partnerships developed during the tour are likely to endure, though the extent of the collaborations will vary from one organization to another for a number of reasons, both internal and external (the economic situation in the country, for example).

Evidence already exists to confirm that local partnerships with Biogen will be sustained. In three cases, Hosts are brainstorming with their Biogen office to plan for future projects, and in one case, virtual meetings between Biogen staff and students are already underway.

Strengths and Weaknesses of Local Partnerships

Partnering with different organizations when designing and implementing the World Biotech Tour gave the Hosts opportunities to benefit in multiple ways. Linking with the right research



A Biogen Italy employee volunteer shows the results of the PTC taste test to Biogen Foundation Executive Director Chris Barr in Milan, Italy. Photo courtesy of MUST (Italy).

partners allowed them in three cases to participate in biotechnology festivals. For three Hosts, partnerships with research and industry enabled them to pay visits to research labs with their Ambassadors, giving them chances to meet role models and have a glimpse of the working environment of researchers. Connections with policy makers in Portugal resulted in the Science Café being presented in the country's parliament, while in Canada, the Science Café was organized in the museum in collaboration with Canada's French-language public broadcaster, Ici Radio-Canada. Finally, in two cases collaborations resulted in connecting the Hosts not only with individual industries, but also with clusters of industries. Partnering with new organizations gave two Hosts the chance to participate in nationwide initiatives, including Domus's (Spain) participation in the Science on Stage Europe project.

The two negative comments from Hosts concerning local partnerships involved the challenge of matching expectations between the partners and the Hosts, and the mentor relationship, which was often much more demanding than researchers originally envisioned.

Strong and sustainable collaborations require a considerable investment of time and personnel. To build better partnerships in the future, Hosts twice commented they would have liked to know more details in advance about their tasks as Hosts to better inform partners and engage them in the process. One Host proposed that contacting organizers of local biotechnology events from the very beginning would have been very helpful when fulfilling the events requirements for the tours. Finally, as diversity was one of the aims of the tour, collaboration between the Host and organizations that reach different audiences on a national scale would have assisted them in reaching that goal more quickly.



Volunteers from Apprentis en biosciences (Biosciences Apprentice) in Montreal, Canada, help facilitate the Pipette by Numbers activity during the WBT festival at the Montréal Science Centre. Photo courtesy of the Montréal Science Centre.

Feedback from WBT Hosts

This section shares reflections and feedback from Hosts about the WBT program overall. Quotes are used throughout to share feedback in Hosts' own words.

Hosts' Motivations to Participate

The most popular motivating factor for organizations to host the tour was the international collaboration component, a reason given by more than half of the Hosts.

“It is very important for us to connect with the rest of the world, which is what the World Biotech Tour allowed us.”

“Montréal is a multicultural city. It is very important for us to connect with the rest of the world, which is what the World Biotech Tour allowed us. We wanted to be part of an international event, to reach out and get inspired by other Science Center[s] and also show what we can do.”

Half of the Hosts also wanted to participate in order to begin a conversation on biotechnology in their country with four Hosts motivated to do this with teenagers.

“We were motivated to participate to focus on biotechnology, which wasn't a core program focus previously.”

“We wanted improve the way we work with young people.”

Three Hosts were motivated to foster their local partnerships as a way to reach different audiences. Three Hosts were motivated to participate in the tour in order to reach out to disadvantaged groups, and two Hosts were very motivated to collaborate with ASTC.

“Part of our vision is to become a platform where different parties, such as researchers, companies, schools and [the] general public can meet and interact around relevant science and technology-related topics. Heureka's role is to be a facilitator or mediator for the above interaction and therefore the World Biotech Tour serves our vision very well.”

“Few initiatives aiming to engage the public in scientific research, mainly cutting-edge research subjects linked to controversies in Brazil. Especially high-school students from public schools, mainly the poorest sectors of the society. Most of the activities are still top-down and based on the deficit model.”



A WBT Ambassador from Museu da Vida shows a young visitor how to use simple materials to convert a cell phone into a microscope for viewing cheek cells at an event in Rio de Janeiro. Photo courtesy of Museu da Vida.

"We wanted to try our first project with [the] ASTC network and also to be part of the global tour."

Two Hosts were motivated to better align with their national agenda by advancing the discussion on biotechnology. Finally, individual Hosts expressed their motivation to bring the international breadth of research into their country, to become a world-class science center, to make this a step to similar projects in the future, and to fulfill their mission to collaborate with schools.

Hosts' Expectations

When commenting on their expectations while applying for the WBT, half of the Hosts named the international collaboration component and the engagement with teenagers as two of the most important benefits they expected from hosting the tour.

"We expected to share, with other partner locations, ideas on activities/strategies/programs for the effective communication of biotechnologies."

"Work with youth was a new challenge for our team as we normally work with adults and while we aim at changing the way young people are taught we mostly empower teachers and educators to do so."

The biotechnology theme and the opportunity to organize a biotechnology festival were also expectations for four Hosts of the tour.

"Scitech saw the WBT as a great opportunity to communicate a science topic which was under-represented in our programing but relevant across many of our state science priorities."

In their applications, three Hosts anticipated finding out more about how biotechnology is perceived by the public and were hoping to become more familiar with the topic.

"Biotechnologies are at the centers of our lives, but the general population knows little about it. It is also an underrepresented topic in media, school, museums and science popularization in general. The festival was an opportunity to start a conversation about biotechnology, at least for a few days."



Science and Arts Event Director Wiktor Gajewski at Copernicus Science Centre in Warsaw, Poland, holds up the World Biotech Tour plaque during the launch event of the WBT's year-long presence at the science center. Photo courtesy of the Copernicus Science Centre.

Two Hosts listed among their expectations the forthcoming collaboration with the Biogen Foundation and the collaboration with the ASTC network. The tools provided to engage the public with science were an expectation for two Hosts. The discussion on ethical implication was an expectation for one Host, as well as understanding how the topic of biotechnology is perceived in other countries. One Host expressed the wish to reach out to disadvantaged groups via their participation in the tour; one Host wanted to promote collaboration within their own national network, and finally, one expected to connect better with the research sector in their own country.

Hosts' Suggestions to Improve ASTC's Management Efforts

Hosts have given their feedback on the management efforts of the ASTC office during the tour year. In addition to the very positive comments on the efficient communication between ASTC and Hosts, they gave a number of suggestions for improving this relationship.

Some Hosts wished for a more detailed outline of the expected tasks involved in hosting the tour. Other Hosts requested more flexibility in the tour schedule in order to better match



Professor Steven Rehen from the Federal University of Rio de Janeiro speaks to students at the Museu da Vida's WBT festival about current neuroscience research, ethics, and socio-economic impacts in Brazil. Photo by João Laet.

“Focusing on reaching both a wide audience and providing quality experience for a small group of young people is quite challenging.”

school calendars. There were Hosts who would have liked more guidance on how to reach different communities, more suggestions about potential formats for the award ceremony, more assistance with their social media strategies, and more exchange among Hosts. Finally, one Host would have liked an alumni exchange program for Hosts.

“The WBT could be greatly improved if the whole program was focused on Ambassadors training and activities event done by and for them. Focusing on reaching both a wide audience and providing quality experience for a small group of young people is quite challenging, both in organizational terms and even more so in communication.”



A WBT Ambassador from Copernicus Science Centre presents her biotech project on stage to a panel of judges and the public during the final WBT festival event in Warsaw, Poland. Photo courtesy of Copernicus Science Centre.

Conclusions and Recommendations

This study used a meta-evaluation approach to document key findings related to the first iteration of the WBT, a three-year initiative designed to showcase the role of science centers and museums in promoting a greater public understanding of biotechnology. The results indicated that WBT had broad appeal to the science center and museum community, given that 24 applications were received from 19 countries in the last two years of the program.

Hosts shared similar motivations and expectations for participating in the WBT. The international scope of the project was considered an asset and a motivating factor for choosing to participate. They indicated that their participation in the project provided the opportunity for their science center/museum to reach out to policy makers or media and to reinforce their visibility in the country. Hosts also appreciated having the opportunity to initiate ethical discussions around biotechnology and related research, and they shared specific expectations related to how WBT components could be used to enhance their existing programming.



At the final WBT festival event at Technopolis in Mechelen, Belgium, an Ambassador (center) is awarded a “ticket” and a trip to represent the science center at the Science Centre World Summit 2017 in Tokyo. Photo courtesy of Technopolis.

Final Reflections on WBT Components

The results from the meta-evaluation document the success of the program's implementation model in that each of the key components was transferred across and implemented in 12 science centers around the world. This work included training more than 100 Ambassadors, the use of five biotechnology labs in numerous locations, and weeks of festival programming. Tens of thousands of people attended WBT events, and hundreds of thousands more were engaged through social media and other online channels.

The LIAB kits proved to be a valuable resource for Hosts and were well received by participants as well. The materials were designed to meet the needs of Hosts in that they were easy to use without extended training, used simple technology that was readily available, helped connect biotechnology content to everyday life, and could be transported to venues outside of the science center.

The ready-made kits and facilitation guidelines also provided a context for staff and Ambassadors to strengthen their science communication skills in relation to complex scientific topics related to biotechnology. Perhaps not surprisingly, Hosts plan to continue using the WBT kits beyond the life of their tour, providing another indication of the kits' value.

The LIAB materials had the potential to help Hosts reach new audiences through both the festival and through school visits. The evaluations include some evidence to support that new audiences were reached as part of the festival, and that the topic of biotechnology was new to many audiences. The project and evaluation reports did not include evidence to suggest that Hosts used the LIAB kits to engage new schools that were not already partners with the Host institution. This could be considered a missed opportunity in the first implementation of the WBT.

The importance of the Ambassador Program within the WBT changed over time. The Hosts rarely mentioned Ambassadors when describing their preliminary motivations to participate in the WBT. This changed during each tour stop, as Hosts and evaluators alike recognized the impact the program had on everyone involved.

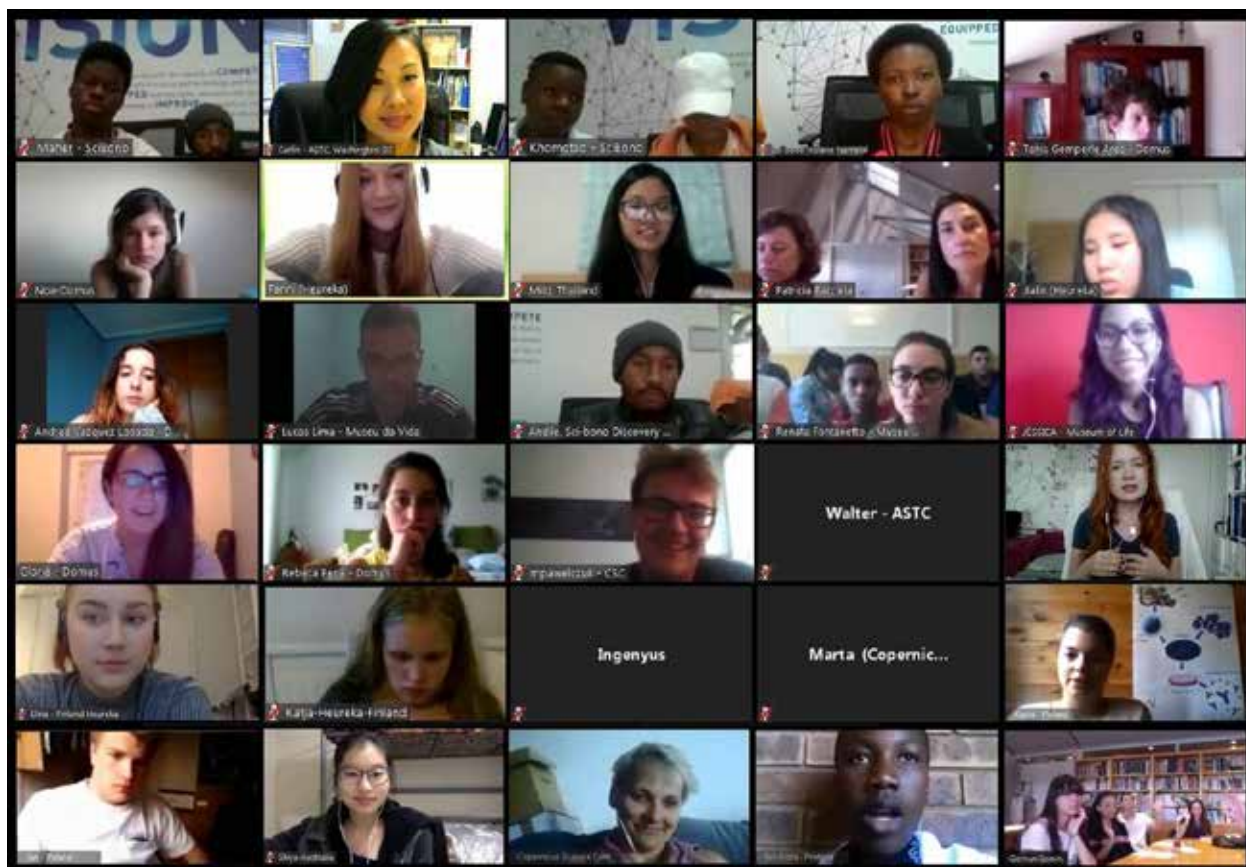
Across the three years, the Ambassador Program evolved to become the flagship



Young festival-goers in Tokyo complete the Hidden Biotech Scavenger Hunt at Miraikan during the WBT festival. Photo by Carlin Hsueh.

component of the WBT. It seemed to fill an important niche for science centers, by providing a new and meaningful touchpoint with local youth and industry professionals. The Ambassador Program also allowed science centers to integrate WBT program requirements, as Ambassadors were often a focal point of festivals and central to the delivery of the LIAB kits. Perhaps as a result, the programmatic and evaluation efforts devoted to the Ambassador Program increased over the three years of the program.

The Ambassadors developed strong presentation and science communication skills and increased appreciation for and knowledge of biotechnology. They gained self-confidence, and many of them are pursuing additional studies related to biotechnology. A few Hosts reached new audiences through the Ambassador Program, but only when they partnered with other organizations that provided an entrée to those audiences. And although the Ambassadors were as diverse as the 12 Hosts that recruited them, they shared similar challenges, such as time conflicts with competing priorities, English proficiency determining level of engagement with international aspects, and communication challenges with mentors.



Managers and Ambassadors met periodically through an online video platform (Zoom) to discuss a theme or do a science communication exercise with each other. Photo courtesy of ASTC.

All sites hosted a festival as part of their WBT. Most focused primarily on family or youth audiences. Festival participants rated these events as successful at creating an enjoyable experience that helped them learn about biotechnology. Feedback from participants was quite positive with regard to three of the four festival requirements, with only the Scavenger Hunt receiving mixed results. One of the most notable impacts of the festival was on the Hosts, which had the opportunity to introduce biotechnology programming that can be sustained long after the life of the WBT project. When compared to the number of strengths, the number of weaknesses and recommendations related to the festivals were few.

The WBT was also successful in connecting science centers with local professionals from Biogen. Though deep involvement from the Biogen affiliates could not be mandated, when it did occur, it was viewed as beneficial to the local sites during and after the WBT stop. Biogen staff served as judges, mentors, speakers, and workshop facilitators, and provided assistance with public relations.



Four Japanese Ambassadors (center front) visit the Biogen Tokyo office and exchange ideas about their WBT projects with Biogen staff. Photo courtesy of Miraikan.

Final Reflections on the Flexible and Iterative WBT Model

In its first iteration, WBT was designed to allow for maximum flexibility in its implementation so that Hosts could adapt the program as needed to fit their local resources and culture. This seems an appropriate choice for a new initiative that deploys this type of new programming model, as it provides formative information about how Hosts choose to implement each element of WBT. On the other hand, this flexibility makes it difficult to draw program-wide conclusions.

This report has helped identify a number of common choices that were made across sites, as well as common gaps in programming that can now be used to establish a tighter set of requirements for the next implementation. For example, a number of Hosts elected to have Ambassadors present the LIAB materials as part of their WBT festival and/or school-based programming. The strength of this decision lies in the fact that the LIAB materials are already expected to be of high quality given their development process. As such, they provide a context for Ambassadors to learn new content and strengthen their science communication skills as they share that LIAB content with other WBT participants.

The flexibility that Hosts were allowed when implementing the WBT figured prominently in how the Ambassador Program was executed at each site. In particular, the variability in the size of each Ambassador cohort made it difficult to draw program-wide conclusions and also created inconsistencies in project outcomes. A program involving five Ambassadors that self-select for their involvement is quite different than a program that involves 73 students who are taught by teachers who agree to participate.

Engagement levels also varied significantly, which led to vastly different experiences for the Ambassadors. There are also questions as to whether the unique and special opportunities offered by the Ambassador Program are diminished with large numbers of Ambassadors participating at specific sites.

Of the original program requirements, festivals offer the greatest opportunity for flexibility. ASTC and the Biogen Foundation might choose to provide fewer requirements for that component



ASTC's World Biotech Tour Program Manager Carlin Hsueh documents festival activities at Museu da Vida's WBT festival in Rio de Janeiro. Photo by João Laet.



The Let's Talk LIAB activity was designed to facilitate a conversation about the ethics and beliefs the public has about current and future biotechnologies and their effect on people around the world. Photo by Carlin Hsueh.

of the project moving forward. The original WBT festival schedule suggested that Hosts identify a venue outside of their science center for one day of their festival programming. This idea seems to be a promising practice in that the four Hosts who followed this suggestion each indicated their success in reaching new audiences. ASTC and the Biogen Foundation might consider making this a requirement of future work.

The leadership team might also choose to provide additional support to Hosts by responding to common challenges related to signage and media promotion, and the need for consistent “take home messages” for participants with regard to biotechnology content. Tip sheets could be created to help prepare Hosts to address each of these challenge areas proactively in future iterations of the program.

WBT evaluations were multi-method and tended to focus directly on programmatic elements of the initiative. This approach is appropriate for the first year of a new project, as it has the greatest potential to help document the value of WBT components at the local level. WBT evaluators collected a tremendous amount of information to inform the continued development and implementation of the program at the local level. Results from WBT evaluations were successful at documenting the impact of the Ambassador Program on youth, the ways that LIAB materials did and did not work well across a range of contexts, and the learning and satisfaction associated with festival events.

The focus on programmatic elements does not necessarily serve ASTC and the Biogen Foundation’s larger goals of understanding the broad value of the program. Based on the initial scope of work for this summative evaluation, ASTC was hoping to find evaluation evidence to document the successes and challenges related to the international and iterative design of the project. Details about each of the following topics were scarce in both the project and evaluation reports, and thus lessons learned in relation to these topics are still unknown: the ways that Hosts built on the experiences of WBT implementations that had come before them, the importance of the common international theme, the specific ways that the program was modified to accommodate local culture and customs, and whether and how the WBT was successful at helping Hosts reach new audiences.

Though the summative evaluation cannot document the full list of anticipated results, learning from the flexible nature of both the program and evaluation design should help the program’s

leadership team develop additional supports and constraints for similar future international programs. For example, WBT Hosts indicated the need for additional structure and guidance with regard to the expectations of the program and its implementation.

ASTC and the Biogen Foundation should be in the position to use this report and the documents submitted by each site to create clear guidelines for program expectations for the next round of Hosts, as well as tip sheets to prepare sites to be proactive in their planning related to common challenges found across the first cohorts of Hosts.

For example, if the WBT aims to get the Hosts outside their comfort zones (such as reaching hard-to-reach communities), ASTC could provide more guidelines for the Hosts about the types of organizations it is worth contacting and tips on how to reach out to them. Even though cultural differences make universal guidelines impossible, tips and suggestions on types of organizations Hosts should consider seeking out could assist in building new local partnerships (for example, patients' organizations that focus on certain biotechnology issues, or community centers that might serve to recruit young people from hard-to-reach communities). Success stories from the original 12 Hosts might also serve as inspirational examples to those who participate in similar programs in the future.



An Ambassador explains her biotech project about a new original design for a menstrual pad and communication app to the judges panel during the WBT festival at Heureka in Vantaa, Finland. Photo courtesy of Heureka.

“It would be beneficial to standardize and harmonize, to some extent, the evaluation tools and criteria in order to build a longitudinal database and a historical knowledge.”

At the programmatic level, ASTC might choose to revise existing LIAB materials to help ameliorate some of the common challenges found across activities. The leadership team might also choose to create new activities to meet the needs and interests shared by Hosts, keeping in mind the common successes and challenges from the original group of five activities.

Future iterations of the Ambassador Program should include clear guidelines on minimum and maximum numbers of Ambassadors within each cohort and some standardization on the kinds of training each Ambassador receives. When partnering with universities in order to recruit mentors, templates of documents that provide more details on the role of the mentors and the extent of collaboration during the hosting period could be useful for the organizers.

As with the implementation of program components, the evaluation methods used to collect data seemed to converge around particular topics. ASTC and the Biogen Foundation might consider creating a small set of common items that could be translated to the languages needed for Hosts' target audiences and required as part of future evaluations. This sentiment and the potential benefits of this approach are best summarized by the evaluation team from Montreal who noted:

“It would be beneficial to standardize and harmonize, to some extent, the evaluation tools and criteria in order to build a longitudinal database and a historical knowledge. Also, it can be useful in monitoring the evolution of certain aspects over time. The data can then be used by future ASTC evaluation teams. ASTC should propose a methodological framework that specifies the aspects that should be minimally assessed by any WBT evaluation teams.”

This recommendation captures best practices from the multisite evaluation (MSE) literature by offering ASTC and the Biogen Foundation suggestions for specific supports that would streamline the evaluation process. Generally speaking, MSEs occur in two or more sites and include systematic cross-site data collection across non-uniform contexts.⁴ The variability across sites and the lack of consistency in evaluation design are often cited as a challenge of multisite evaluations.^{4,5} The negotiated centralized evaluation model of MSE has the potential to overcome some of these challenges.⁶ By definition, this model is applicable for projects like the WBT “where data are

⁴ R. B. Straw and J. M. Herrell, “A framework for understanding and improving MSEs,” *New Directions for Evaluation*, no. 94 (2002): 5-16.

⁵ J. M. Sinacore and R. S. Turpin, “Multiple sites in evaluation research: A survey of organizational and methodological issues,” *New Directions for Program Evaluation*, no. 50 (1991): 5-18.

⁶ F. Lawrenz and D. Huffman, “How can MSEs be participatory?” *American Journal of Evaluation* 24, no. 4 (2003): 471-482.

collected across sites, each site is large and complex itself, sites are funded independently, and each site conducts its own evaluation.”

The negotiated centralized evaluation model includes three stages: (1) creating local evaluations, (2) creating the central evaluation team, and (3) negotiating and collaborating on the participatory MSE. In its first iteration, ASTC served as the central evaluation team and worked with local teams to create local evaluations. Building on this approach, we recommend that the next iteration of the project

include an enhanced role for the central evaluation team in order to negotiate and collaborate more extensively in the evaluation conducted across WBT sites. ASTC might choose to engage a professional evaluator to join the team in order to provide dedicated expertise in this area.

The participatory components related to stage three of the negotiated centralized model were informed by findings from the Beyond Evaluation Use study, which produced a number of recommendations that might be used to guide the next steps in ASTC’s work with WBT.⁷ Scholars recommend, for example, that the central evaluation team find ways to decrease the burden of participating in the MSE on partners. Responses from WBT Hosts and evaluation teams echo this sentiment, as they requested additional and specific expectations for WBT programs and evaluations. They also noted the need for additional constraints that might help narrow the scope of the project around the programs and evaluation metrics that are most meaningful to ASTC and the Biogen Foundation. These types of requests are shared throughout the report and provide specific examples of how ASTC might begin to respond to this recommendation.

Another element of an MSE is the use of shared metrics. Building on the similar approaches used by evaluators who collected data about the first WBT initiatives, ASTC might choose to develop survey items that could measure participant understanding of biotechnology content and the satisfaction with WBT activities that could be used across Host locations. ASTC might also choose to institute shared procedures and metrics to document program components that were missing from most evaluations of the first initiative.



Former Scitech Director, Alan Brien (center), raises the WBT trophy, a symbol of the program that travelled to all 12 Hosts, during the opening of the WBT festival in Perth, Australia. Photo courtesy of Scitech.

7 J. A. King and F. P. Lawrenz, *Multisite evaluation practice: Lessons and reflections from four cases* (San Francisco: Wiley, 2011).

A standard way to document whether and how new audiences were reached through WBT is one example, given that evaluators did not seem inclined to study this outcome directly. Should ASTC choose to develop shared metrics, best practice suggests that the central evaluation team provide consistent and open communication about the development and use of common measures, including the provision of multiple entry points through which partners can engage in the process. Shared metrics, for example, could represent a small component of each Host's larger and unique evaluation efforts.

Clear and consistent communication are also key components of an MSE, and ASTC has made strides in this area through its first iteration. The team was in regular communication with each Host during their program year, and ASTC provided regular web meetings to allow Hosts to exchange ideas. While these resources created a vast repository of information, the material may be too dense for ASTC, the Biogen Foundation, and Hosts to use for day-to-day decisions about how to implement the program. Moving forward, the central evaluation team might require Hosts to submit brief "back-of-the-envelope" products and findings that could be distilled and disseminated regularly.

Streamlining expectations for communication products might also allow for quick and ongoing assessments of how WBT continues to evolve across Hosts and could provide additional information about the importance of the international scope of the project. ASTC may want to consider creating new activities, similar to LIAB, that require a local content link to be added as they move from one country to the next. Alternatively, ASTC might create activities that generate



An Ambassador explains his biotech project to Dr. Pichet Durongkaveroj, the Minister of Science and Technology of Thailand (MOST) during the WBT festival at the National Science Museum (NSM) in Pathum Thani, Thailand. Photo Courtesy of NSM.

data that could be stored and compared from one country to the next. This could work not only in the case of comparing scientific findings, but additionally in the case of comparing opinions from discussions that relate to ethical dilemmas posed by the activities.

ASTC might consider bringing Hosts together once the venues for an international tour are selected in order to present the educational resources, exchange over the intended adaptations, and train the Host staff on how they can use them. During the training, ASTC might consider allowing Hosts to propose educational activities that can be adapted with an angle that relates to the specific scientific interest of the Host (propose contents that can easily be adapted to focus the science into locally/nationally relevant research).

As designed and implemented, the WBT was successful in achieving many positive outcomes. Twelve Hosts enthusiastically embraced the opportunity to participate in an international project, and the communities they serve benefitted from their science center's participation. ASTC executed a first-of-its-kind, multipronged, global effort that reached hundreds of thousands of people in 12 different countries across six continents. More than 100 high-school students gained significant communication skills, confidence, and a clearer picture of biotechnology and its role in today's world. Twelve of those students had an opportunity to travel to Japan and participate in a global science center summit—the Science Centre World Summit 2017. Biogen is recognized as an active partner within communities where they have operations and also where they have no presence. ASTC and the Biogen Foundation have received strong returns on their investments.

The World Biotechnology Tour has a strong foundation on which to build. The findings in this report, lessons learned, and experience gained during this initial effort can help inform the planning of future iterations of similar programs, initiatives, and other collaborative informal science learning efforts of international scope.



The Ambassadors in Thailand facilitated the LIAB activities during the National Science Museum's WBT festival. Photo courtesy of the National Science Museum Thailand.

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Lab-in-a-Box Activity Sheet Template

NISE Network NanoDays guide template. NanoDays project was supported by the National Science Foundation (NSF) under Award No. 0940143.

Pipette by Numbers

North Carolina Museum of Natural Sciences

Virus Slayer

Movia Robotics

Paramecium Symphony

Baltimore Underground Science Space (BUGSS)

Ryan Hammond, new media artist

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Poland - The Shipyard (Stocznia), Warsaw, Poland

Portugal - João Arriscado Nunes, Irina Castro, and Patrícia Ferreria, Centre for Social Studies of the University of Coimbra (CES), Coimbra, Portugal

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International Biogen affiliates

Biogen Portugal

Biogen Japan

Biogen Canada

Biogen Italia

Biogen Australia

Biogen Brazil

Biogen Finland

Biogen Poland

Biogen Iberia

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Author Biographies

Todd Boyette is Director of Morehead Planetarium and Science Center at the University of North Carolina (UNC) at Chapel Hill. During his time at Morehead, Boyette has expanded outreach programming and launched the North Carolina Science Festival. He recently completed a two-year term as president of the Association of Science Museum Directors and is a faculty member at UNC's School of Education. He has served as Principal Investigator for several NASA- and NSF-funded projects and is currently Principal Investigator on EvalFest, an NSF-sponsored project designed to build evaluation capacity with the science festival field. Prior to becoming Morehead Director in 2006, he was President of the North Carolina Grassroots Science Museums Collaborative, President and CEO of The Health Adventure in Asheville, North Carolina and Director of Imagination Station in Wilson, North Carolina. Boyette holds a doctoral degree in science education from North Carolina State University. He also holds a master's degree in science education and bachelor's degrees in science education and in chemistry.

Aliki Giannakopoulou has been working at the Research & Development Department of Ellinogermaniki Agogi in Greece, since June 2014 as a researcher in a number of European funded projects. Aliki has more than 10 years' experience as a science communication consultant and has previously worked as a senior project manager at the External Relations department of the science museum NEMO in Amsterdam, Netherlands, developing new European collaborations and managing existing European projects. Before working for NEMO she worked for six years at Ecsite, the European network of science centers and museums as a Communications, Conferences and EU Projects Manager. She has also worked in the United Kingdom at the Research Councils UK in the Science in Society Unit. She holds a master's in science communication from the University of the West of England and a bachelor's degree in Environmental Science from the University of the Aegean.

Karen Peterman is the President of Karen Peterman Consulting, Co., a firm that specializes in the evaluation of and research on STEM education projects. Her research focuses on developing and studying methods and measures that are appropriate for use in informal learning environments including science festivals and other activities that feature public engagement with science. Originally trained as an experimental psychologist at Duke University, Peterman began working in the field of program evaluation in 2002. She holds a doctoral degree in developmental psychology from Duke University and a bachelor's degree in psychology from Emory University.



About Partners

About ASTC

The Association of Science-Technology Centers (ASTC) is a global organization providing collective voice, professional support, and programming opportunities for science centers, museums, and related institutions, whose innovative approaches to science learning inspire people of all ages about the wonders and the meaning of science in their lives. Through strategic alliances and global partnerships, ASTC strives to increase awareness of the valuable contributions its members make to their communities and the field of informal STEM learning. Founded in 1973, ASTC now represents 700 organizational members that welcome more than 120 million people each year in more than 50 countries. ASTC members include not only science centers and museums, but also nature centers, aquariums, planetariums, zoos, botanical gardens, and natural history and children’s museums, as well as companies, consultants, and other organizations that share an interest in informal science education. For more information about ASTC, or to find a science center near you, visit www.astc.org.

About the Biogen Foundation

The mission of the Biogen Foundation is to provide access to science education and essential human services to children and their families in the communities in which Biogen operates. We are committed to sparking a passion for science and discovery, supporting effective science education initiatives, and strengthening efforts to make science education and science careers accessible to diverse populations. We want to inspire the next generation of science leaders who will make our world better. Learn more about the Biogen Foundation at www.biogen.com/en_us/biogen-foundation.html.

Appendix A: Project Description



Detailed Project Description

PROJECT OVERVIEW:

The World Biotech Tour (WBT) showcases the role of science centers in bringing together key stakeholders to promote understanding of a relevant societal issue: biotechnology. By involving students, teachers, science center professionals and the general public in hands-on activities and discussions about key issues pertaining to biotechnology, the WBT will demonstrate the relevance, excitement and wonder of biotechnology in a fun and exciting way.

From 2015-2017, the Association of Science-Technology Centers (ASTC) and Biogen Foundation will partner to bring the WBT to 12 selected international science centers for 3-day science festivals focused on the theme of biotechnology. Science centers participating in the WBT will provide a culturally unique visitor experience through several activities developed and hosted at each site. Selected science centers are awarded **\$25,000 (USD)** to fund WBT activities and programs throughout the active tour year (January – November).

3-DAY BIOTECH FESTIVAL

Each participating science center will host a 3-day science festival with a biotechnology theme at their center. The festival should include several events, including a **ceremony** that involves the WBT trophy exchange or opportunities for representatives to address the audience, and any additional events the center develops on their own to make the festival a culturally unique experience. Planning for the event should include the Biogen Foundation and ASTC in several mandatory meetings leading up to the festival. Below are the minimum required activities each center must host during the 3-day event:

- **Hidden Biotech Scavenger Hunt**
Did you know biotech is all around us, even though we don't see it right away? Guide visitors in exploring the hidden biotech in your center's exhibits.
Detailed description - Museum staff will re-visit their center's permanent and visiting exhibits to find the "hidden" biotech topics. This will give staff the opportunity to re-explore their own exhibits and view it from a different perspective. It reminds us that biotechnology is all around us and we interact with it on a daily basis. By taking a new look at exhibits that at first glance may not seem biotech related and discovering the hidden biotech in them we begin to learn how we can perceive the world in this new light as well. Each center will then guide visitors through the same process by developing a self-guided or guided scavenger hunt through the center's exhibits to look for hidden biotechnology.
- **Science Café**
Host an open forum discussion with guest science speakers.
Detailed description – Invite people from all parts of the biotech field, such as from research labs, universities, policy makers, and government officials to come together and discuss the current advances and discoveries in biotechnology. The public can learn about what's new and exciting in current research and ask questions directly to scientists. By connecting people with those directly involved in the research and advocacy of biotech, we can empower the public to actively learn about biotechnology and how it affects their lives.
- **Meet-a-Scientist**
Invite a scientist to present activities to the public about their research. Get a chance to work alongside a real biotech scientist.
Detailed description –Have a scientist set up an activity station at the museum in which they will guide visitors through the activity or have them give a short presentation on their research. Visitors can ask questions directly to scientists and demystify what really goes on in the laboratory. Centers are suggested to reach out to local universities and Biogen employees.

- **Lab-in-a-Box**

Science centers will use the ASTC-designed activities provided in each box during events. Resources will also be available for download at the WBT website, www.WorldBiotechTour.org.

Detailed description – ASTC will design hands-on activities that will be provided in kits for each museum. These activities can be used at any of the WBT events and be accompanied by the center’s own biotech activities. The activities will cover the basic foundations of biotechnology research, the excitement of biotech innovation, and the social global impact biotechnology has in all our lives. The activities by no means cover the broad breadth of biotechnology and serve mainly as a way to scaffold the key messages of biotechnology and the spirit of the WBT. Each center is encouraged to develop their own activities and presentations to compliment the lab-in-a-box activities and to make their WBT event culturally unique.

- **Suggested 3-day festival schedule**

The 3-day festival will impact the different kinds of visitors informal science institutes impact: School groups and students, families, and the community.

Detailed description – A suggested schedule for the 3-day science festival is:

- Friday – Activities geared towards school groups and students
- Saturday – Activities geared towards families and the general public
- Sunday – Bring the activities outside of the center and out to the community

AMBASSADORS PROGRAM

Each center will assemble a select team of youths (14-18 year olds) to develop and present a biotech topic of their choice. They will present their topics to museum guests, schools, and community members and should have a large presence during all WBT events.

- **Mentor**

Ambassadors will partner with a mentor (staff member, Biogen employee, teacher, etc) who will assist the teen in researching and training on how to communicate to the public.

Detailed description – Each center will help pair a teen with a biotech mentor. The teens can work with their mentors on how to research a biotech topic, what kind of presentation to create, and how to present their topic to the public. The ambassador can also develop a hands-on activity related to their topic and facilitate the lab-in-a-box activities during WBT events.

- **Present**

Ambassadors will present their biotech topics to (a) museum guests, (b) 3 local schools, and (c) at a community center/event.

Detailed description – Once the ambassadors have created a presentation and/or activity based on a biotech topic they must communicate their research to the public. Besides presenting at the museum, ambassadors are encouraged to go out to their community and local schools. Their mentors and museum staff will help coordinate presentation opportunities at local schools and community center.

- **Virtual Exchange**

Ambassadors converse with ambassadors from other participating centers around the world using online communication channels (Microsoft Yammer, Zoom, social media).

Detailed description – A big focus of the project is to foster global collaboration. Ambassadors from each museum will connect with other ambassadors around the world to discuss their ideas and experiences in the WBT. A topic will be assigned for each exchange (approximately 4-5 per year).

- **World Summit 2017**

Nominate an outstanding ambassador to represent your center’s WBT program at the 2017 World Summit event in Tokyo, Japan

Detailed description – At the end of each year, participating centers will be able to nominate one outstanding ambassador to attend the World Summit in Tokyo, Japan. The summit will be the culmination of the 3-year project and will show to the world the results of the tour. These outstanding ambassadors will present their biotech topic and discuss their experience in the WBT to leading figures in the field.

COMMUNITY OUTREACH

The project aims to bring biotech out to the community instead of only catering to those that visit museums.

- **Communicate**

Use social media and other communication channels to update community members on events and activities

Detailed description – The WBT strives to be a global phenomenon. To quickly disseminate information to the world there will be a strong emphasis on using social media to engage people from all the around the world. Social media can include Facebook, Twitter, Instagram, and other local media. This will also include updates on the WBT social media outlets. When possible, science centers should attempt to attract local media (TV, print, or online) to cover and promote WBT events and activities.

- **Participate**

Recruit ambassadors, center staff, community volunteers, local university staff, and Biogen staff to participate in WBT activities.

Detailed description – The WBT involves engaging and connecting members of the biotech community with the public and information science institutes. Each center is encouraged to reach out to local universities and biotech companies to volunteer and participate in all WBT events, including mentoring ambassadors. Volunteers should be recognized at each event for their participation and commitment to the WBT.

REPORT

Submit periodic reports on program progress

- **Evaluate**

Select a local evaluator to report on program progress and visitor reactions to WBT events.

Detailed description – Another purpose of the WBT is to evaluate how a global project is received and how people react to the biotechnology theme. The data collected from each year will be used to improve the following year's program. The final report will show all partners the successes and challenges to a project like the WBT. Each center will select a local evaluator, but the evaluator will be funded through ASTC's budget.

- **End-of-year Webinar**

Participate in an online seminar with the other WBT sites, ASTC, and Biogen Foundation to share individual program events and feedback

Detailed description – Evaluation at the end of each year is essential for the future success of the program. At the end of each project year the sites will participate in an online webinar hosted by ASTC where all partners will discuss the successes, challenges, and suggestions for the project.

CONTACTS

World Biotech Tour

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World Biotech Tour

Powered by BIOGEN FOUNDATION & ASTC

3-Day Biotech Festival

Student activities

Activities at the science center geared towards school groups
**Friday*

Family activities

Activities at the science center geared towards families
**Saturday*

Community activities

Take the activities to the community and streets
**Sunday*

Exhibit Scavenger Hunt

Guide visitors in exploring the hidden biotech in your museum's exhibits

Science Cafe

Host an open forum discussion with people in the biotech field, from research to policy

Meet-a-Scientist

Host a scientist "meet & greet" where guests can speak/Q&A with a biotech scientist at the museum. The guest scientist may bring an activity to engage visitors

Ambassadors Program

Assemble a team of local youths (15-18 years old) to develop and present a biotech topic of their choice to science center guests, schools, and community members

Mentor

Ambassadors will partner with a mentor (staff member, Biogen scientist, teacher, etc) who will assist in researching and training how to communicate to the public

Present

Ambassadors will present their biotech topics to (a) museum guests, (b) 3 local schools, and (c) at a community center/event

Virtual Exchange

Ambassadors converse with ambassadors from other participating centers around the world using online communication channels (Yammer, Zoom, social media)

World Summit 2017

Nominate an outstanding ambassador to represent your center's WBT program at the 2017 World Summit event in Tokyo, Japan

Community Outreach

Bring biotech out to the community throughout the year

Communicate

Use social media and other communication channels to update community members on events and activities

Participate

Recruit ambassadors, center staff, community volunteers, local university staff, and Biogen staff to participate in community activities

Report

Submit periodic reports on program progress

Evaluate

Select a local evaluator to report on program progress and visitor reactions. **ASTC*

End-of-Year Webinar

Participate in an online seminar with the other WBT sites, ASTC, and Biogen Idec to share individual program events and feedback

Lab-in-a-Box

Science Centers will use the three ASTC-designed activities provided in each box during events both in and outside the center. Resources will also be available and downloadable at the WBT website

www.WorldBiotechTour.org



Appendix B: Application Form

Application deadline: 31 May, 2016



The World Biotech Tour (WBT) is a multiyear initiative that will bring biotechnology to life through science festivals and related activities. The program, supported by ASTC and the Biogen Foundation, will run from 2015-2017, culminating in presentations at the Science Centre World Summit in Tokyo in 2017.

Selection process of host sites

For detailed project description and financial aspects, see the “Detailed Project Description” document.

Please respond as best as you can to the following questionnaire. The WBT team will review all proposals and make a selection based on the provided responses and additional criteria that relate to geographical distribution, previous experience, etc*. It is highly recommended that you include photos, timelines, and examples of programs and events that would support your bid as a tour stop. The results will be communicated to all applicants by **1 August, 2016** and announced publicly at ASTC’s annual conference.

** At this point only non-US science centers are selected as host venues for the World Biotech Tour. However, we are always glad to hear interest from US sites and would like to note that the WBT may consider opening to US institutions in the future.*

Questionnaire:

- Can your institution execute the programs and activities described in the “Detailed Project Description” document within the active tour year (January-October, 2017) adapted to your local situation and still maintaining its global significance?
- Has your institution ever planned and implemented a large science festival-like event? Describe.
- Does your institution currently have an exhibition on biotechnology? Describe.
- Do you have regular programs on this topic?

- What additional resources on this topic could participants access through your science center?

- What is your connection with the science/research community on this topic?

- Have you ever created and/or participated in programs involving 14-18 year-olds? Describe.

- Have you ever had workshops with youth (14-18 year-olds) in order to train them for science communication on the museum floor or in the public?

- Does your institution organize and host science cafes or similar discussion-based events on science and society topics with the public?

- Do you have in house (please check all that apply by double-clicking checkbox):
 - Scientists familiar with the topic
 - Project or youth program coordinators
 - Internet video/audio capability
 - Media specialists

- Have you ever had an exchange program with another institution in the past? If so, with whom?

- Have you ever been involved in an international exchange program involving youth? If so, with whom and describe?



- Is there a Biogen office location near your science center? While not a requirement to be geographically near a Biogen affiliate, past events have proven beneficial to have employee volunteers present at events. (You can view a map of current Biogen locations at <http://www.worldbiotechtour.org/become-a-stop>)

If selected, would you (please check all that apply by double-clicking checkbox):

- Agree to raise local funds if the ASTC contribution would not suffice? (i.e. pay for translation costs)
- Join the international video webcast at the end of 2017 to present an end-of-year report?
- Collaborate with local Biogen affiliates (if applicable) to incorporate employee participation in WBT events?

Is there any additional information you want to provide to make your case?

Signed:

Institution CEO (Signature)

Project manager (Signature)

Institution CEO (Print)

Project manager (Print)

Email:

Email:

Phone:

Phone:

Send the signed and completed form, along with any supplemental documents, via email as a PDF attachment to WorldBiotechTour@astc.org by 31 May, 2016.

Include in the email body:

- Institution name
- Contact name
- Contact email
- Institution location (City, Country)
- A brief explanation of your interest in participating in the World Biotech Tour



Appendix C: Science Museum Progress Report and Final Report Forms



World Biotech Tour Science Centre Initial Progress Report 2017

Due by 1st September, 2017

Complete the information in the designated content box. In areas with no fixed content space, there is no limit to the amount of information you can share. Please be as thorough as possible with details up to this point of the project. When completed:

- Save the document as pdf or Word .doc under the name of your institution, for example "WBT Progress Report 2016_ASTC.pdf"
- Attach photos/video (for large files please use a file sharing program such as Dropbox).
- Submit an invoice for the next 20% microgrant installment, \$5,000 USD, and include the bank wiring information for your institution.

Contact Information

* First Name

* Last Name

* Telephone

* Email

Organization Information

* Name

* Address

* Telephone

* Fax

* Website Address



* **Organization Type** (i.e. Science center, university, research facility, non-profit, government funded, etc)

* **Year Organization Founded**

* **Recent Accomplishments** (list and describe recent programs and events executed at your science center that are not related to the World Biotech Tour)

* **Monitoring and Evaluation** (How did you monitor or evaluate these recent accomplishments?)

Project/Program Follow Up

* **Project Timeline** (List dates of past WBT events and planned future events with a brief description of the event)

*** Geographic Area Served**

*** Gender Served by This Grant up to this point (Estimate):**

% Female
 % Male

*** Age Served by This Grant up to this point (Estimate):**

% Adolescents
 % Adults
 % Children
 % Elderly
 % Infants/Toddlers

*** Number of People Served by this grant up to this point** (Include notes or explanation if you are including number of people served through physical attendance at events or online engagement through social media)

*** Outcomes** (i.e. Results of each event up to this point. Examples can include: Method and number of ambassadors recruited, ambassador workshops, mentor/ambassador pairings, activities and science talks executed, number of attendees, names and titles of special guests, marketing campaigns, Biogen Foundation participation-if applicable, how the lab-in-a-box kits have been used, etc. The descriptions should indicate how the examples meet or go beyond the project requirements)

* **Key Learnings** (i.e. What you learned from events, such as ideal time to recruit ambassadors, how to engage press and media, what did and did not work, etc. Include any unexpected outcomes as well as a dedicated description for the Lab-in-a-Box activities feedback.)

* **Evaluation** (i.e. Describe how the museum is working with the evaluators of the WBT. Do the evaluators give immediate feedback, attend events/workshops, observe the ambassadors, etc? What can be improved?)

* **Improvements** (How would you improve your WBT events and how could Biogen and ASTC support you better. Indicate improvements you will make in your future WBT events)

* **Budget** (Estimate % of where budget was allotted, e.g. printed materials, activity supplies, marketing, staff salary, etc)

* **Photographs** (attach to report or include links)

* **Videos** (attach to report or include links)

* **Press and media coverage** (attach to report or include links)

* **Other Comments**

World Biotech Tour Science Centre Final Report 2017

Due by 12th January, 2018

Complete the information in the designated content box. In areas with no fixed content space, there is no limit to the amount of information you can share. Please be as thorough and detailed as possible. When completed:

- Save the document as pdf or Word .doc under the name of your institution, for example "WBT Final Report 2017_ASTC.pdf"
- Attach photos/video (for large files please use a file sharing program such as Dropbox).
- Submit an invoice for the final 20% microgrant installment, \$5,000 USD, and include the bank wiring information for your institution.

Contact Information

* **First Name**

* **Last Name**

* **Telephone**

* **Email**

Organization Information

* **Name of Science Centre**

* **World Biotech Tour website url** If your institution's website had a separate page for WBT information and announcements

Project/Program Follow Up

* **Project Timeline** List dates of past WBT events and planned future events with a brief description of the event. Include ambassador visits to schools, workshops, and outreaches. If no new dates since the initial progress report, you can copy/paste from the progress report.

*** Staff Participation** *List essential staff members, their roles and titles involved in the planning and execution of the WBT.*

*** Budget** *Estimate % of where budget was allotted. This can be a copy of the estimates made in the progress report with additional costs included if applicable.*

*** Geographic Area Served**

*** Gender Served by This Donation up to this point (Estimate):**

% Female

% Male

*** Age Served by This Donation up to this point (Estimate):**

% Adolescents

% Adults

% Children

% Elderly

% Infants/Toddlers

*** Number of People Served by This Donation up to this point**

*** Breakdown of people served** *Describe the number of people served through physical attendance at events, online engagement, etc.*

Results

Expectations *What were your early expectations for the project?*

Motivation *What were your science center's motivations for participating in the project?*

*** Ambassador Program Outcomes** *What was the recruitment process; number of ambassadors recruited; number and description of mentors; management of ambassadors; exchanges; describe workshops; describe school visits; festival participation; unexpected outcomes.*

- How has the ambassador program exceeded your expectations?
- What improvements do you want to see in the ambassador exchanges?
- Do you feel the Facebook Group was successful in fostering interactions between the ambassadors? How can we improve these interactions?
- Do you plan to use the ambassadors in future programming at your science center? At local schools and community centers?
- Will you be able to continue organizing the ambassadors for future alumni events? (e.g. webinars, virtual exchanges, additional WBT events, Facebook reminders, etc)

*** Ambassador Presentations** *If your institution had a separate event for the ambassador presentations, describe the event and list aspects that were successful and what changes you would suggest to future cohorts. How was the “winning” ambassador selected for the SCWS?*

*** Festival Outcomes** *What was the planning process; list other organizations involved in event planning; how was the World Biotech Tour highlighted if festival was not a standalone event, communication with ASTC and Biogen; press and media successes and challenges; festival logistics feedback; list of special guests and speakers; unexpected outcomes.*

*** Lab-in-a-Box** *What types of activities or biotech topics would you like to see in future versions of the Lab-in-a-box? What can be improved with current lab-in-a-box activities? Would you be interested in more table top activities or workshop activities (i.e. activities that require sign-ups and takes 1-2hrs to complete)?*

*** Key Learnings** *What are some tips and suggestions you’ve learned that should be passed on to future WBT tour stops? These include any unexpected outcomes, such as most challenging aspects of the project, as well as a dedicated description for how you utilized/will use the Lab-in-a-Box activities.*

* **Sustainability** *Do you plan to continue parts of the WBT program, such as the ambassador program or the lab-in-the-box activities, in your science center after the active year and how do you plan to sustain it at your science center.*

Collaborations

* **Evaluators** *Describe the relationship with evaluators, such as how often the museum and evaluator were in contact, were the evaluators aware of all WBT events, what suggestions would you give to future cohorts to improve evaluation process.*

* **Biogen** *Describe the collaboration between your science center and the Biogen affiliate. Will your science center continue to plan future events and activities with the Biogen affiliate? If so, please explain.*

* **ASTC** *What improvement would you like to see in ASTC's management of the project?*

* **Other Comments**

Supplemental

* **Photographs** (attach to report or include links)

* **Videos** (attach to report or include links)

* **Press and media coverage** (attach to report or include links)

* **Translated materials** (attach to report or include links)

* **Quotes from visitors, mentors, and ambassadors** (list here and include name and involvement with the WBT)



World Biotech Tour

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