Taking Stock of the STEM Beyond School Project: Accomplishments and Challenges

An Evaluation Report Prepared for the OSU Extension 4-H and Portland Metro STEM Partnership Team

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Executive Summary

The Center for Research on Lifelong STEM Learning was invited by the Oregon State University Extension Service 4-H Youth Development and the Portland Metro STEM Partnership to evaluate Year 1 of the STEM Beyond School (SBS) project. The STEM Beyond School project seeks to improve underserved youth's access to and interest in STEM learning through: 1) the development of a statewide network of out-of-school providers focused on STEM learning opportunities, 2) building capacity of out-of-school providers to deliver effective STEM programming, and 3) delivering high dose programming to underserved youth. The Center evaluated the impact of the first year of programming on several youth outcomes (attitude towards learning, persistence in solving problems, active engagement with science, connection with and enjoyment in the program itself, and attitude toward science including whether they can succeed in science), assessed the type and quality of programming offered to youth, and analyzed the development of a state-wide network that supports out-of-school learning. As a demonstration/pilot project, the SBS project focused on collecting data that would address outcomes of the project and inform the development of a sustainable infrastructure that would support a Networked Learning Community of community-based STEM education providers.

This report draws from various data collection methods to provide insights into the development of the STEM Beyond School network and the potential impact of out-of-school programming on youth's learner identity and associated factors which contribute to the development of interest in STEM and STEM learning. Data were collected from SBS Regional Coordinators, Program Providers, and youth participants through online and paper-based surveys; interviews with Regional Coordinators and Program Providers; and reporting workbooks and self-assessment tools completed by Program Providers.

Data indicate that investments into the SBS system and professional development and youth programming by the state have been instrumental in fostering a growing network of effective and impactful out-of-school STEM program providers. In general, program providers felt supported through a sufficient amount of collaborative learning opportunities. The SBS project engaged 1,277 youth (83%[1]) through interactive and engaging activities, experiments and field trips focused on a wide range of topics. The program was successful in affecting outcomes across all 6 measures, but primarily for those students who entered with lower initial scores or about half the participants. These results indicate that the programs did not just appeal to, or positively impact participating students who already connected well with science. Youth also shared a wide range of experiences they valued about the programs, including opportunities to engage with science and engineering activities, experiments, and field trips, as well as other aspects unique to out-of-school programming such as a space to safely express themselves, make choices about their learning and receive support from instructors who encouraged them to grow intellectually and personally, which are core components in development of identity. During year 1, program improvement and program implementation, as well as the

[1] Data based on 606 participants.

development of a community of providers dominated the agenda, making systematic data collection a lower priority. Based on empirical findings, the report provides recommendations for improvements and future iterations of the SBS project.

Key Findings in Detail

Program quality

- The SBS project led to development of diverse, engaging and highly interactive opportunities for underserved youth. Program providers reported that through their out-of-school STEM programs, youth participated in STEM programming and field trips which they had otherwise not experienced in the past.
- Program providers often incorporated opportunities for youth to visit college and university campuses, meet with STEM professionals and learn about STEM career opportunities, and encouraged youth to think about their futures and choosing a STEM-related path. When asked what they enjoyed the most about the programs, several youth responded that they valued these opportunities.

Youth Outcomes

- The SBS project serve 1,277 youth statewide, with 83.0% combined disadvantaged based on data from 606 participants. Median total of hours of programming provided by all sites was 94.8.
- The program was successful in affecting outcomes across all 6 measures, but primarily for those students who entered with lower initial scores or about half the participants. These results indicate that the programs did not just appeal to, or positively impact participating students who already connected well with science. However, youth who began the program with high scores for youth outcomes did not report significant increases in these measures over time. This result should be interpreted very cautiously because unchanging or mildly declining pre-post attitudinal or dispositional measures can be considered a success based on research about development of student interest and other complexities. We suggest that Outcome 1 be amended in the future to provide a more realistic measure of positive youth outcomes that align with interest and learning theory.
- Youth shared that they valued not only the opportunities to engage with science and engineering activities, experiments, and field trips, but that their time spent in the SBS programs were important to them because of the opportunity afforded to them to make friends, feel like they belong and can safely express themselves, make choices about their learning and receive support from instructors that encouraged them to grow intellectually and personally. These aspects are core components of identity.

Network

- Ninety-six percent (96%) of respondent program providers agreed that the SBS network fostered idea sharing and mutual learning. In general, in-person meetings, which were viewed as prime opportunities for relationship building, were seen as more valuable and impactful than webinars.

Development of systems and tools

- A large portion of this project was dedicated to creating measures and measurement instruments that could be used not only to evaluate STEM Beyond School, but other out-of-school STEM programs, both in terms of programming and student impact. The evaluation team was successful in creating a set of instruments intended to measure the proposed outcomes of the project, but given limitations around the priority of research and evaluation versus program improvement and implementation, fewer pre/post matched student data sets than desired for in-depth analysis at the program or participant level were collected. We make recommendations for improved data collection support in the upcoming program year.

STEM Beyond School: The Context

Why is STEM Beyond School Needed?

Students in under-resourced communities across the state have significantly fewer opportunities to connect to STEM learning than their more advantaged peers. This uneven approach fails to ensure that youth are developing their skills, abilities, and dispositions in STEM, and as a result, may not seek opportunities in Oregon's future STEM workforce and economy. STEM Beyond School was established to address this problem by focusing on two critical aspects: providing high quality STEM learning experiences to youth now, and creating a supportive infrastructure for community-based programs to continually improve and expand to reach more youth over time.

What are the Goals of STEM Beyond School?

STEM Beyond School was designed to support existing community-based programs to provide high quality STEM experiences to youth across the state. This out-of-school and predominantly off-school grounds project stipulated that participating youth in grades 4 through 8 engaged with a minimum of five different STEM experiences located in their communities and supported by highly relevant field experiences. Programs were required to provide at least 70 hours of learning connected to the interests of their youth that followed the four tenants of SBS (student driven, students as do'ers and designers, students apply learning in new situations, relevant to students and community-based). For comparison, elementary students in Oregon receive 1.9 hours per week of science instruction (Blank 2012). SBS was therefore a targeted investment towards dramatically increasing meaningful STEM experiences for underserved youth while also advancing the capacity of program providers to design and deliver high quality STEM activities for youth that center around learning in and from the community.

STEM Beyond School requires programs to intentionally engage historically underserved youth, specifically youth from communities of color and low-income communities as well as youth with disabilities and those who are English-language learners. With a grant requirement of engaging at least 70% participation amongst these groups, programs were challenged and inspired to rethink their traditional ways of reaching out, recruiting, and retaining those students. In its first year as a demonstration or pilot project, STEM Beyond School reached approximately 1,277 students, with 83% of them considered disadvantaged by ODE categorization (for the 606 students for which we have data).

To ensure long-term benefits for youth, STEM Beyond School provided capacity building support to the community-based programs in the form of educator professional development, program design guidance, a community of practice for participating providers, and equipment. Educators working directly with youth participated in high quality, high dose (80 hours) professional development connected directly to their specific needs. Professional development categories included essential attributes in program quality, best practices in STEM learning environments, fostering STEM Identity, and connecting to the community. Rather than providing one-size-fits-all workshops, the program crowdsourced the needs of the educators and then leveraged expertise from across the state to address specific training or coaching needs. This created a community- and peer-based "just-in-time" professional learning experience that allowed educators to modify their programming in real time.

Based in ample research evidence that providing one-time professional development and support is not sufficient to support ongoing program improvement, STEM Beyond School established an infrastructure within various STEM Hub networks to connect programs to each other and a larger body of STEM education experts to learn, collaboratively solve problems, and support innovative efforts. Building on principles from the Community of Practice and Networked Learning Community literature, the project enhanced programming through new regional partnerships and new practitioner relationships leveraged by STEM Hubs. This supported the program's growth as sites used the network as a key resource to share their successes and meet the needs of their students.

Out of School STEM Programs as effective STEM Learning Experiences

In a series of consensus reports, the US National Academy of Sciences has argued consistently that informal or out-of-school science or STEM experiences can be powerful particularly for children and youth from minority groups underserved in STEM. This important finding was first made prominent by the 2009 report *Learning Science in Informal Environments: People, Places and Pursuits* (National Research Council, 2009). In a short policy-oriented consensus report in 2015 entitled *Identifying and Supporting Productive STEM Programs in Out-of-School Settings* (National Research Council, 2015), the National Academies specified basic principles from the research literature that ought to guide the design and implementation of effective out-of-school STEM experiences for youth. This report also introduced the concept of a learning ecosystem as a foundational concept for connected STEM learning across settings and time. The two reports were instrumental in determining the basic requirements for SBS, and also formed the theoretical foundation for youth outcome and program assessment described in this report.

Scope of the Study

This evaluation project was dedicated to the examination of collaboration among out-of-school STEM program providers, support organizations, and the SBS Project Partnership Team, as well as their collective impact on students' STEM learning and identities as well as developing and testing measures and measurement instruments that could be used to both evaluate and improve the STEM Beyond School project into the future. The ultimate goal of this effort, which will be continued in year 2 is to provide specific, data-driven recommendations that will help to strengthen and sustain the positive progress in developing a network of program providers across the state of Oregon. This report is intended to provide insights into the nature of the network that the SBS project sought to establish and the youth who participated in SBS programming. While this report is limited in scope to the evaluation of the first year of STEM Beyond School programming, it ultimately feeds into a broader narrative about the impact and value of out-of-school education. Specifically, we explored a certain set of research questions, and we addressed results from the project for the outcomes presented by the Oregon Department of Education Request for Proposals that led to the STEM Beyond School project.

Research questions

The overarching research question for the summative aspect of the evaluation was simply whether the STEM Beyond School Project was effective. Specific research questions that guided the study included:

1. To what degree did intensive out-of-school experiences influence youth attitude towards learning, persistence in solving problems, active engagement with science, connection with and enjoyment in the program itself, and attitude toward science including whether they can succeed in science?
2. Did the STEM Beyond School project develop an effective statewide network that supports out-of-school STEM learning experiences and continuous improvement and learning?
3. Did the programs involved in the STEM Beyond School project use effective practices? What was the quality of the STEM programming provided to participating youth?

Results

Outcome 1: Increase student STEM interest, motivation, and enthusiasm in STEM-related activities and careers.

Youth were asked near the beginning of their programs, and then again near the end of their programs, to rate their agreement on a variety of statements that sought to measure their attitude towards learning, persistence in solving problems, active engagement with science, connection with and enjoyment in the program itself, and attitude toward science including whether they can succeed in science, all aspects that lead to the development of identity and interest in science (See Table 1 for scale definitions and for the full pre and post surveys with items and scale descriptions, see the Technical Appendix). Scores on the pre-survey were generally on the high end of the scale; most were in the 3- to 4-point range out of a possible total of 5 points, indicating that students overall had weak to moderate agreement with statements provided to them (1 on the scale as "strong disagreement" and a 5 as "strong agreement") (see Table 2). When respondents initially score highly on scales like these, they face what is called a “ceiling effect”, which means that they are less likely to experience a positive change on a post-survey. For example, think of a math teacher who gives her students a preliminary test at the beginning of the year to determine their baseline math knowledge. The lowest score on the test is a 3/10, while the highest is a 9/10. At the end of the year, the teacher gives the same test to directly compare what the students have learned. The student who scored the 3/10 has a much greater chance of seeing a larger change in his score than the student who scored 9/10; the latter can only improve by 1, while the former can improve by 7. When examining the SAS respondents, we witnessed this ceiling effect. When we examined all youth who took both the pre- and post-surveys, we found that there was not a significant change in students’ answers. That is because the high-ranking students had little to no room to grow on our scales.

Table 1. Definitions of each scale used in the Pre- and Post-Survey.

Scale	Definition
Learner Identity	Students see themselves as succeeding in learning and working environments emphasizing science.
Belonging and Relatedness	Students demonstrate persistence, utilize problem-solving skills and seek help when faced with learning challenges, obstacles, and setbacks.
Purpose and Relevance	Students demonstrate active participation and interest in science learning.
Competency and Self-Efficacy	Students feel like they belong in the learning environment, can relate to others and to the topics they are learning within the program.
Constructive Coping and Resilience	Students believe that learning activities and professional work in science are meaningful, important, and worthwhile.
Cognitive Engagement	Students believe that they have the capability to succeed in learning opportunities and careers that involve science.
Relationship to Science	Personal perspective on how they relate to science.

Table 2. Mean and Median Pre Student Affective Survey Scores for 7 constructs that represent important potential program outcomes for youth, all matched students who Took Pre- and Post-Survey. Refer to technical appendix for items for each scale and Table 2 for definitions.

Scale	Mean	Median	No. of Students
Learner Identity	3.82	4.00	177

Belonging and Relatedness	4.20	4.50	132
Purpose and Relevance	4.02	4.20	130
Competency and Self-Efficacy	3.41	3.50	132
Constructive Coping and Resilience	3.85	4.00	177
Cognitive Engagement	4.12	4.33	176
Relationship to Science	3.76	3.83	175

However, youth who started the programs with lower scores on youth outcomes exhibited statistically significant positive growth from the beginning of the program to the end. To examine these youth, we removed those who scored a 4.0 or above, meaning they agreed or strongly agreed with the statements given to them. The low-score youth had scores that indicated weak disagreement with the statements and we see that after participating in the program, these scores have moved significantly upward. This reflects an increase in interest in and affinity with science or engineering. Ultimately, this indicates that SBS not only engaged with underserved youth, but with low-interest students and that this engagement correlated with positive gains in youth outcomes.

Table 3. Students with Low Score Means (Less than 4.0) Comparisons

Scale	Pre Test Mean	Post Test Mean	Mean Change[1]
Learner Identity	3.17	3.53	+ .36
Constructive Coping and Resilience	2.20	3.52	+ 1.32
Cognitive Engagement	2.89	3.52	+ .63
Belonging and Relatedness	3.02	3.69	+ .67
Purpose and Relevance	2.98	3.73	+ .75
Competency and Self-Efficacy	2.81	3.05	+ .24
Relationship to Science	3.13	3.33	+ .20

1. Change scores were examined using paired samples t-tests. All change scores were found to be statistically significant with $p<.05$.

When asked what they liked most about the program, most youth had more than one answer to offer (see Figure 1). The most common responses centered around engaging in science- or engineering-related activities, experiments, and field trips, though there were also a large number of youth who said that their favorite aspects of the programs had more to do with the social environments created—that they felt that they belonged in these programs, that they could express themselves in a manner they felt unable to when they were in school, that they valued opportunities to spend time with old friends and the chance to make new ones. These aspects lead to the development of identity. There was also a common sentiment of appreciating greater autonomy over their learning choices—the ability to pick a subject for the program or to free-roam at museums—and the general instructor support that they felt came from their program providers who encouraged them to interact with new technologies and subjects.

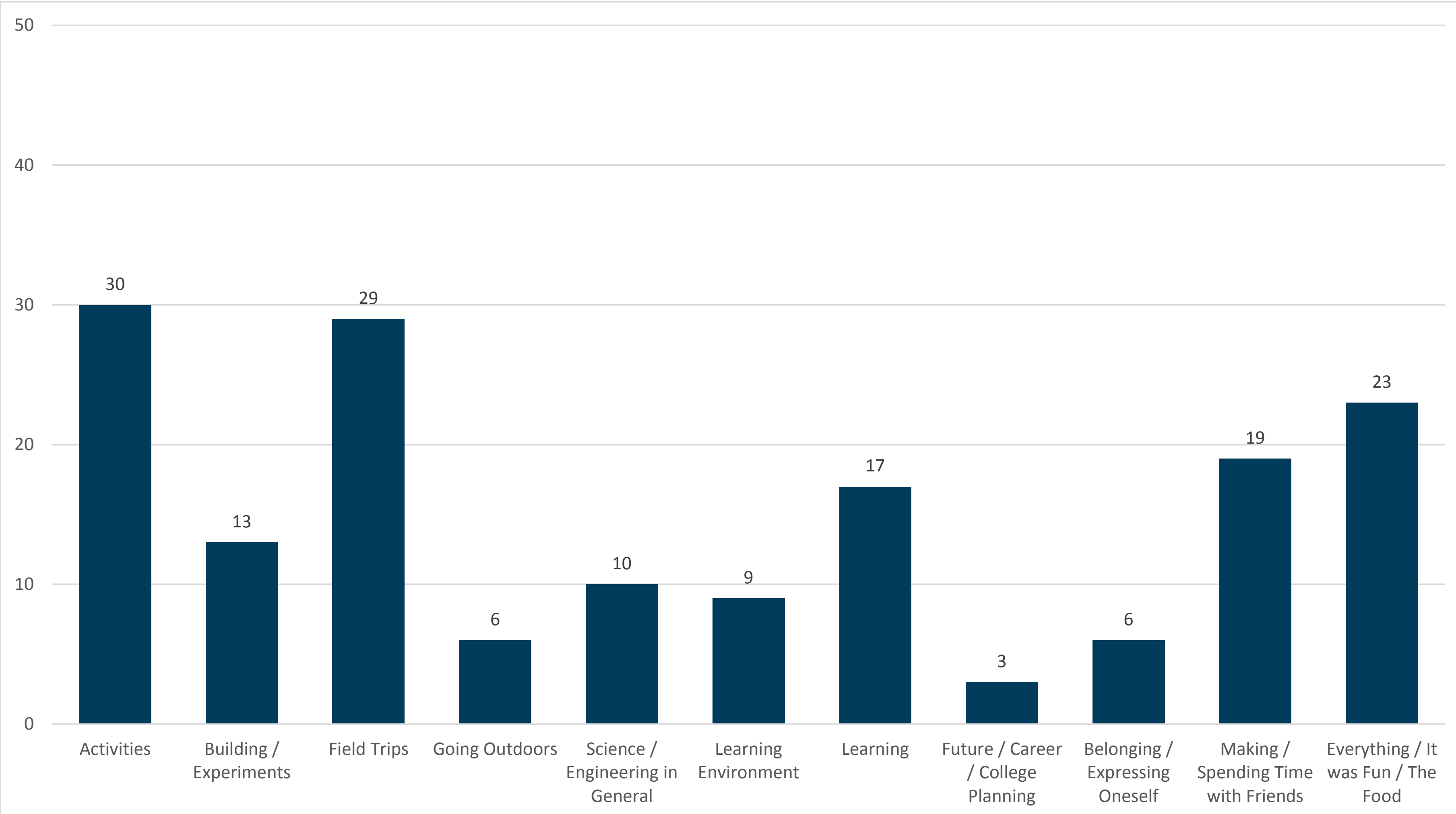

Figure 1. Please tell us what you liked most about this program? Represented are percentages % of respondents who gave a constructed answer that could be coded into one of 11 categories.

Outcome 2: Ensure that students have opportunities to develop a mindset and confidence to envision their future within STEM careers.

The majority of providers offered opportunities for youth to connect to STEM careers/professionals. Several acknowledged that connecting with STEM jobs in the community was the focus for the program in general. In some cases, local STEM professionals provided some of the instruction (e.g., computer coding) for either after-school or off-site activities. In other cases, youth had the opportunity to visit with and interview professionals in a wide range of STEM careers (e.g., engineers, wildlife biologists, airline pilots). In addition, many providers included visits to university, community college and technical college campuses, as well as potential local employers such as Intel, Autotech, Marvin Wood Products, Gunderson Metals, and iFly in order to expand youth conceptions of the STEM possibilities available to them in the future. One provider shared, "Kids who participated got thinking about what they want to do in their future careers or after high school." Another provider whose program emphasized STEM college and career readiness said, "so many of our STEM students can now tell you what college they want to go to, what they want to major in or get certified in, and have a drive and desire to want to continue their education beyond high school. It is amazing that we now have 4th and 5th grade students already envisioning what their life might look like after high school."

[The program] was fun and helped me explore the different STEM jobs that I could have.
– 7th Grade Student

When asked what their favorite part of the program was, several students noted that they especially preferred the opportunities that programs offered to learn, solve problems, and help them think about their futures, their college plans, and their careers.

Outcome 3: Increase opportunities for students to engage in interactive, student centered, applied learning, especially in the Math and Science/Engineering content (aligned to Oregon standards).

The funding and support provided by SBS allowed programs to provide a wide variety of STEM activities for underserved youth in their communities. Most programs focused on two or more dimensions of STEM (i.e., science, technology, engineering and mathematics) with the majority focusing on aspects of the biological sciences, followed by activities involving technology and engineering/design (see Table 4). Programs met at least once per week and many also provided summer camps. For many youth, this was the first opportunity they had had to engage in STEM programs and activities outside of school.

In addition to regular after-school STEM activities, another notable benefit of SBS funding was the ability for programs to provide off-site activities to which youth would not normally have access. Program providers used this opportunity to expose youth to a variety of STEM experiences including trips to OMSI, Oregon Zoo, Oregon Coast Aquarium, and the Air and

Space Museum. In addition to visiting STEM institutions, many providers also engaged youth in less structured outdoor exploration activities such as habitat exploration in tide pools, surveying streams for water quality and aquatic life, and using rescue beacons. For many youth, program providers reported that these were novel activities and places that they had not before experienced and many youth shared their excitement about these opportunities in their post Student Affective Survey responses (see Table 3 and Figure 1).

Table 4: STEM focus of SBS programs and examples of activities provided for participating youth.

Number of sites	STEM Focus	STEM Activities
16	Biological sciences (botany, entomology, ornithology, marine science)	Monitor water quality, survey for macroinvertebrates, grow a community garden, animal dissection, investigate tide pools
8	Technology	Computer coding, automotive technology, robotics
7	Engineering/design	Paper circuits, robotics, model airplanes, Rube Goldberg machines, design and build a bridge
3	Chemistry	Chemical reactions, making erupting volcanoes
3	Astronomy	Eclipse event, solar energy
3	Mathematics	Ratios/proportions, graphing/functions, YouCubed curriculum
2	Physics	Egg drop, disc golf
1	Industrial science	Welding
1	Food science	Food shopping, cooking, exercise

The majority of providers described their program delivery as hands-on, exploratory- or inquiry-based, and designed to be fun and engaging with opportunities for creativity and cooperative learning (Table 4). Every responding program felt that SBS helped them make positive, lasting changes in programming that will benefit youth well into the future. For example, one provider said, “we saw kids’ confidence grow, they developed a sense of adventure and exploration, they got to know the place they live, and they developed stronger relationships with each other and families."

> **I like the projects that we do that involve building things. This class is very interactive and it is fun to find out new ways to solve problems involving science.**

In addition to providing more STEM opportunities, providers reported that they were able to go deeper into STEM, with the aim of changing the culture of how students feel about STEM by creating a passion for it. Many program providers emphasized youth voice and choice in programs, an important component of STEM interest and learning. In some cases, youth met with staff at the beginning of the program to discuss and choose activities that were of interest to them.

Many programs were able to purchase durable equipment that can be used in the future, thus contributing to the sustainability of new activities and programs. Finally, a commonly described outcome was how SBS changed the providers themselves by expanding their conception of STEM and how to provide high-quality programming for youth.

Outcome 4: Decrease opportunity gaps among historically underserved student populations (grades 4-8) in science, engineering, and mathematics.

Out of the 606 participants in the STEM Beyond School project for whom we had data, 83% of them are considered disadvantaged as categorized by the Oregon Department of Education. See Table 5 for more information.

Table 5. Demographic information for some participants in the STEM Beyond School project based on Oregon Department of Education criteria for combined disadvantaged (historically underserved races/ethnicities, economically disadvantaged students, English learning students, and students with disabilities).
n = 606. Note that some youth who participated in SBS are considered underserved based on more than one category, but that they are only factored in to the "combined" value once.

Category	%
Historically underserved races/ethnicities	51.2%
English Learners	18.0%
Students Experiencing Poverty	76.9%
Students with Disabilities	15.7%
Combined Disadvantaged	83.0%

Outcome 5: Develop a statewide network of out-of-school providers to disseminate and implement effective practices, ideas and resources for STEM related education.

A major goal of SBS was to establish a network of out-of-school STEM providers across the state of Oregon that serves as the foundation for peer-exchange and support oriented towards reflection and ongoing improvement. The providers were to take part in a variety of professional development (PD) opportunities in support of an ongoing reflection and improvement process, including webinars, learning communities, and in-person convenings. In an end-of-year interview between Regional Coordinators and program providers, 24 out of 25 provider respondents agreed or strongly agreed that participation in SBS PD and events supported sharing of programming ideas and provided a forum for learning and sharing with other educators. In particular, 12 out of 25 respondents reported that the in-person regional and state meetings were the most useful for building relationships with other sites, learning about other programs, and sharing knowledge and activities. The in-person events also helped build energy and enthusiasm for the project and provided sufficient time for people to connect and share successes and struggles.

The SBS Learning Communities, also called Communities of Practice, were opportunities for smaller groups of providers to come together for a specific period of time (~6 weeks) on a topic of shared need, to learn together usually under the guidance of a practitioner with expertise or experience associated with the selected topic. These learning communities were deemed useful by 11 respondents who found them more personal in nature due to their small group nature. In addition, the learning communities focused on specialized topics of interest to participants, offered opportunities for discussion and networking, and helped providers become more comfortable offering STEM content and activities.

In contrast, webinars were generally viewed as less useful due to their format, which limited sharing. In addition, webinars were often viewed as boring, repetitive, and the content was not always of interest to everyone. However, others appreciated the variety of topics covered, seeing examples from other programs, and the consistent time that made it easier to schedule.

Nearly every participant was able to provide an example of a new relationship they developed as a result of SBS. Although the majority of these connections were with other SBS participants, some sites described creating better relationships with parents, schools, and other community organizations (e.g., the Benton County Health Department) that were valuable in reaching and working with underserved populations.

Outcome 6: Develop baseline data elements to inform size, scope, quality and student outcomes of out-of-school STEM aligned activities

As a demonstration/pilot project, STEM Beyond School focused on collecting data that would address the other outcome areas and inform the development of a sustainable infrastructure that would support a Networked Learning Community of community-based STEM education providers. Rather than guessing at the data elements that would be most informative and useful, effort was focused on testing assumptions about what would or would not work. For example, the following systems and tools were developed and/or leveraged:

1. Statewide infrastructure with regional coordination and statewide supports in concert with the Regional STEM Hubs. - NEW
2. Online reporting workbooks for sites. - NEW
3. Made improvements to and leveraged the use of the Common Measures Student Affective Survey. - MODIFIED
4. Self Assessment Process that includes a tool to inform PD plan and individual provider goals. - NEW

5. Flexible Professional Development Process to provide "just in time" opportunities - NEW
6. Site provider interview protocols - NEW

Self-Assessment Process

As part of the phase 2 effort, we recommend revisiting this outcome to identify the critical data elements that will inform STEM education providers continuous improvement efforts, the Networked Learning Community infrastructure and support, and future research into out-of-school STEM learning.

A major part of the STEM Beyond School project was developing the systems for the backbone organization to run the project, the development of community of practice of out-of-school providers in Oregon, supports for continuous improvements of these programs, and also the elements and approaches to collecting data about the quality and outcomes of the project.

The STEM Beyond School self-assessment process was developed to: 1) support program providers in developing dynamic, high-quality STEM programming guided by the thoughtful use of intentionally gathered information and alignment of programming with research-based practices; 2) identify and prioritize professional development needs around research-based practices for successful out-of-school STEM programming, and identify ways to connect programs with each other; and 3) characterize the nature of the programming to help us as evaluators understand and explain youth survey results (results from the student affective survey).

30 program providers in some cases, educators from the same programs filled out the online self-assessment tool in the fall of 2016 (near the start of their programming). The SBS leadership team used the program providers' responses to the self-assessment tool to help determine professional development needs.

How did the SBS program providers use the self-assessment process? 30 program providers (in some cases, educators from the same programs) filled out the online self-assessment tool in the fall of 2016 (near the start of their programming). They each received their responses immediately after submitting them. At the all-program event on April 20, 2017, the regional coordinators led the program providers in their regions in choosing one of the four core programming requirements on which to discuss their own responses and changes they would like to make in their programs based on these discussions. Anecdotally, the program providers were very engaged in the process at the all-program event, but it was clear that they needed additional facilitation to engage in the self-assessment process.

Conclusions and Lessons to Inform Future Project

Concluding on the overall research questions

The SBS project led to development of diverse, engaging and highly interactive opportunities for underserved students. Program providers reported that students got to participate in STEM programming and field trips with which they had otherwise not been able to participate in the past. In addition, program providers often incorporated opportunities for students to visit college and university campuses, meet with STEM professionals and learn about STEM career opportunities, and encouraged students to think about their futures and choosing a STEM-related path. In turn, several students responded that they valued these opportunities.

Although the SBS project by and large succeeded in achieving the desired outcomes as summarized above, findings from the youth survey indicated that programs did not fully meet the stated outcome of increasing youth attitudes toward science and other youth outcomes. In fact, only youth who began the program with low scores for these outcomes reported significant increases in these measures over time. We feel that this result is not so much about the work of the program providers, but more about how we measure outcomes and warrants further discussion.

The challenge is not that SBS programs were somehow insufficient at positively influencing youth STEM outcomes, but that in fact the outcome itself is unreasonable and should be amended in the future. In particular, Outcome 1 made the erroneous assumption that successful STEM programming should yield increases in participating youths' interest in and motivation for STEM and STEM learning, and should trigger increased enthusiasm for subsequent STEM-related activities or even a career in a STEM or STEM-related field. However, this assumption is incorrect for a number of reasons. First, interest itself cannot increase indefinitely. Theoretical models of interest development describe a 4-phase process during which early "situational interests" may become well developed "individual interests" over time (Hidi & Renninger, 2006). Therefore, youth who enter a program with well-developed STEM interests already will at best sustain those interests, or possibly evidence a decrease due to a purely statistical phenomenon called the ceiling effect. Secondly, some participants may overestimate their positive judgment at the beginning, and end with a much more stable, realistic and potentially lower rating on many affective or dispositional measures. Finally, programs that increase skills and understanding, and that focus on exercising resilience, teamwork, responsibility, or persistence may not be perceived as "fun," and a realistic expectation should be that they teach valuable skills without depressing attitudes. That is, unchanging or mildly declining pre-post attitudinal or dispositional measures could be considered a success.

For these reasons, we suggest that Outcome 1 be amended in the future to provide a more realistic measure of positive youth outcomes that align with interest and learning theory. We also recommend including measures of cognitive outcomes as these can increase over time even for youth with high levels of interest and other affective outcomes (Renninger & Su, 2012).

Recommendations to inform future project

In this section, we provide recommendations based on lessons learned to inform future iterations of the SBS project. These recommendatons come from evidence from interviews with program providers, a focus group with regional coordinators, and our own experiences with the project.

Feedback about STEM Beyond School Program Elements

When asked what SBS project elements should continue, the majority of respondents were interested in seeing continued funding and financial support as well as a continuation of the Learning Communities and the support from RC's in particular. Networking during in-person meetings was important for many. Others mentioned the flexibility in choosing their own programming and in SBS project elements (e.g., PD choices). Finally, several providers wanted to see a continuation of incorporating student voice, including families, and continuing to foster STEM identity.

When asked what SBS elements should stop, only eight program providers responded to this question, the majority of whom felt that the PD hours and particularly the webinars could be decreased or eliminated. One person suggested eliminating the NGSS piece because it was difficult for informal providers.

Program providers reported the following suggestions for how SBS project elements can be modified in the future to improve the program:

- the reimbursement process needs to be simplified/streamlined
- decrease programming hours from 70—diminishing returns
- require smaller cohorts
- help with transportation
- make sure that expectations are clear at the beginning of the grant
- help facilitate cross-site programming
- streamline reporting/tracking process.

Role of the Regional Coordinators

In general, the regional coordinators (RCs) felt that their role in SBS was a positive one. They felt well-connected with their sites as the point person to contact with questions/issues and they enjoyed this aspect of the relationship. This seemed like a reasonable role since there were over 30 sites all over the state and RCs were able to consolidate information so that it came from four people rather than 30 separate sites. However, the negative side of this relationship was that they began to feel like "middlemen" who were receiving information from two sides—the SBS project management team and individual program providers—and trying to convey information and answer questions in a timely manner. However, they often felt like they were asking providers for information from the management team without fully understanding what it was needed for. They found it frustrating to be unable to justify to sites why it was needed or what it was for.

In the future, RCs suggest that their roles be clarified, particularly the amount of autonomy they have to make decisions on their own. For example, RCs were frustrated that they were unable to approve non-consumable purchases under a certain price. Finally, they request that a schedule be established at the outset so everyone knows what is needed and when so there are no last-minute requests that they must make of the program providers. We note that this was a pilot/demonstration project with no pre-planning time supported at the outset.

Transferability and measuring deep conceptual learning

Transfer is defined as the ability to extend what has been learned in one context to new contexts (e.g., Byrnes, 1996), and is an indication of deep conceptual learning rather than rote memorization. Since a goal of education is to empower learners to apply their knowledge and skills in new situations, measures of transfer play an important role in assessing the quality of people's learning experiences. In particular, there are four characteristics of teaching and learning that providers should focus on to help facilitate transfer (National Research Council, 2000):

- Facilitate the learning of concepts with deep understanding. Help youth understand the "why" as well as the "what."
- Avoid overly contextualized knowledge. Find ways to explore concepts in several different contexts to explicitly model learning transfer.
- Use prompts to help learners make the leap from one context to another.
- Help learners connect their existing knowledge and skills with those being taught.

In order to measure knowledge transfer, providers should identify a concept or theme that runs through the program, of which youth have gained a deep understanding within a variety of contexts. Next, identify the knowledge and skills associated with that theme. Finally, develop a novel problem for youth to solve which requires them to use the knowledge or skills in a new way or a new context. For example, one provider used the theme of "water quality" that youth explored in her program over many weeks. She then asked them to predict whether and where fish would be found in an unfamiliar stream. Youth used their knowledge about fish biology to make predictions (e.g., temperatures and oxygen levels necessary for fish), and used their skills in measuring water quality to test those predictions.

Due to time and capacity constraints, most SBS program providers were unable to develop and conduct a measure of learning transfer in the pilot year of the program. We foresee that real measures of transferability in future iterations of SBS are not realistic because of the diversity of programming and concrete goals. Instead, we recommend student participant reflections on their growth in the program as a proxy measure and as a formative assessment for the program providers to use in improving their programs.

Designing effective out-of-school STEM programming

The following were topics that emerged from the self-assessment tool responses as issues that required discussion, exchange, or direct support. We recommend that SBS 2.0 refer to these topics to inform design and development of professional development opportunities for this year.

- Incorporating culturally relevant perspectives
- Engaging students in student-led investigations and exploration of challenges
- Connection to family/home setting

- Supports for assessing student learning
- Off-site programming
- Field Experiences

We recommend that program providers fill out and reflect upon a modified self-assessment tool with the purpose of reflecting on and improving their practices as well as providing stronger data to assess what kinds of practices they used in their programming (e.g., NGSS science practices and other research-based approaches to effective out-of-school STEM programming).

Changes to the Student Survey

We recommend several adjustments to the student survey that will help support actionable feedback to program providers, increase the numbers of returned surveys, and increase our understanding of the impacts of the project on the participating youth.

Specific adjustments we recommend include:

- Support program providers in presenting the survey to students in a more engaging way; embed survey into the programming experience.
- Add an open-ended question in pre-survey about motivations for attendance that can be shared with program providers and help explain the results.
- Add an open-ended question in the post-survey on personal growths in skills or understanding or consider reflective exercise whereby there is first some form of group discussion and program feedback, and then an exercise in which participating youth share individual thoughts on reflection cards. These could be collected and linked to the post survey.
- Refine questions about science affinity (asking if they have visited zoos, national parks, etc. *outside* of the out-of-school program).
- Add a scale for measuring career interest and aspiration using a "possible selves" framework.
- Potentially shorten the survey by focusing on critical outcome measures and eliminating some constructs entirely.
- Simplify reading level of the survey further and potentially use icons or emoticons for scale anchors (smiley faces).
- Examine the access to science/science affinity scale for possible improvements.

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Technical Appendix (Methods)

Student Affective Survey

The STEM Beyond School project focused on developing an instrument in conjunction with the Portland Metro STEM Partnership's Common Measures project, which is working toward creating a set of instruments that can be employed across the state to measure student attitudes in an established and universal manner. The pre survey, which was based on the existing PMSP Student Affective Survey which has been used with 10K + youth per year, and having been in use for 5+ years, included a variety of measures related to the personal perspective of students on STEM, including general attitudes towards STEM and personal significance of STEM. The survey was structured to be a list of statements with which students would rate their agreement on a five-point Likert scale from 1, which meant "Highly Disagree", to 5, which meant "Highly Agree".

The original Student Affective Survey (Saxton, et al 2014) was modified by revisiting its research base and examining additional research (e.g., Cole 2012) and modified and chosen with the following principles: 1) measurable, 2) teachable/malleable (clear teaching strategies available), 3) Research/Evidence-based, and 4) can be validated.

The development of the survey was impacted by several factors. First, there was negotiation among team members to include items and constructs that best met the varied needs of participants. Second, was the varying needs of the program providers which required the design of a survey that could be implemented both on paper and online. These factors ultimately led to the pre survey being split into two versions with overlapping and non-overlapping parts in an attempt to measure all constructs desired while limiting the length and burden placed on the student-respondents.

A reliability analysis of the included scales of the pre survey, coupled with continued concerns about length and readability, which had been confirmed by program provider feedback, led to a redesign of the post survey. Scales were shortened by removing items that decreased reliability, and some concepts were eliminated for which scale reliability could not be increased sufficiently without losing validity. The result was a shortened survey that, while not covering all desired concepts, measured student perspectives on science or engineering and on learning and engaging with science or engineering comprehensively and reliably, while addressing practitioner concerns with length and clarity.

The post survey included 4 items that were not included in the pre survey and that served as rough indicators for student affinity with science. Far from mature scales such as Science Capital, these four items provide us with rough estimates for a student's closeness to science and their behavioral indicators for science engagement at home (from NAEP). Note that these are not change measures, but important independent variables that allow improved interpretation of change data.

The total numbers of youth who participated in the Student Affective Surveys are not reflective of the total number of youth participants in the SBS programs. 13 of the programs, or 38%, did not participate in the pre survey and 8, or 24%, did not participate in the post survey. Despite more programs participating in the post survey, overall less youth participated as numbers dropped following the end of the school year, as is common in out-of-school programming.

Overall Survey Participation Numbers

Survey	Number of Students	Percentage
Pre Only	265	39%
Post Only	239	35%
Matched Pre-Post	177	26%
Total	681	100%

Scale and Items for pre and post survey. Alpha (Cronbach's alpha) is a statistic that measures internal consistency of a set of survey items.

Scale and Items	Version Item Included

1. I like learning new things.	Pre/Post
2. I like to solve complex problems.	Pre/Post
3. I like going to my out-of-school activities that involve science.	Pre/Post
4. I like figuring things out.	Pre/Post
5. I can succeed in situations that involve understanding science.	Pre/Post
6. I would like a job that uses science when I'm an adult.	Pre/Post
7. Someone like me does not get a job that requires understanding of science.	Pre Only
8. Science doesn't have anything to do with me.	Pre Only
Constructive Coping and Resilience **Alpha: Pre: .73; Post: .65**	Pre/Modified Post
9. When a problem in science is really difficult, I give up easily.	Pre Only
10. When I have difficulty learning something, I remind myself that this is important for my future.	Pre/Post
11. If I get stuck, I try something different to solve the problem.	Pre/Post
12. If I don't understand something in science, I ask for help.	Pre/Post
13. If I get stuck in science, I often don't know what to do next.	Pre Only
14. If a problem in science is really difficult, I just work harder.	Pre/Post
Growth Mindset **Alpha: Pre: .50**	Pre Only*
15. If I put in enough effort, I can succeed in science.	Pre/Post
16. I have limits to how much I can accomplish given my basic ability in science.	Pre Only
17. When I can't do problems in science, I feel like I'm not very smart in science.	Pre Only
18. I can't change how good I am in science.	Pre Only
19. No matter how smart you are, you can always change it quite a bit.	Pre Only
Cognitive Engagement **Alpha: Pre: .84; Post: .81**	Pre/Modified Post
20. I find topics related to science interesting.	Pre/Post
21. I enjoy learning new things in science.	Pre/Post

22. I don't really care about doing well in science.	Pre Only
23. I often feel bored during science.	Pre Only
24. I try hard to do well in science.	Pre/Post
Belonging and Relatedness **Alpha: Pre: .86; Post: .86**	Pre/Post
25. I feel like I am a part of this program.	Pre/Post
26. I feel respected in this program.	Pre/Post
27. I feel comfortable in this program.	Pre/Post
28. I feel like I can be myself in this program.	Pre/Post
Autonomy and Ownership **Alpha: Pre: .309**	Pre Only*
29. I like to be told exactly what to do in science.	Pre Only
30. I do my work in science because we have to.	Pre Only
31. I do my work in science because it matters in my life.	Pre/Post
32. I like to have choice in how I complete an assignment or task.	Pre Only
33. I try harder when I have choices on how I spend my time in science.	Pre Only
Purpose and Relevance **Alpha: Pre: .84; Post: .86**	Pre/Modified Post
34. Science is important for my future.	Pre/Post
35. Many of the things we learn in science are not very useful to me.	Pre Only
36. Learning science teaches me valuable skills.	Pre/Post
37. Science helps people solve problems to make the world a better place.	Pre/Post
38. Science helps people understand the world.	Pre/Post
Competency and Self-Efficacy **Alpha: Pre: .82; Post: .85**	Pre/Modified Post
39. I am good at science.	Pre/Post
40. I am not good at learning science.	Pre Only

41. I can help others understand science.	Pre/Post
42. I find science confusing.	Pre Only
43. I am good at solving challenges that involve science.	Pre/Post
Affinity with/ Access to Science **Alpha: Post: .64**	Post Only
44. In my free time, I read books or watch tv shows or visit websites about science.	Post Only
45. I know someone in my family who is a scientist or engineer.	Post Only
46. In my free time, I fix or building things.	Post Only
47. In my free time, I do experiments or use science kits.	Post Only
Net Promoter **Alpha: Post: .84**	Post Only
48. I am satisfied with this program.	Post Only
49. I would take part in a problem like this again.	Post Only
50. I would tell my friends to take part in this program.	Post Only
Relationship to Science* **Alpha: Pre: .91; post: .90**	
3. I like going to my out-of-school activities that involve science.	Pre/Post
4. I can succeed in situations that involve understanding science.	Pre/Post
5. I would like a job that uses science when I'm an adult.	Pre/Post
20. I find topics related to science interesting.	Pre/Post
21. I enjoy learning new things in science.	Pre/Post
24. I try hard to do well in science.	Pre/Post
39. I am good at science.	Pre/Post
41. I can help others understand science.	Pre/Post
43. I am good at solving challenges that involve science.	Pre/Post

* Constructed scale from items in the other scales

Self-Assessment Process

The purpose of the self-assessment process was the following:

1. Support program providers in developing dynamic, high-quality STEM programming guided by the thoughtful use of intentionally gathered information and alignment of programming with research-based practices.
2. Identify and prioritize professional development needs around research-based practices for successful out-of-school STEM programming, and identify ways to connect programs with each other.
3. Characterize the nature of the programming to help us as evaluators understand and explain youth survey results (results from the student affective survey).

We designed the SBS Program Self-Assessment Tool specifically to look at STEM experiences in longer (e.g. 70 hours) out of school settings. We designed the tool based on research about what elements make up high-quality out of school STEM programs (Fenichel and Schweingruber 2010, NRC 2012a, 2012b, 2015) and a published survey that examines use of the NGSS practices (Hayes et al. 2016). We used those references to design the tool and also incorporated the four core programming requirements for SBS. See Appendix for a full version of the self-assessment tool and the guide that was developed for facilitation of reflection about the self-assessment responses for program improvement.

Similar to science inquiry where evidence is gathered to understand a phenomenon, effective programs gather evidence to determine what's working and what needs to change. The self-assessment process included an online survey (self-assessment tool) for program providers to fill out as they planned their programming, reflection on their responses partway through programming to examine their own responses to the tool and self-identify strengths and opportunities for growth, and an opportunity to fill out the survey again at the end of their yearly programming.

Interviews with program providers

Program providers were interviewed utilizing an interview protocol by Regional Coordinators at the end of the SBS program to better understand how SBS was perceived by the providers of STEM programs for youth and how it could be improved in the future. Providers participated in a structured interview designed to examine how SBS helped sites to:

- provide high quality STEM learning opportunities for youth
- improve STEM affective and learning outcomes
- support sharing of ideas/information with a variety of other educators

Specific information was solicited about how the PD activities (Learning Communities, webinars, NGSS Consulting, and all-program events) helped providers as well as how they could be improved in the future. Sites were also asked to briefly describe the STEM activities they provided to youth, and how SBS supported (or not) their ability to engage youth in a variety of high quality STEM activities.

The findings from these interviews will be critical in planning for future iterations of the SBS program and improving how the program works for both program providers and the youth who participate.

Final instruments and tools attached

Pre_Student Affective Survey Purpose &Relevance_Competency&Self Efficacy
Pre_Student Affective Survey Belonging&Relatedness_Autonomy&Ownership
Post_Student Affective Survey_science version
Self-Assessment Tool
Self-Assessment Guide
STEM Beyond School Exit Interview Questions

STEM BEYOND SCHOOL: Student Affective Survey

Please select only one choice for each statement, using a #2 pencil or blue or black pens only.

To mark your answer, please fill in the bubble like this:	○	○	○	○	○
If you want to change your answer, do this:	○	~~○~~	○	●	○

We really want to know what you think of science. Thank you for sharing your thoughts with us! Please select only one choice for each statement.

	1- Strongly disagree	2	3	4	5- Strongly agree
1. I can succeed in situations that involve understanding science.	○	○	○	○	○
2. I would like a job that uses science when I'm an adult.	○	○	○	○	○
3. Someone like me does not get a job that requires understanding science.	○	○	○	○	○
4. Science doesn't have anything to do with me.	○	○	○	○	○
5. I like figuring things out.	○	○	○	○	○
6. I like learning new things.	○	○	○	○	○
7. I like to solve complex problems.	○	○	○	○	○
8. I like going to my out-of-school activities that involve science.	○	○	○	○	○
9. I am good at science.	○	○	○	○	○
10. I am not good at learning science.	○	○	○	○	○
11. I find science confusing.	○	○	○	○	○

	1- Strongly disagree	2	3	4	5- Strongly agree
12. I'm good at solving challenges that involve science.	○	○	○	○	○
13. I can help others understand science.	○	○	○	○	○
14. Science helps people solve problems to make the world a better place.	○	○	○	○	○
15. Science is important for my future.	○	○	○	○	○
16. Many of the things we learn in science are not very useful to me.	○	○	○	○	○
17. Learning science teaches me valuable skills.	○	○	○	○	○
18. Science helps people understand the world.	○	○	○	○	○
19. I try hard to do well in science.	○	○	○	○	○
20. I find topics related to science interesting.	○	○	○	○	○
21. I enjoy learning new things in science.	○	○	○	○	○
22. I don't really care about doing well in science.	○	○	○	○	○
23. I often feel bored during science.	○	○	○	○	○
24. If I don't understand something in science, I ask for help.	○	○	○	○	○
25. If a problem in science is really difficult, I just work harder.	○	○	○	○	○
26. When a problem in science is really difficult, I give up easily.	○	○	○	○	○

	1- Strongly disagree	2	3	4	5- Strongly agree
27. When I have difficulty learning something, I remind myself that it is important for my future.	○	○	○	○	○
28. When I get stuck in science, I often don't know what to do next.	○	○	○	○	○
29. If I get stuck, I try something different to solve the problem or complete the task.	○	○	○	○	○
30. If I put in enough effort, I can succeed in science.	○	○	○	○	○
31. I have limits to how much I can accomplish given my basic ability in science.	○	○	○	○	○
32. I can't change how good I am in science.	○	○	○	○	○
33. No matter how smart you are, you can always change it quite a bit.	○	○	○	○	○
34. When I can't do problems in science, I feel like I'm not very smart in science.	○	○	○	○	○

STEM BEYOND SCHOOL: Student Affective Survey

What is your First Name ____________________ Last Name __________________

What is the name of your school? ___________________________________

What Month were you born? (If you were born in December, you would answer "12")

What is the day of your birth? (If you were born on March 3rd, you would answer "03")

What year were you born? (If you were born in 2006, you would answer "2006")

Month		Day		Year			
0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1
X	2	2	2	2	2	2	2
X	3	3	3	X	3	3	3
X	4	X	4	X	4	4	4
X	5	X	5	X	5	5	5
X	6	X	6	X	6	6	6
X	7	X	7	X	7	7	7
X	8	X	8	X	8	8	8
X	9	X	9	X	9	9	9

STEM BEYOND SCHOOL: Student Affective Survey

Please select only one choice for each statement, using a #2 pencil or blue or black pens only.

To mark your answer, please fill in the bubble like this:	○	○	○	○	○
If you want to change your answer, do this:	○	✕	○	●	○

We really want to know what you think of science. Thank you for sharing your thoughts with us! Please select only one choice for each statement.

	1-strongly disagree	2	3	4	5-strongly agree
1. I can succeed in situations that involve understanding science.	○	○	○	○	○
2. I would like a job that uses science when I'm an adult.	○	○	○	○	○
3. Someone like me does not get a job that requires understanding science.	○	○	○	○	○
4. Science doesn't have anything to do with me.	○	○	○	○	○
5. I like figuring things out.	○	○	○	○	○
6. I like learning new things.	○	○	○	○	○
7. I like to solve complex problems.	○	○	○	○	○
8. I like going to my out-of-school activities that involve science.	○	○	○	○	○
9. I feel like I am part of this program.	○	○	○	○	○
10. I feel respected in this program.	○	○	○	○	○
11. I feel comfortable in this program.	○	○	○	○	○
12. I feel like I can be myself in this program.	○	○	○	○	○

STEM BEYOND SCHOOL: Student Affective Survey

	1-strongly disagree	2	3	4	5-strongly agree
13. I do my work in science because it matters in my life.	◯	◯	◯	◯	◯
14. I do my work in science because we have to.	◯	◯	◯	◯	◯
15. I like to be told exactly what to do in science.	◯	◯	◯	◯	◯
16. I try harder when I have choices on how I spend my time in science.	◯	◯	◯	◯	◯
17. I like having choices in how I complete an assignment or task.	◯	◯	◯	◯	◯
18. I try hard to do well in science.	◯	◯	◯	◯	◯
19. I find topics related to science interesting.	◯	◯	◯	◯	◯
20. I enjoy learning new things in science.	◯	◯	◯	◯	◯
21. I don't really care about doing well in science.	◯	◯	◯	◯	◯
22. I often feel bored during science.	◯	◯	◯	◯	◯
23. If I don’t understand something in science, I ask for help.	◯	◯	◯	◯	◯
24. If a problem in science is really difficult, I just work harder.	◯	◯	◯	◯	◯
25. When a problem in science is really difficult, I give up easily.	◯	◯	◯	◯	◯
26. When I have difficulty learning something, I remind myself that it is important for my future.	◯	◯	◯	◯	◯
27. When I get stuck in science, I often don’t know what to do next.	◯	◯	◯	◯	◯

	1-strongly disagree	2	3	4	5-strongly agree
28. If I get stuck, I try something different to solve the problem or complete the task.	○	○	○	○	○
29. If I put in enough effort, I can succeed in science.	○	○	○	○	○
30. I have limits to how much I can accomplish given my basic ability in science.	○	○	○	○	○
31. I can't change how good I am in science.	○	○	○	○	○
32. No matter how smart you are, you can always change it quite a bit.	○	○	○	○	○
33. When I can't do problems in science, I feel like I'm not very smart in science.	○	○	○	○	○

STEM BEYOND SCHOOL: Student Affective Survey

What is your First Name ____________________ Last Name __________________

What is the name of your school? ___________________________________

What Month were you born? (If you were born in December, you would answer "12")

0	0
1	1
X	2
X	3
X	4
X	5
X	6
X	7
X	8
X	9

What is the day of your birth? (If you were born on March 3rd, you would answer "03")

0	0
1	1
2	2
3	3
X	4
X	5
X	6
X	7
X	8
X	9

What year were you born? (If you were born in 2006, you would answer "2006")

0	0	0	0
1	1	1	1
2	2	2	2
X	3	3	3
X	4	4	4
X	5	5	5
X	6	6	6
X	7	7	7
X	8	8	8
X	9	9	9

STEM BEYOND SCHOOL: Post Student Affective Survey

We really want to know what you think of science. Thank you for sharing your thoughts with us!
Please select only one choice for each statement.

To mark your answer, please fill in the bubble like this:	O	O	O	O	O
If you want to change your answer, do this:	O	~~O~~	O	O	O

	1 strongly disagree	2	3	4	5 strongly agree
I like learning new things.	O	O	O	O	O
I like to solve complex problems.	O	O	O	O	O
I like going to my out-of-school activities that involve science.	O	O	O	O	O
I like figuring things out.	O	O	O	O	O
I can succeed in situations that involve understanding science.	O	O	O	O	O
I would like a job that uses science when I'm an adult.	O	O	O	O	O
When I have difficulty learning something, I remind myself that this is important for my future.	O	O	O	O	O
If I get stuck, I try something different to solve the problem.	O	O	O	O	O
If I don't understand something in science, I ask for help.	O	O	O	O	O
If a problem in science is really difficult, I just work harder.	O	O	O	O	O
If I put in enough effort, I can succeed in science.	O	O	O	O	O
I find topics related to science interesting.	O	O	O	O	O
I enjoy learning new things in science.	O	O	O	O	O
I try hard to do well in science.	O	O	O	O	O
I feel like I am a part of this program.	O	O	O	O	O

STEM BEYOND SCHOOL: Post Student Affective Survey

	1 strongly disagree	2	3	4	5 strongly agree
I feel respected in this program.	O	O	O	O	O
I feel comfortable in this program.	O	O	O	O	O
I feel like I can be myself in this program.	O	O	O	O	O
I do my work in science because it matters in my life.	O	O	O	O	O
Science is important for my future.	O	O	O	O	O
Learning science teaches me valuable skills.	O	O	O	O	O
Science helps people solve problems to make the world a better place.	O	O	O	O	O
Science helps people understand the world.	O	O	O	O	O
I am good at science.	O	O	O	O	O
I can help others understand science.	O	O	O	O	O
I am good at solving challenges that involve science.	O	O	O	O	O
In my free time, I read books or watch TV shows or visit websites about science.	O	O	O	O	O
I know someone in my family who is a scientist.	O	O	O	O	O
In my free time, I fix or build things.	O	O	O	O	O
In my free time, I do experiments or use science kits.	O	O	O	O	O

	1 Strongly Disagree	2	3	4	5	6	7	8	9	10 Strongly Agree
I am satisfied with the program.	O	O	O	O	O	O	O	O	O	O
I would take part in a program like this again.	O	O	O	O	O	O	O	O	O	O
I would tell my friends to take part in the program.	O	O	O	O	O	O	O	O	O	O

Please continue to the next page! →

STEM BEYOND SCHOOL: Post Student Affective Survey

Since the end of last school year in 2016, which of the following have you done or visited?	Yes	No
Science museum or science center	O	O
Air and Space museum	O	O
Aquarium	O	O
Zoo	O	O
Science festival	O	O
Maker Fair	O	O
Nature center	O	O
State or National Park	O	O
Wildlife watching	O	O
Spent time in nature	O	O

Please tell us what you liked most about the program.

Your First Name ________________________________ Your Last Name __________________________________

What is the name of your school? ____

What grade are you in?	4	5	6	7	8
	O	O	O	O	O

What Month were you born? (If you were born in December, you would answer "12")

What is the day of your birth? (If you were born on March 3rd, you would answer "03")

What year were you born? (If you were born in 2006, you would answer "2006")

Default Question Block

Welcome to the STEM Beyond School Self-Assessment Tool!

Self-assessment is an important element of the STEM Beyond School (SBS) Project's approach to fostering impactful STEM programs in out-of-school settings across Oregon. We have developed this SBS Self-Assessment Tool in order to help you in continuously improving your STEM program. The SBS Self-Assessment Tool is based on research-based practices that are known to contribute to productive STEM learning in out-of-school settings, and it is targeted specifically towards longer (e.g. 70 hours) out-of-school experiences, and the core programming requirements for SBS.

How to Use This Tool

The primary intent of the SBS Self-Assessment Tool is to support you in developing dynamic, high-quality STEM programming. We envision that completing this survey will serve as a reflective activity that supports thoughtful consideration of program change from your program's unique starting point. Consequently, keep in mind that there are no right or wrong answers here.

You can use the Self-Assessment Tool to help make informed decisions about your program planning during various stages of program design. We encourage you to use the Self-Assessment Tool for initial planning (phase one); again during mid-year, as an opportunity for further reflection (phase two); and at the end of the project for program reflection (phase three).

The SBS program leadership team will use responses on the SBS Self-Assessment Tool to identify professional development needs around research-based practices for successful out-of-school STEM programming. Regional Coordinators will use the responses to help SBS program sites connect with, and learn from each other and to help SBS programs plan throughout the year. Your final program reflection at the end of phase 3 will also be used to characterize the nature of the experiences that youth will encounter in the SBS program.

We will share your reflections and answers with you by sending a summary to the email with which you'll provide us. Please feel free to share any feedback or concern about this tool in general or your use of the tool with your regional coordinator.

Thank you for your participation, and for being a champion of engaging STEM learning in Oregon!

First, please provide the following contact information. You will receive an automated copy of your responses to this email address once you complete the self-assessment tool.

First Name	
Last Name	
Email Address (required)	
Organization	

STEM Beyond School Self-Assessment Questions

Engaging students as do'ers, designers, investigators, builders, etc. and providing first-hand experiences with materials and processes

How often will YOUTH do each of the following in your STEM out-of-school programs? Please choose the category that represents your best estimate.

	Never	25% or less of the sessions	25 to 50% of the sessions	50 to 75% of the sessions	75 to 100% of the sessions
Develop their OWN question or choose their own challenge to explore	O	O	O	O	O

	Never	25% or less of the sessions	25 to 50% of the sessions	50 to 75% of the sessions	75 to 100% of the sessions
Choose things to investigate (such as stream temperature, velocity, or slope)	○	○	○	○	○
Design their OWN investigations	○	○	○	○	○
Implement their OWN investigations	○	○	○	○	○
Construct or build their OWN solution to a problem or challenge	○	○	○	○	○
Try a new or different solution for the same problem or challenge	○	○	○	○	○

	Never	25% or less of the sessions	25 to 50% of the sessions	50 to 75% of the sessions	75 to 100% of the sessions
Make and record observations	○	○	○	○	○
Gather quantitative (numbers) or qualitative (descriptive) data	○	○	○	○	○
Analyze relationships using charts or graphs	○	○	○	○	○
Analyze results using basic statistics (e.g., mean, median, distribution)	○	○	○	○	○
Explain the reasoning behind an idea	○	○	○	○	○
Write about what was observed and why it happened	○	○	○	○	○

	Never	25% or less of the sessions	25 to 50% of the sessions	50 to 75% of the sessions	75 to 100% of the sessions
Give some form of presentation to the group (either informally or in a formal way)	○	○	○	○	○

	Never	25% or less of the sessions	25 to 50% of the sessions	50 to 75% of the sessions	75 to 100% of the sessions
Use evidence to support or refute a claim	O	O	O	O	O
Create a physical model of a scientific idea, such as a model of the solar system	O	O	O	O	O
Use models or model thinking to explain observations or data	O	O	O	O	O

How often will <u>you</u> (as the instructor) do each of the following in your <u>STEM out-of-school programs:</u>

	Never	25% or less of your sessions	25 to 50% of your sessions	50 to 75% of your sessions	75 to 100% of your sessions
Explain STEM concepts to youth primarily through verbal means	O	O	O	O	O
Have youth watch you demonstrate an experiment, process, equipment, or tool	O	O	O	O	O
Use activity sheets to practice skills or content	O	O	O	O	O
Review and/or define STEM vocabulary	O	O	O	O	O
	Never	25% or less of your sessions	25 to 50% of your sessions	50 to 75% of your sessions	75 to 100% of your sessions
Use open-ended questions to stimulate whole group discussion	O	O	O	O	O
Have youth work with each other in small groups	O	O	O	O	O

	Never	25% or less of your sessions	25 to 50% of your sessions	50 to 75% of your sessions	75 to 100% of your sessions
Support youth to question each other in respectful ways	○	○	○	○	○
Encourage youth to explain concepts to one another	○	○	○	○	○

Establishing a supportive learning community that encourages discovery and exploration of the unknown

How often will you (as the instructor) do each of the following in your STEM out-of-school programs?

	Never	25% or less of your sessions	25 to 50% of your sessions	50 to 75% of your sessions	75 to 100% of your sessions
Encourage youth to try again if they don't succeed the first time	○	○	○	○	○
Create a culture of trying new things and learning from mistakes	○	○	○	○	○

Responding to youth's interests, experiences, and cultural practices

In your initial program plan, to what degree will you consider the interests of youth in your STEM out-of-school programs?

- ○ High degree
- ○ To some degree
- ○ Mostly not
- ○ Not at all

How will you determine or identify the interests of youth in your STEM out-of-school programs? Check all that apply.

- ☐ Based on reasonable assumptions
- ☐ Based on personal or other staff person's experience
- ☐ Based on informal conversations with youth
- ☐ Based on own empirical evidence from evaluation data
- ☐ Based on general research on youth interest
- ☐ Other

Please describe an example source of information:

In your initial program plan, to what degree will you consider cultural perspectives and practices of youth in your STEM out-of-school programs?

- ○ High degree
- ○ To some degree
- ○ Mostly not
- ○ Not at all

How will you determine or identify cultural perspectives and practices of youth in your STEM out-of-school programs? Check all that apply.

- ☐ Based on reasonable assumptions
- ☐ Based on personal or other staff person's experience
- ☐ Based on informal conversations with youth
- ☐ Based on empirical evidence from own evaluation data
- ☐ Based on research about audience's cultural perspectives and practices
- ☐ Other

Please describe an example source of information:

Please describe the challenges to knowing or understanding the cultural perspectives and practices of youth in your STEM out-of-school programs.

How often will youth have an opportunity to choose projects or activities? Please rate the following between 1 (not at all) and 10 (all the time):

	0	1	2	3	4	5	6	7	8	9	10
*Move the bar slider											

Supporting a social experience that involves collaboration and leadership

In your initial program plan, please roughly estimate the approximate % of time youth will spend in:

Large group work (whole group involved in activity or discussion)	0	%
Small group work (split into multiple small groups)	0	%
Dyads (work done in pairs)	0	%
Alone/individual work	0	%
Other	0	%
Total	0	%

When youth are working in small groups, how will the small groups be structured (check all that apply)?

- ☐ Youth work in unstructured teams and/or small groups
- ☐ Youth choose their tasks or roles within teams
- ☐ Tasks or roles are assigned within teams according to youth's perceived strengths
- ☐ Tasks or roles are assigned within teams so that youth can develop new skills
- ☐ Tasks and roles are intentionally rotated over time (youth cannot just select what they think are their strengths)

Positioning staff members as co-investigators and learners alongside young people

In your initial program plan, please roughly estimate the % of time that instructors will utilize the following roles:

Expert/conveyor of information	0	%
Facilitator of experiences	0	%
Co-learner and peer, together with youth	0	%
Other ________	0	%
Total	0	%

Connecting with and supporting youth learning across settings, including school, home, and community

How often will you (as the instructor) do each of the following in your STEM out-of-school programs:

	Never	25% or less of your sessions	25 to 50% of your sessions	50 to 75% of your sessions	75 to 100% of your sessions

	Never	25% or less of your sessions	25 to 50% of your sessions	50 to 75% of your sessions	75 to 100% of your sessions
Use STEM concepts to explain natural events or real-world situations (connecting what youth are learning to real-world situations)	○	○	○	○	○
Talk with youth about things they can do at home that are similar to those done in your program	○	○	○	○	○
Facilitate sharing of youth's relevant STEM prior knowledge or experience	○	○	○	○	○

How often will youth be expected to take ideas, activities, objects they created, etc. home?

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Often
- ○ Always

How often will youth be invited to bring ideas, activities, objects they created from home?

- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Often
- ○ Always

Will community members be involved in the program?

- ◯ Yes
- ◯ No

Which community members will be involved in the program (Check all that apply)?

- ☐ Families of participating youth
- ☐ Business/industry representatives
- ☐ People from community-based organizations (non-profits)
- ☐ People from government agencies
- ☐ Other ______

What will be their roles be in the program?

What challenges do you face when involving community members in your STEM out-of-school program?

What strategies or ideas do you anticipate using to engage families as partners in out-of-school STEM learning?

In your initial program plan, how many hours (out of total programming) will youth typically go off-site?

Hours off-site ______

Out of (total hours of programming)

Do you need assistance to meet the SBS requirement of 51% of programming to be off-site?

- yes
- no

What connections do you envision sharing with students as opportunities for additional STEM learning outside of your program?

	Not consider	May reference	Being considered as part of programming	Is part of programming
Museums				
Websites				
Family/home settings				
Nature places (parks, etc.				
Movies				
Business/industries				
Colleges/universities				
STEM Careers				
Community-based				
Other				

Developing a coherent 70-hour youth experience

How often will youth have opportunities to practice skills during your program:

	Never	25% or less of your sessions	(25 to 50% of your sessions	50 to 75% of your sessions	75 to 100% of your sessions

	Never	25% or less of your sessions	(25 to 50% of your sessions	50 to 75% of your sessions	75 to 100% of your sessions
Within a similar situation or context in which they learned them (e.g., same skill, SIMILAR situation)?	O	O	O	O	O
Within a new situation or context (e.g., same skill, NEW situation)?	O	O	O	O	O

Coherence within learning experiences allows students to develop their knowledge and understanding of concepts and practice/use of skills over time and in a variety of settings. Coherence may be harder to achieve when programming is driven by student interests and needs.

As you consider your initial program plan, where do you envision your level of coherence? Please rate the following between 1 (Multiple individual learning experiences with little to no connections between them) and 10 (a sequence of learning experiences that are connected and build upon each other during the course of the program).

	0	1	2	3	4	5	6	7	8	9	10
Move the bar slider											

What level of coherence are you seeking in your program? Please rate the following between 1 (Multiple individual learning experiences with little to no connections between them) and 10 (a sequence of learning experiences that are connected and build upon each other during the course of the program).

	0	1	2	3	4	5	6	7	8	9	10
Move the bar slider											

Strategies and tools for assessing student progress

Please describe how you plan to assess youth learning.

What supports do you need to assess student learning?

Final thoughts

What additional support may benefit you in planning high-quality STEM out-of-school programs?

Please write any additional notes and thoughts here.

Self-Assessment Results Guide

Introduction

Thank you for taking the time and effort to fill out the STEM Beyond School Self-Assessment Tool when you were planning your program. Your thoughtful responses and now your thoughtful reflection on your responses will help you improve experiences of youth in your out-of-school programs.

This guide helps you ask questions to your own responses. As you are looking at your own responses, keep in mind that the self-assessment tool questions are meant to help you reflect on your program. They do not necessarily indicate any right or wrong direction since programs differ so dramatically in focus, goals, lived experience etc. We recommend that you discuss reflections with others in your regional group to find answers to your questions, or to even generate questions that can be discussed. Ultimately, the ideal is for you to find a way to make changes to your program (or keep doing things), based on thoughtful analysis and reflection. The SBS team will be available to provide support where needed in addressing potentially difficult issues.

How to Use this Guide

This guide is framed around the four SBS programming requirements. We recommend that you start by choosing one of the requirements on which to focus. Then move on to others. We suggest that you use the following flow when using this guide to reflect on your own responses.

1. Read brief “why it’s important” section.
2. Review your own responses to the self-assessment tool (or the responses given by the person who filled out the tool for your site). This review can serve as a reminder to revisit where you were at the time. We have given you pointers of the questions that most relate to each SBS programming requirement.
3. Discuss the important considerations with your team or other program providers.
4. Discuss the reflection questions with your team or other program providers.
5. Consider the cross-cutting themes of “Supportive Learning Community” and “Cultural Perspectives” in *all* the discussions.
6. Use pages 7 & 8 to take notes on your decisions and next steps for each of the four SBS Programming Areas.

Cross-cutting Themes

Supportive Learning Community

Establishing a supportive learning community that encourages discovery and exploration of the unknown is an important part of all SBS programming requirements. The 2015 National Academies of Science report on *Identifying and Supporting Productive STEM Programs in Out-of-School Settings* (NRC 2015) describes the importance of providing an environment where "young people are encouraged to develop their own questions, to devise ways of investigating and addressing those questions, and to share the results of their inquiries, which will often be tentative" (p. 19). To specifically consider how your programming is encouraging a supporting learning community, look at your responses to questions 8, 19-20, and 22 and also consider this concept when reflecting upon the four SBS programming requirements (see below).

Cultural Perspectives

Consideration of youth's personal experiences, cultural perspectives, and interests is critical for engaging youth in STEM learning (and learning in general). When youth engage in learning and doing science and engineering, they bring their cultural worldviews with them. Programs can acknowledge this reality by building upon lived experiences of their participants and providing space for multiple voices to be heard. These strategies are effective ways to engage all youth in the learning of STEM. To specifically consider how your programming is responsive to cultural perspectives, look at your responses to questions 13, 14, 15, 16 and also consider this concept when reflecting upon all four SBS programming requirements (see below). To read more about this topic, refer to Ciechanowski et al. 2015.

STEM Beyond School Programming Requirements

1. Core Programming Element: Student Driven - Responsive to Student Needs and Interests

Why Student Driven is Important:

Structuring learning opportunities that give youth choice is a powerful tool to motivate their learning. Youth become purposeful learners who engage in an activity because they want to, not because someone else told them to. Research shows that when youth recognize a question, problem, or strategy as meaningful, they are more likely to become interested in it, and to persist in learning it. Structuring out-of-school STEM programs that are responsive to youths' prior interests and experiences so that they can see STEM as personally meaningful and relevant may be especially important for youth from communities historically underrepresented in STEM fields. To read more about this topic refer to National Research Council (2015, pp. 20-21).

Please review your responses to the following Self-Assessment questions

- (5a-e) How often will youth do each of the following…
  - Develop their own question or choose their own challenge to explore
  - Choose things to investigate (such as stream temperature, …)
  - Design their own experiments
  - Implement their own investigations
  - Construct or build their own solution...
- 8 , 10-12, 17, 19

Important Considerations

- Youth needs may include such factors as feeling safe and part of a community, developing positive relationships with adults other than their parents, being involved in creative activities, having opportunities to plan and be in decision-making roles, and providing opportunity for control and ownership of their situation.
- Youth interests can be tapped by providing greater autonomy or choice in both the types of activities they engage in and how they are allowed to reach the goals of the activity. For instance, you can provide students the choice to build a windmill or catapult but you can also give them the flexibility to build their device in whatever way they want (allowing mistakes, do-overs, experimentation, etc.).
- Youth choice can include both their ability to choose what they do (within reason), and who they are doing this with (group composition and degree of group-based work).

Reflection Questions

Given your discussion on programming driven by student needs and interests, ask your team the following questions:

- Are we doing enough of this for our youth? Do we want to do more of this for our youth?
- What does the Student Affective Survey data tell us about our youth in this area?
- How do the cross-cutting themes of supportive learning community and cultural perspectives contribute to this focus?
- What opportunities exist for increasing this focus?
- What supports, resources, or professional development would help us address this better?

2. Core Programming Element: Students as Do’ers & Designers

Why Engaging Students as Do’ers & Designers is Important

Multiple National Academy of Sciences reports on STEM learning in out-of-school settings stress the importance of engaging youth in active discovery, exploration, or making. Science, or now STEM, is not to be read about and shown, but to be experienced actively as it is being done. The Next Generation Science Standards are based on a seminal report by the Academies entitled *A Framework for K-12 Science Education*, which embraces these ideas by putting eight science and engineering practices front and center, and makes them the entry point for science education and the focus of what students will be doing when learning science. Engaging youth as active explorers, investigators, experimenters, makers, designers or builders is the bedrock on which interest development, science understanding, and motivation form. Active engagement is also where students experience and practice the ups and downs of figuring things out, and build their resilience, focus, and ultimately satisfaction in their own accomplishments. This process supports development of a growth mindset where everyone can achieve when youth struggle and succeed. Success is sweetest when earned fairly and squarely. To read more about this topic refer to National Research Council (2015, pp. 16-19).

Please review your responses to the following Self-Assessment questions

- 5(f-n) How often will youth do each of the following…
    - Try a new or different solution for the same problem or challenge
    - Make and record observations
    - Gather quantitative (numbers) or qualitative (descriptive) data
    - Analyze relationships using charts or graphs
    - Analyze results using basic statistics
    - Explain the reasoning behind an idea
    - Write about what was observed behind an idea
    - Give some form of presentation to the group
    - Use evidence to support or refute a claim
- 6, 8

Discuss Important Considerations

- Students as do’ers & designers goes beyond hands-on learning and encompasses students’ active “minds-on” engagement. For instance, students following directions or following an adult modeling the activity to complete a field investigation may be hands-on, but students asked to figure out and design the investigation are do’ers & designers.
- Learning opportunities need to be challenging enough that when students succeed, the success feels earned and legitimate. If it is too challenging, students may give up too soon and feel discouraged.
- Giving students the opportunity to choose their own question or develop their own solution to a problem also provides student interest and choice.

Reflection Questions

Given your discussion on programming driven by student as do'ers & designers, ask your team the following questions:

- Are we doing enough of this for our youth? Do we want to do more of this for our youth?
- What does the Student Affective Survey data tell us about our students in this area?
- How do the cross-cutting themes of supportive learning community and cultural perspectives contribute to this focus?
- What opportunities exist for increasing this focus?
- What supports, resources, or professional development would help us address this better?

3. Core Programming Element: Students Apply Learning in New Situations

Why Students Applying Learning in New Situations is Important

A 2012 National Academies of Science report on 21st Century skills referred to "deep learning" as the ability to transfer what has been learned in one situation to another one (NRC 2012). This is considered by some the true meaning of having learned, when it can be applied in a novel situation or context. But this so-called far transfer needs to be practiced, ideally by allowing the learner to first practice within the context in which he/she encountered the new learning, and only then make them apply a more established ability or skill to a novel situation or context. To read more about this topic refer to National Research Council (2012, pp. 69-100).

Please review your responses to the following Self-Assessment questions

- 5f,k - p How often will youth do each of the following…
    - Explain the reasoning behind an idea
    - Write about what was observed behind an idea
    - Give some form of presentation to the group
    - Use evidence to support or refute a claim
    - Create a physical model of a scientific idea,...
    - Use models or model thinking to explain observations or data
- 36-38

Discuss Important Considerations

- While we need to provide opportunities for students to demonstrate understanding and practice skills in similar situations in order to build competency/proficiency, we often forget to see if they truly understand the concepts and are able to use the skills in different situations.

- Students are used to answering short, recall questions including recounting what happened, describing what they experienced or retelling a story but these don't assess their actual understanding.
- Shifting from recollection-only to putting youth in the empowered position to wield their knowledge to solve problems and explore concepts in contexts they have not yet experienced provides opportunities to demonstrate their actual understanding.
- The balance between activities that use the same skill in a similar situation and activities that use the same skill in a new (or modified) situation will be dependent on many factors including length of program, nature of program, types of activities, etc.

Reflection Questions

Given your discussion on programming that includes opportunities for students to apply learning to new situations, ask your team the following questions:

- Are we doing enough of this for our youth? Do we want to do more of this for our youth?
- What does the Student Affective Survey data tell us about our students in this area?
- What opportunities exist for increasing this focus?
- How do the cross-cutting themes of supportive learning community and cultural perspectives contribute to this focus?
- What supports, resources, or professional development would help us address this better?

4. Core Programming Element: Relevant to Students & Community-based

Why Relevant to Students & Community-based is Important

According to a 2015 National Academies of Science report, "commonly, young people's ideas about STEM reflect cultural models that include images of obsessive genius scientists working lonely late night hours in their laboratories. Such cultural models make STEM less appealing to many youth who envision their future life's work as addressing significant issues in their communities. A major goal of STEM education therefore is to help youth understand the relevance of STEM to the worlds they know, so they can understand the utility and value of STEM and how it is situated in meaningful social contexts" (p. 20). Out-of-school STEM programs have an opportunity to address this issue by connecting youth to relevant settings and contexts within their communities that "treat youth as knowledgeable and capable, thus supporting youth to intellectually, socially, and emotionally to fully participate, contribute, and develop as members of the STEM learning community" (p. 21). To read more about this topic refer to National Research Council (2015, pp. 20-22).

Please review your responses to the following Self-Assessment Tool questions

- 13 - 16, 24-31, 34

Discuss Important Considerations

- Just because it's in the community, doesn't mean it will be relevant to the student; for example, your community has a golf course but referencing the game of golf may be meaningless if the students have never played golf or seen the game of golf.
- On the other hand, having students investigate a common or frequently utilized community space, such as a skate park, might provide highly relevant learning opportunities.
- Highly relevant topics may often involve issues affecting the families and youth who live in the community.

Reflection Questions

Given your discussion on programming relevant to students, ask your team the following questions:

- Are we doing enough of this for our youth? Do we want to do more of this for our youth?
- What does the Student Affective Survey data tell us about our students in this area?
- What opportunities exist for increasing this focus?
- How do the cross-cutting themes of supportive learning community and cultural perspectives contribute to this focus?
- What supports, resources, or professional development would help us address this better?

References and Resources for Further Reading

Ciechanowski, K., S. Bottoms, A. Fonseca, and T. St. Clair. 2015. Should Rey Mysterio drink gatorade? After School Matters. Spring Issue: 29 - 37.

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National Research Council. (2015). *Identifying and Supporting Productive STEM Programs in Out-of-School Settings.* Committee on Successful Out-of-School STEM Learning. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

Student-Driven

Student as Do’ers & Designers

Students Apply Learning in New Situations

Relevant to Students & Community-based

RCs: Please duplicate this document for taking notes

STEM Beyond School Exit Survey Questions

1. On a scale of 1-10 (1 = not at all & 10 = very), to what degree do you think the networking and learning (professional development) activities associated with SBS were focused on helping sites provide high quality STEM learning opportunities for their youth?
    a. Please explain your rating:

2. On a scale of 1-10, to what degree do you think the networking and learning (professional development) activities associated with SBS were focused on improving outcomes for underserved youth?
    a. Please explain your rating:

3. On a scale of 1-10, to what degree did participation in SBS PD opportunities (e.g, Communities of Practice sessions, consulting support, webinars, workshops, etc.) and events (e.g., regional and statewide) support sharing of programming ideas/strategies/activities/etc. and provide a forum for you to learn from and share with other educators?
    a. Please explain your rating and share a specific example

4. Was the 80 hours of professional development just right, too much or not enough and why?

    a. What was the most helpful aspect about the
        i. the Learning Communities
        ii. webinars
        iii. NGSS Consulting
        iv. Two all-program events

    b. How might we improve
        i. the Learning Communities
        ii. webinars
        iii. NGSS Consulting
        iv. Two all-program events

5. What other supports would you need to continue to improve your programming?

6. On a scale of 1-10, to what degree did SBS support changes to your programming that will continue next year (or into the future)?
    a. Please describe the changes that you made and/or provide an example of such a change
    b. Please describe how the changes improved the experiences for your youth

7. Thinking beyond Professional Development opportunities, how well did the STEM Beyond School provide you and your program opportunities to reach out to learn from others or share your experiences with other programs?
    a. Please provide an example of a new relationship or connection that has been instrumental in helping you to improve outcomes opportunities for your youth

8. Did your program provide STEM programing for the first time?
    a. If YES - Please describe the benefit you saw for your youth

    b. If NO - Please describe how you grew/expanded your programming this year

9. Referring to the NGSS Practices, did you incorporate more or more advanced opportunities for youth to
    a. Design their own engineering solution, and test & iterate that solution YES, NO or N/A
        i. If yes, describe an example

    b. Design their own science experiments   YES, NO or N/A
        i. If yes, describe an example

    c. Explain their thinking using evidence   YES, NO or N/A
        i. If yes, describe an example

10. Did your program provide opportunities to highlight or connect to STEM careers and/or STEM professionals?
    a. If yes, please describe

11. Of the four core programming areas, which area or areas did your program try to incorporate the most?
        i. Student-Driven
        ii. Students as do'ers & designers
        iii. Apply new learning
        iv. Relevant to students/community-based
    b. Why did you focus on this area or areas?

12. Thinking about STEM Beyond School, we want to know your ideas as we move this project forward in the future:
    a. What should we continue to do or support?

    b. What should we stop doing or supporting?

    c. What should we modify or change in what we are doing or supporting?

13. Is there anything else you want us to know?

Thank you for being part of this amazing pilot year!