Title: Innovative Approaches to Staff Development and Teacher Training Using IMLS Grant Funding

Day/Time/Location: Monday, October 23, 2017: 2:30 PM - 3:45 PM, Convention Center, Meeting Room 211CD

Handout # 2 Museum of Science – “Next Generation Science Thinking and Innovation for Museum Educators” Summary Paper
Project Background

Through the generous funding provided, we intended to increase the capacity of the staff at the Museum of Science, Boston, to develop new learning experiences that align with current trends in formal science education. Over the course of several professional development sessions, including group discussions, book studies, and team-based investigations, museum staff were asked to reflect on new state and national science education standards and related literature. We sought to familiarize our colleagues with new student performance expectations in science and engineering, as well as with new strategies for highlighting science content and the nature of science in different learning environments.

For the scope of our work, we chose to use the term ‘Next Generation Science’ (NGS), in order to encompass much more than just curriculum standards. For our programming, participants were each given a copy of A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas.¹ This underpinning conceptual framework was released before the Next Generation Science Standards² or state specific adaptations, and it offers a comprehensive vision for science literacy. This resource draws upon 20+ years of research to provide guidelines for formal science education, and this knowledge forms the basis for new performance standards that shape curriculum and assessment. The text also specifically identifies science educators working in informal settings as critical practitioners who play a role in bringing the nature of science to all learners.

As NGS propels the national agenda for science education forward, museum professionals need to build shared understandings and uniform language throughout their institutions. However, despite the Museum of Science’s strong commitment towards supporting K-12 science and engineering education, knowledge about formal school settings is not consistent across our distinct work groups. Varied work schedules and responsibilities have prevented some staff members from regularly engaging in professional learning. Colleagues have also had limited opportunities to create communities of learning around their PD programs, and have not always been encouraged to translate their learning experiences into practice. We sought to address several of these concerns through a varied, asynchronous program model.

Program Design

The Next Generation Science Thinking and Innovation for Museum Educators (NGS TIME) project incorporated participation from not only museum educators assigned to directly support teachers and students, but also exhibit content developers, educators who work in staffed exhibits, colleagues who present live programs to the public, and evaluators who partner with educational programs. We sought to solve the challenge of access to professional development across work groups through a varied program design model.

Twenty-four Museum of Science educators across multiple work groups and at various stages of their careers engaged in this workplace learning opportunity. We focused on the question: If and how might we integrate Next Generation Science into our work? There were four components to the staff development experience:

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1. **Three 2-hour meetings supplemented with ~12 self-guided hours** of close reading, investigations into practice, and paired discussions amongst participants. Each meeting was offered twice to accommodate staff schedules. This component allowed participants to make meaning of Next Generation Science and to consider connections to their work.

2. **Practitioner experiments** developed and carried out by 8 participant teams. The experiments allowed staff members to explore means of applying what they were learning about NGS.

3. **A Teacher Leader Institute**, whereby staff could interact with a community of school leaders engaged in making sense of Next Generation Science and its implications for curriculum and instruction. The hope was that museum educators with limited access to formal school settings would deepen their understanding of how NGS impacts teachers, schools, and students.

4. **An experiment showcase**, which provided an opportunity for teams to share their ongoing experimental work, and to receive constructive feedback from colleagues and project advisors.

This work took place over a seven month period and was led by the Manager of Teacher Professional Development, Lesley Kennedy, who drew upon the added expertise of a team of regional and national leaders in informal and formal science education. This advisory team provided substantial information about staff development opportunities offered at other informal science intuitions, which helped us structure a program model that best capitalized on the thirty hours of professional development programming afforded to each participant.

It was anticipated that participants would deepen their knowledge of current science education reform and apply lessons learned from this project to their respective teaching practices. This was expected to lead to improved opportunities for both students and teachers to experience our museum through new learning experiences developed with a strong understanding of school-based science instruction. We posited that a shared understanding of current science education reform among museum educators would provide a critical foundation for our ongoing work of supporting students and teachers, and that this would make it easier for everyone to understand new developments as the work in both the school and museum settings moves forward.

**Program Achievements**

Our program participants became highly engaged in making sense of the science and engineering practices. For many of these museum professionals, it was initially assumed that we engage our visitors daily in opportunities to behave like scientists and engineers. While many of the educational offerings at the Museum of Science are strongly aligned with the elements of Next Generation Science, including disciplinary core ideas and cross-cutting concepts, there is more work ahead to incorporate science skill sets into our museum culture. It was important for our educators to consider how this new focus on practices relates to what they currently offer, and how some of the science skill sets may not have been as emphasized in their previous endeavors. During the NGS TIME project, team discussions focused attention upon which of the SE practices our learning environments best support, and which practices are more challenging to bring to life. Staff members built new understandings around the nuanced nature concerning when we empower our visitors to enact real science and engineering, instead of simply modeling it for them.

By the end of the program there were several notable examples where participants had incorporated what they had learned into their practice. Examples include:

- Creating a new live presentation comparing instances of the science and engineering practices during the Renaissance with examples from modern day, and another program under development to address the disciplinary core ideas relating to the physics of waves;
Developing a protocol for examining video of public and school audience large group presentations for evidence of modeling the practices, as well as for evidence of actually engaging audiences in some of the practices.

Challenging visitors in our Hands-On Lab to identify when they were engaged in the practices of scientists, and asking them to reflect on when they might access these skills in their daily lives.

As a result of this project several work groups have renewed their efforts to revise their school program descriptions and appropriately map their offerings to new standards, with the intent of better communicating how these programs support schools’ efforts to achieve the vision of NGS. These include our school visits group, our live presentations group, and our traveling school programs group. Additionally, our web-team is developing a new search engine capability that utilizes NGS disciplinary concepts to help school-based educators identify programs and exhibits connected to their curriculum.

Other experiments proved to be worthwhile learning endeavors, even though they did not amount to strong tangible outcomes. Examples include:

- Exploring ways to help teachers recognize NGS connections within our exhibit halls;
- Conducting a survey to learn about teachers’ expectations with regards to engaging in the science and engineering practices during school field trips;
- Developing a shared visual iconography of the science and engineering practices that could be used across the museum’s learning experiences.

Some of these experiments will likely be revisited as time and resources become available.

NGS TIME participants were also invited to join a three-day summer institute for teacher leaders. This program component provided them with an opportunity to learn more about the work of teachers and schools, but it was less successful than we had hoped, due in part to scheduling conflicts. We are left with questions about how to provide authentic opportunities for museum professionals to engage with formal educators as part of their professional development.

Evaluation Findings

Overall, evaluation findings from a post-program survey suggest that Museum educators understood how the components of Next Generation Science set out to change science education in an important way. Participants also agreed that the changes in the formal education arena are important and relevant to their museum work (Finding 1). By participating in the project, participants gained a deeper understanding of NGS and local science standards (Finding 2).

After participating in the NGS TIME project, museum educators reported using the science and engineering practices more frequently in their educational offerings, and they had additional ideas for future changes to their work. (Finding 3).

When reflecting on the NGS TIME project, participants claimed that some areas of the professional development experience were more beneficial than others. In particular, they cited the meetings and interactions with colleagues as most helpful. Additionally, the between-meeting work, the experiments, and the experiment showcase were noted as valuable as well (Finding 4).

From a series of interviews conducted nearly a year after the formal components of the NGS TIME program were completed, we learned that most museum professionals feel the program has influenced their work, even beyond the conclusion of the program activities. Interviewees discussed how participating in the program either resulted in specific changes to their projects, or led to an enhanced awareness of NGS that impacted
their thinking and conversations with other staff. All of the interviewees saw potential ways in which NGS could be applicable to their future work.

Participants also had several suggestions to make the program structure more successful. These include ensuring that everyone has ample time to work on each aspect of the program, offering more guidance on the development of experiments, scheduling meeting times during the experiment phase to provide more accountability, and providing a more robust model for sustaining projects beyond the completion of the program.

Program Extensions

Organizational changes during the project timeframe have created opportunities to expand and extend this work. One participant was promoted to the Director of Education Programs, and with her support we engaged in an additional, modified version of the NGS TIME meetings distinctly for our Traveling School Program team. This learning experience was directly situated in their need to revise their programs and communication structures for their school audience. Rather than develop experiments, each participant was assigned to apply their learning by revising a specific school program. To ensure a more successful opportunity for these museum educators to learn from a school-based educator, the team worked with a school teacher for 5 weeks. This teacher-in-residence worked in a mentor capacity with the team on several program revisions, and will remain in the role of advisor for several months to come.

Project Next Steps

The NGS TIME project leader acknowledges the need to work more closely with the participants’ managers throughout programs of this sort to ensure support not just in attending meetings, but also in the asynchronous work. Additionally, we recognize that it was possible for participants whose job responsibilities are most directly related to our work with schools to conduct experiments and change practices within the timeframe of the grant. For other museum educators, there may be less intrinsic motivation to shift behavior and, not surprisingly, changes with respect to exhibit development take considerably longer to enact.

The Director of Education Programs is highly committed to ongoing NGS-related professional development, and she continues to encourage educators within her eight departments to consider how they might improve their teaching practices in support of schools and school age children. She is also in a position to influence the collaborative work between our educational programs and exhibit development as we head into a period of significant change. Due to these leadership changes and the accomplishments of and lessons learned from the initial NGS TIME project, the Museum of Science is now primed to build on this body of work with both a receptive audience and with continued buy-in from our administrators.

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