REVEAL

Responsive Museum Facilitation

A Video-Based Reflection Guide for
Engaging with Families at Interactive Exhibits

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Acknowledgements

Table of Contents

Getting Started

Preparation for the Session Leader

Museums, science centers, and other informal education institutions offer powerful engagement and learning experiences for children and adults of all ages. Staff facilitators, such as museum educators or docents, play an important role in these settings and can enhance and deepen visitors' interactions at exhibits and during programs. By effectively balancing the exploration of educational content with sensitivity to the needs and desires of visitors, facilitators create personalized interactions with the potential to impact visitors long after the experience is over. Despite their important role, however, it's rare for staff to have the opportunity to watch other facilitators in action, learn about and practice new facilitation strategies, or discuss their practice with peers and colleagues. Even rarer are quality, sustained, research-based professional development resources to help these individuals reflect on their work and improve their practice.

The video-based professional development program presented in this guide is intended to help fill this gap and provide a catalyst for staff facilitators in museums, science centers, and other informal learning environments to discuss, reflect on, and improve their educational practices in conversation with their colleagues. The materials were developed as part of the REVEAL project, which studied the work of facilitators interacting with families at interactive exhibits in a science center (see Introductory Session Handout 1, "Provoking Reflection"). While other professional development (PD) projects have focused on more formal programs, such as stage demonstrations or classes for school groups, this professional development resource centers on informal, conversational interactions between staff and visitors. In addition to being a common way that staff members engage with visitors, we believe these types of unscripted interactions offer unique opportunities for educators to capitalize on the characteristics of informal learning and enrich visitor experiences while still allowing families to pursue their own goals and priorities.

The REVEAL professional development program is made up of a short introductory session and four discussion modules. Each discussion module involves viewing two videos of a facilitator interacting with a visiting family at a math exhibit, discussing these videos, and practicing new facilitation strategies and techniques based on the conversations. The professional development guide includes links to the videos for each module and handouts for participants, as well as instructions for the leader about how to organize the session and facilitate the discussions.

Timing and Scheduling

We understand that it can be difficult for floor staff to meet frequently or for an extended period of time, so each of the discussion sessions is between 1.5 and 2 hours long. Depending on the size and talkativeness of your group, you may require a bit more or less time. Since the homework assignments are designed to encourage experimentation and to give participants time to reflect, we suggest scheduling sessions at least a few days, but no more than two weeks, apart. If you wait longer than two weeks between sessions, it's easy for participants to lose sight of the content.

Tailoring the Program to Your Institution

Museums and science centers come in many flavors, and each has its own culture or shared philosophy that guides facilitated interactions with visitors. These factors will influence your participants' approach to the content of this program. Consider the following as you prepare to lead these sessions:

- Who are the primary audiences for your exhibits? How do you think these visitors view your museum?

- Does your team have a shared understanding of what "good" facilitation looks like? If so, how would they describe it?

- How do facilitators conceptualize the goals of their interactions with visitors?

- How and when do facilitators currently have the opportunity to work together? How do they support each other's work?

If you think it would be useful, you might want to have a discussion around these issues during the introductory session.

Choosing Practice Exhibits

The REVEAL project focused on facilitator-family interactions at math exhibits, and the videos in this program take place at two particular exhibits. These are unlikely to be exhibits you have at your own institution. It is useful, therefore, to have two to three specific exhibits that your participants can refer to when thinking about how the program content applies to your institution. The exhibits in the videos are open-ended, have multiple potential outcomes, present opportunities for exploring content at different levels of understanding, and accommodate intergenerational visitor groups, so it's best if you can choose similar exhibits from your own setting. You may want to enlist participants' assistance in choosing exhibits, especially if they work in different, unrelated areas. These exhibits will also be used for "reflection homework" between sessions, when participants will be encouraged to observe or interact with families and record their observations.

Watching Video Together

You and your colleagues may have not had the opportunity to collaboratively watch and discuss videos of facilitation before. We have included a set of tips for you to share with your group about best practices for viewing video in the context of professional development. Similarly, your group may not have had experience sharing personal stories and views about their work, so it's important to establish group norms at the outset to create a safe space for the conversations. Discussing both of these issues is part of the purpose of the introductory session.

Scheduling the Introductory Session

The purpose of the introductory session is to give participants some background information about the program, introduce the practice exhibits from your institution, discuss video viewing tips, and make sure the schedule and process going forward work for everyone. There are several handouts that participants get at this session that will provide more in-depth preparation for the first discussion module. Be sure to read them yourself before the introductory meeting.

Using Discussion Modules 1–4

After the introductory session, the professional development program is divided into four discussion modules, each written to help you as the session leader guide activities and conversations with your colleagues. Each of the modules includes seven standard sections. Below we outline the general structure and content of each of these.

Module Sections

Module overview

The overview highlights key information for the session leader, including module objectives, required materials, the general plan and structure for the session, and tips for the facilitator.

Warm-up activity

The group can try an optional physical or mental exercise, based on improvisational or icebreaker-style games. (See the section below about warm-up activities for more information.)

Homework discussion

At the outset of each module (other than Module 1), participants have the opportunity to discuss what they've done since the previous meeting, sharing new insights, perspectives, and observations.

Module introduction

The session leader introduces the module topic, highlights key ideas from the pre-module background reading, and helps participants connect the topic with their own previous knowledge and experiences.

Video discussion

This section includes background information about each of the module videos; questions, observations, and key moments relevant to each video; and a handout for participants to support the video-based discussions.

Reflection homework

The session leader introduces activities to try out after the session, as well as an introductory reading for the next module.

For further exploration

Each module ends with links to additional bonus videos and further readings relevant to the module topic. Full references for additional readings, as well as literature referenced in the handouts, are contained in the References list. A full list of video links is included in the Appendix.

Module Icons

Icons throughout the modules alert the session leader to the nature of each module section.

Materials

Agenda

Referencing a reading or handout

Physical activity or active facilitation practice

Information for the session leader to deliver or paraphrase for participants

Discussion among participants

Video viewing

Module Content

Warm-Up Activities

There are multiple reasons for the warm-up activities in each module, including giving participants a break from sitting, providing a kinesthetic way of experiencing the content, and, perhaps most importantly, getting to know and trust each other better. Some of the issues participants will be discussing can be sensitive and staff may feel hesitant about sharing their views unless the group has established a strong sense of trust. Particularly in institutions where participants don't often work closely together, warm-up activities can be an excellent way to build this trust and establish a supportive environment for the conversations.

We know that many institutions have a limited amount of time for professional development, so we have made the warm-up activities optional. Each module is paired with a companion activity from the NISE Network "improv exercises" guide (http://www.nisenet.org/catalog/improv-exercises) that we believe best fits the session focus. However, please feel free to incorporate any activity that you think fits the parameters outlined in the "Warm-Up Activity" section of each module.

These warm-up activities are largely based on improvisational (improv) games. The thesis of improv is: "say yes!" In other words, be open to whatever possibility is presented. As such, these activities do have a level of interpersonal risk associated with them that can be uncomfortable for some people. As a leader, it is important for you to encourage a supportive environment in which anything someone says or does to contribute to the game is welcome.

Group Discussions

During the module discussions, your job as leader is to keep the conversations focused, encourage contributions from all participants, and manage the overall flow and timing of the module. In this role, don't be afraid to gently end a conversation in order to move on to the next topic or section. Similarly, don't be afraid to dive deeper into a topic that particularly resonates with your group. Ultimately, the goal of this program is to support professional reflection and learning, so use your time with your group as best you can with this in mind.

The discussion questions during the introduction and the video sections of each model are arranged in a specific order to help guide the flow of the conversations and support participant learning and reflection. We encourage you to take the time to go through the questions in the recommended order. At the same time, you may need to modify the discussion protocols to accommodate the size of your group. Most discussions are structured as small group conversations followed by large-group debriefs, in order to provide participants with a more comfortable context for sharing personal stories and perspectives. However, if you have fewer than six participants, you might choose to run all discussions with the whole group.

Module Videos

In addition to following the suggestions in the introductory session "Video Viewing Tips" handout, it will be particularly helpful for you, as the leader, to watch both videos in each module once or twice ahead of time so that you are familiar with the interaction and content and can anticipate the observations and insights your participants might share.

Homework

The intent of the homework for each module is to give participants an opportunity to develop skills in professional noticing and exhibit facilitation—paying attention to how personal experiences and assumptions shape facilitation approaches, observing families to understand their needs and interests, and trying out and reflecting on different facilitation strategies. Although we strongly recommend incorporating the homework into the professional development program, as with the warm-up activities, use your best judgment regarding how to use the homework relative to how much time participants will have between each module.

Introductory Session

Introducing the REVEAL PD Program

Introducing the REVEAL PD Program

> Spend the introductory session (about one hour) discussing the following topics, taking time for thoughts and questions from the group at each section.

Share why you chose this PD program for this group and your expectations for its impact.

This helps everyone to be on the same page and to work toward a shared outcome. Emphasize that this program was developed through research with front-line museum facilitators and that these partnerships gave shape to the focus of the REVEAL project. Tell participants that they will be getting background information on REVEAL to review before the next session (Handout #1).

If appropriate, discuss aspects of your institution's culture that are relevant to this professional development.

- Who are the primary audiences for your exhibits? How do you think these visitors view your museum?

- Does your team have a shared understanding of what "good" facilitation looks like? If so, how would they describe it?

- How do facilitators conceptualize the goals of their interactions with visitors?

- How and when do facilitators currently have the opportunity to work together? How do they support each other's work?

Identify the exhibits in your institution that you will practice with during the program.

Either tell the group which exhibits you have chosen or enlist their aid in coming up with a few that have these characteristics in common with the REVEAL exhibits: open-ended, multiple potential outcomes, opportunities for exploring content at different levels, and accommodating to intergenerational visitor groups. Tell participants they will be reading about the REVEAL exhibits that will be featured in the videos before the next session (Handout #3).

Introduce the idea of using videos for professional development.

It is unlikely that participants in your group have used unscripted videos of visitors and facilitators interacting as part of professional development before. Tell them that such videos are the backbone of this professional development program, and that there are some important techniques for watching the videos, which are outlined in Handout #2.

Set group norms for discussions during the modules.

As with sharing your own goals for the program, establishing group norms helps to create a supportive, welcoming environment, particularly since some of the content and activities in these modules ask participants to share personal stories and views. Some possible group norms might include:

- Be respectful of other perspectives.
- Listen to understand.
- Recognize that everyone has something to learn.
- Acknowledge that everyone has expertise and personal strengths to offer.
- Speak from personal experiences.
- Take risks and ask questions.
- Honor confidentiality.

It is helpful to discuss these norms from the very beginning. Then, as needed during discussions, remind participants about them to maintain a respectful and productive environment.

Prepare for the first module.

Make sure you have a plan for scheduling time for the first discussion module. As participants leave, distribute the four handouts to read before the next session:

1) Provoking Reflection: Program Intent and Objectives
2) Video Viewing Tips
3) REVEAL Exhibit Descriptions
4) Introducing Module 1: Understanding the Family Context

Museums, science centers, and other informal education institutions offer powerful engagement and learning experiences for children and adults of all ages. Staff facilitators, such as museum educators or docents, play an important role in these settings and can enhance and deepen visitors' interactions at exhibits and during programs. By effectively balancing the exploration of educational content with sensitivity for the needs and desires of the visitors, facilitators create personalized interactions with the potential to impact visitors long after the experience is over. Despite their important role, however, it's rare for staff to have the opportunity to watch other facilitators in action, learn about and practice new facilitation strategies, or discuss their practice with peers and colleagues. Even rarer are quality, sustained, research-based professional development resources to help these individuals reflect on their work and improve their practice.

Through the program, we hope participants will**:**

1) *Strengthen and deepen their awareness and understanding of the complex dynamics of family learning in museums and how these relate to the role of a museum facilitator;*

2) *Increase their skills in reflecting on their practice so as to become more effective facilitators and more insightful museum professionals; and*

3) *Expand their repertoire of strategies for facilitating exhibit-based family learning in museums in a way that honors and responds to the needs and goals of families.*

The video-based professional development program presented in this guide is intended to help fill this gap and provide a catalyst for staff facilitators in museums, science centers, and other informal learning environments to discuss, reflect on, and improve their educational practice with their colleagues. The program blossomed from the REVEAL project (see next page), a research study that concentrated on the work of facilitators interacting with families at interactive exhibits in a science center. While other PD projects have focused on more formal programs, such as stage demonstrations or classes for school groups, this professional development resource centers on informal, conversational interactions between staff and visitors—particularly staff facilitation of family learning at interactive exhibits. In addition to being a common way that staff members engage with visitors in these settings, we believe these types of interactions offer unique opportunities for educators to capitalize on the characteristics of informal learning and deepen and enrich visitor experiences while still allowing families to pursue their own goals and interests.

This professional development program builds on findings and lessons learned from REVEAL to help staff facilitators reflect on and improve their work with families. The program is not a how-to guide to family facilitation. Instead, the videos and professional development modules are designed to prompt discussion, reflection, and experimentation around critical facilitation issues that we identified during our research. Using videos of natural, unscripted interactions with REVEAL facilitators and families, participants can first and foremost develop their "noticing" skills—e.g., paying attention to how personal experiences and assumptions shape facilitation, observing families for clues about how to best respond to and support the group, and understanding how particular facilitation strategies work in different situations. Watching and discussing videotaped interactions, participants can then build on these noticing skills to practice and refine their facilitation strategies with families at their own institutions.

The REVEAL Project

In 2013, the Oregon Museum of Science and Industry (OMSI) received funding from the National Science Foundation to support a three-year study, *Researching the Value of Educator Actions for Learning (REVEAL)*. The project was guided by the belief that front-line educators who engage with visitors—particularly families—at interactive exhibits in all types of informal learning institutions are a central and integral part of the visitor experience. The study was designed to contribute much-needed research to investigate the impact of staff facilitation on visitors and to identify effective staff facilitation strategies for supporting family engagement and learning in these settings.

REVEAL built on the *Design Zone* exhibition, which engaged visitors and families in exploring algebraic relationships and functions through hands-on music, engineering, and art exhibits (http://www.omsi.edu/exhibitions/designzone/). Expanding on this prior work, REVEAL utilized a two-phase research design to study and measure the impact of staff facilitation on family learning at exhibits—specifically, three exhibits from *Design Zone*. The first phase was a qualitative, design-based research (DBR) study with two expert educators to collaboratively develop and refine effective staff facilitation strategies and to identify contextual factors, such as exhibit design or visitor characteristics, that influence the nature and outcomes of these interactions (Pattison et al., 2016) .

Using the model of facilitation developed through the DBR study, the team then trained four new educators on the REVEAL facilitation approach and conducted a quasi-experimental study with 263 visitor groups to compare the outcomes of family learning experiences at the *Design Zone* exhibits with and without the expert facilitation of the educators (Pattison et al., 2017). Family learning and engagement, including visitor satisfaction, level of intergenerational communication, awareness of the mathematics in the exhibit, and depth of mathematical reasoning, were measured through both video analysis and post-interaction visitor surveys. The results of these studies provided some of the first robust, empirical evidence that educators do indeed play an important role in supporting family learning at exhibits and served as the foundation for the ideas and strategies presented through this program.

To learn more about REVEAL and explore more project resources, visit the project website: http://REVEAL.terc.edu.

This program was particularly designed for staff facilitators at museums, science centers, and other informal learning institutions who engage with families and visitor groups through informal, conversational interactions. Throughout this guide, we use the term "facilitator" to refer to staff (paid and unpaid) who interact regularly with visitors in these settings. Although these staff go by many titles (e.g., educator, docent, explainer, instructor, volunteer, teacher, expert), they all share the common goal of facilitating learning for visitors and providing social, personalized experiences that go beyond what can be offered through a stand-alone exhibit or display. Although the REVEAL project focused on math-based exhibits and visitors in family groups, this professional development program emphasizes reflective practices and facilitation strategies that we believe apply to a wide range of content areas, visitor groups, and informal learning environments.

The REVEAL Facilitation Approach

Throughout REVEAL, experienced museum educators were key members of the project team. Working together with researchers, they provided insight into the facilitation process and helped to shape data collection, analysis, and interpretation. From that collaboration, the team developed the REVEAL facilitation model, outlined in the diagram below.
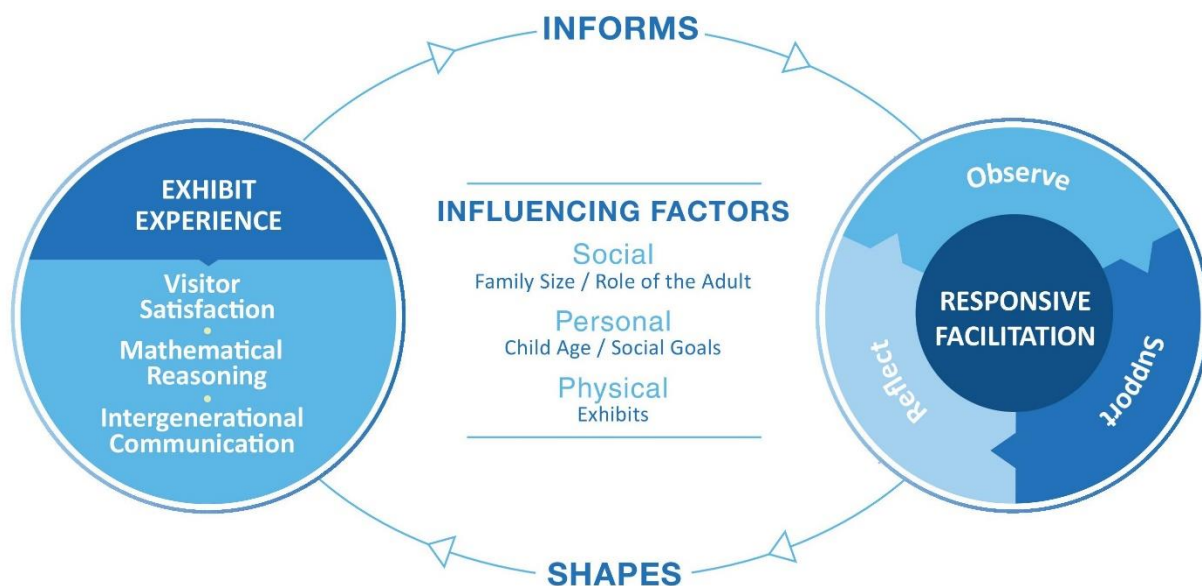
The REVEAL facilitation model reflects the ways that we observed expert educators noticing aspects of a family's interactions, responding to the unique needs and interests of each group, and supporting family engagement and learning. As shown in the diagram, the model identifies the team's three interrelated visitor experience goals (visitor satisfaction, mathematical reasoning, intergenerational communication), outlines the cycle of responsive facilitation (observe, support, reflect) that educators used to support these goals, and highlights the physical, personal, and social factors that influenced the nature and outcomes of the interactions.

Educators used a variety of support strategies as part of the responsive facilitation cycle, including orienting visitors, providing challenges to guide and extend engagement, explaining key aspects of the mathematics, and showing appreciation for visitors' efforts and actions. More importantly, educators continuously worked to find a match between their educational goals and the needs and interests of families. For example, educators modified their facilitation strategies based on the extent to which each family oriented to the basic function and goals of the exhibit, found ways to deepen their own engagement, and discussed the mathematical relationships embedded in the activity. The educators also shifted their role and approach depending on the extent to which family members were already facilitating learning within the group and the degree to which both adults and children seemed comfortable exploring the exhibits together.

This research-based facilitation model, and the key issues that emerged during its development, shaped the focus of the four main modules in this program:

1) **Understanding the Family Context**: How to notice clues about a family's social and educational goals, the roles individuals take on during the interaction, and the match (or mismatch) between educator goals and family interests

2) **Supporting Intergenerational Communication**: How to encourage visitors of different ages to work together during an interaction and how this can lead to richer family learning experiences at exhibits

3) **Encouraging Exploration and Inquiry**: How to support visitor-led exploration of exhibits that emphasizes inquiry and discovery rather than facts or right answers

4) **Negotiating Family and Facilitator Goals**: How to balance the educational goals of the facilitator with the needs and interests of the family in order to support a strong facilitator-family match

Culturally responsive education

During our investigations of staff facilitation, we recognized that studying and supporting how people learn is not free of the influences of our personal identities and cultures as educators and researchers. Thus, the REVEAL study and the facilitation model described above were founded in culturally responsive and asset-based approaches to research and education (e.g., Allen et al., 2007; Brown & Crippen, 2017; Gutierrez & Rogoff, 2003; NRC, 2009a). Paying close attention to how facilitator expectations and assumptions about family learning in museums are shaped by individual cultural backgrounds and prior experiences is essential, we believe, to creating positive experiences for visitors. The better that we can respect and value differences in identity and culture, the better we can work across these differences, serve visitors, and ultimately become more culturally responsive facilitators.

Rather than dedicating a separate module to culturally responsive and respectful facilitation practices, these ideas and practices have been woven throughout the four modules. As you will see, the background readings, reflective questions, video examples, and suggested facilitation strategies presented through the guide continuously reinforce four major threads that were fundamental to the REVEAL facilitation approach:

- **Understanding and *empathizing* with our visitors** and working to appreciate their perspectives;

- **Treating others *as they want to be treated***, not just how we would want to be treated ourselves;

- ***Balancing* the educational goals of facilitators with the needs and interests of visitors**; and

- **Engaging in ongoing *self-reflection* and learning**.

The facilitators who are featured in the videos for this professional development program participated in REVEAL training specifically designed to encourage culturally responsive facilitation and promote overall enjoyment and satisfaction for visitor groups. As you will see, the facilitated interactions are not always successful, either from the perspective of the educator or the visitors, and the facilitators never completely embody the four tenets described above. The process of becoming a more reflective facilitator doesn't guarantee perfection, but it is a journey that can lead to rich professional growth for staff and, ultimately, deep and satisfying visitor learning experiences.

Watching and discussing video of education and learning in action is challenging, even for those who have been doing it for years. Video offers a hyper-detailed record of behavior, talk, intonation, context, background, and more, and it can quickly become overwhelming to try to determine where to focus, which aspects are important, and what details might be relevant for discussions of education in museums. This is particularly true in the context of the REVEAL project, which focused on spontaneous, unstructured interactions between staff members and families at interactive exhibits, situated within the noisy, chaotic environment of the museum. Multiple visitor groups with many family members move in and out of the frame, talk over one another, and compete with the general hustle and bustle around them, while the facilitator does his or her best to navigate the space and support family learning. Sometimes the audio is clear, while at other times it's almost impossible to understand or distinguish what a visitor or facilitator is saying.

Watching and talking about videos of museum facilitators with colleagues adds an additional set of challenges. For many of us in museums, it can be difficult to talk about our job and discuss strategies for improvement. Like many classroom teachers, museum facilitators often work in isolation, with little opportunity to share ideas and strategies with their peers. Because of this, we often lack a common vocabulary for discussing our work, which makes it even more difficult to describe what we are seeing in the videos, connect it with our own practice, and explore ideas for new strategies and approaches.

Despite all of these challenges, we've seen time and time again that video of facilitator-visitor interactions is a powerful and exciting learning resource for museum educators. It takes practice and time, however, to become comfortable with watching video and reflecting on our own practice. With this in mind, we offer the following tips for using video as a professional learning resource, adapted with permission from the work of Susan Jo Russell and colleagues at TERC (Russell et al., 1999):

1) **Use the optional warm-up activities highlighted in each module as a way to establish trust within your group** and set a positive and productive tone for video discussions. This can be critically important when a group of facilitators is just starting to work together in the context of professional learning and reflection.

2) **Use the suggested discussion questions outlined in each module to help focus the video viewing** and clarify why you're watching the video clips. Otherwise, discussions can quickly go off track or become lost in the complexities of the interactions.

3) **As you watch, try to put yourself in the place of the facilitators and empathize with their challenges.** Remember that these videos captured *actual* facilitators at OMSI engaging in unscripted conversations with *actual* families who were not recruited prior to the videotaping. Each clip offers examples of facilitation strategies that might be worth emulating, and others that could be improved.

4) **When discussing the video, use specific examples from the interactions between the staff members and families.** Refer to particular actions or conversations whenever possible. This will keep the conversation firmly rooted in the video and help you and others avoid falling back on prior perceptions or assumptions about families and educators.

5) **Watching a video multiple times before and during the discussion** can be very helpful for understanding all the nuances and complexities of the interactions between staff and families. Even a short video includes a huge amount of information. Similarly, it's important to discuss videos immediately after watching them, rather than watching and then scheduling a separate meeting for reflections and discussions.

6) **Explore different strategies for ensuring that all group members have time to talk and share their thoughts during the discussions.** This is especially important when team members have different levels of comfort and experience with viewing video or reflecting on their practice. If needed to engage everyone, try sharing in pairs before beginning a full-group discussion.

The exhibits used in the videos for this program are from a touring exhibition called *Design Zone*, created by the Oregon Museum of Science and Industry. All of the activities in the exhibition explore algebraic relationships through creative design challenges related to art, music, and engineering. Unlike the algebra many of us learned in school, the mathematical content in these activities focuses on functional relationships among quantities—in other words, quantities that are linked so that a change in one produces a predictable change in the other. Each exhibit in *Design Zone* embodies one or more of these relationships, which visitors must discover, investigate, and use in order to complete the design challenges. Museum educators have an important role in *Design Zone*, and many of the exhibit activities include additional challenges or materials that educators can make accessible to extend and deepen visitor engagement.

For the REVEAL research project, three exhibits (Drawing in Motion, Balancing Art, and Designing for Speed) were used to collect data about interactions between facilitators and families. This professional development program includes videos filmed at two of the three: Balancing Art and Drawing in Motion. Below are descriptions of these two exhibits, as they appeared in the final touring exhibition. Because REVEAL used prototype versions of the activities, you may notice some differences between the exhibits as described below and as they appear on the videos.

For more information about *Design Zone*, visit the exhibition website: http://www.omsi.edu/exhibitions/designzone/.

Balancing Art

Visitors explore equality and the relationship between weight and distance from the balance point in a mobile.

Description

Visitors construct a large mobile using whimsical colored shapes of different weights hung from different positions along a balance bar. To do this, visitors choose weighted pieces, labeled numerically according to their relative weight, from a bin and suspend them from numbered positions along a hanging rod. Positions on the rod are labeled according to their distance from the central point from which the rod is hung. Balance is indicated by the position of the tip of the rod along a scale; a central colored region indicates that the mobile is balanced. Pieces are weighted in relative units of 1, 2, 3, and 4 (i.e., 2 is twice as heavy as 1). Pieces of the same weight are all one color, but are several different shapes. Pieces can be suspended from other pieces, creating more complex mobiles. Visitors can build freely or work on posted challenges.
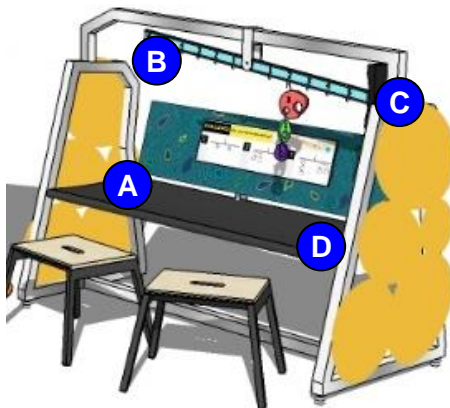
A. Weight bin
B. Balance bar
C. Balance scale
D. Facilitator prop storage

Additional facilitator props:

- Mystery weights (These are shaped like question marks and do not have their weight value labeled. The ordinary thickness piece is a 3, the "Swiss cheese" piece is a 2, and the hollow double thickness piece is a 3.)
- Dry erase board, markers, and eraser

Mathematical Relationships:

To balance, both sides of the bar have to have equal force on them. The force on each side depends on both how heavy the weights are and where they are hung: both weight and position matter. The overall force on each side is the sum of each weight multiplied by its distance from the central point from which the bar is hung (also called the fulcrum).

Drawing in Motion

Visitors use their own movement to explore the coordinate grid and how their combined motion can lead to lines with different shapes and slopes.

Description

Two visitors work together to draw a picture on a gridded screen. One person moves a slider on a number line that represents the horizontal (X)-axis while another moves a slider on a number line representing the vertical (Y)-axis. The combined movements are translated into a real-time drawing on the coordinate grid, similar to an Etch a Sketch. Visitors use buttons to select from four programmed challenges in which they follow on-screen paths to connect a series of dots and create an image that then turns into a colorful animation. They can also create their own shapes in free-draw mode.
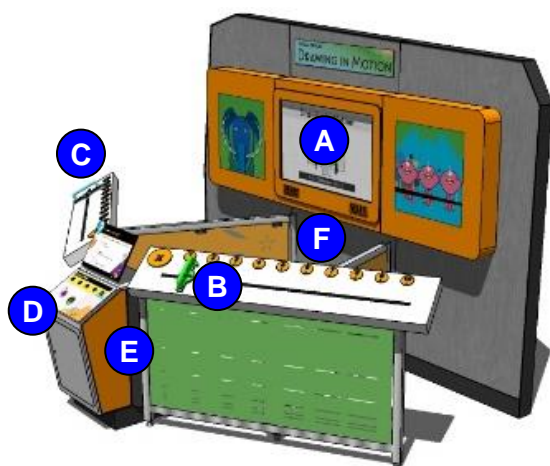
A. Screen
B. X-axis slider
C. Y-axis slider
D. Challenge buttons
E. Facilitator controls
F. Prop storage

Additional facilitator props:

- Laminated challenge cards, dry erase board, markers and eraser
- Facilitator controls (turn off screen timeout, deactivate challenge buttons)

Mathematical Relationships

The position of the "pen" on the screen is a function of the position of both sliders. The X-axis slider determines the horizontal (left and right) position of the pen and the Y-axis slider determines the vertical (up and down) position of the pen. To draw a horizontal line, only the X-axis person has to move. To draw a vertical line, only the Y-axis person has to move.

To draw a diagonal line, both people have to move at the same time. The slope, or steepness, of a line is a function of the relationship between the speed of the X person and the speed of the Y person. If both move at the same speed, the line will have a slope of 1 or -1. If the Y person moves faster than the X person, the line will be steeper. If the X person moves faster, the line will be less steep. Creating a curved line, like a circle, is more complicated, as the relationship between the speed of the X person and the speed of the Y person has to change over time.

Supporting family learning in museums begins by understanding the family context. Although facilitators may spend much of their time with school groups, families continue to be a central audience for informal learning institutions (Ellenbogen et al., 2007; Falk & Dierking, 2013; NRC, 2009b). Because this is such an important and unique group of visitors, the REVEAL project focused specifically on understanding how facilitators can support family learning at interactive exhibits. For this project, we adopted a broad definition of families, including any group of visitors that comes to the museum together and includes at least one adult 18 years of age or older and one child under the age of 18. This might include two biological parents and their son and daughter, a grandfather and grandmother with their grandchildren, a young adult with their younger siblings, a group of adult and child friends, or any number of other configurations. Most importantly, these groups have a shared history together and a learning dynamic that likely involves both children and adults.

Families are not only a large audience for museums, but they are also unique. And it is this uniqueness that creates special opportunities and challenges for facilitators supporting family learning. First and foremost, families almost always have a long history of learning together. Decades of research studies have documented the ways families learn and explore the world at home, at museums, during dinner conversations, outdoors, and across their lives (e.g., Callanan et al., 2012; Ellenbogen et al., 2007; NASEM, 2016). These studies have shown that families are highly effective at learning together and making meaning around different situations and topics, with adult family members often playing important roles in scaffolding and supporting learning (Fender & Crowley, 2007; Pattison & Dierking, 2013). In other words, in the context of family learning, both adults and children are already playing important facilitation roles, even without the presence of a professional educator. Learning is often an important goal of family experiences, but this goal is usually only one of many, including ensuring safety, supporting moral and cultural development, fostering enjoyment, and reinforcing family bonds (Falk, 2009; Falk & Dierking, 2013).

An important reminder when thinking about this audience is that the structure of families and expectations about how families behave and interact can vary greatly across cultures (NASEM, 2016; NRC, 2000; Pattison, 2014). All of us have had families in one way or another, and we often have strong expectations and implicit assumptions about how families should look and behave, especially in regards to adult family members and parenting. It's important to remember that there are many ways a family can learn together and many factors that can influence how a family behaves in a particular situation. Are the adults tired or distracted because of a family emergency? Has a family

spent three hours in the museum, with the children and adults running out of energy and patience? Does an adult see a particular exhibit as an opportunity to help their child with some aspect of development completely separate from the intended goals of the activity? In the REVEAL project, we tried to be sensitive to the unique needs and goals of families, honor the learning and facilitation that naturally occurs within these groups without the support of a trained educator, and remain aware of our own assumptions about family learning and how they might or might not match those of our visitors.

As facilitators, we can occasionally fall into the trap of looking for things that families are doing wrong or criticizing how family members are engaging in their groups. For example, you may have overheard a conversation among museum educators complaining about how parents are "always" on their cell phones. As noted above, however, research from many fields continues to show that families learn very effectively together and that adult family members often play important and successful roles as learning facilitators. In fact, because of the long history families have learning together, they almost always know more about each other than a facilitator does and can be better equipped to tailor museum experiences to individual interests and connect the experiences to prior knowledge or future learning opportunities (e.g., Pattison & Dierking, 2013). In the REVEAL project, we adopted an asset-based perspective on family learning (e.g., Garibay et al., 2015; Gutiérrez & Calabrese Barton, 2015; Gutierrez & Rogoff, 2003), focusing not on what we thought families were doing "wrong" at exhibits but instead identifying the strengths of family learning and finding strategies that facilitators could use to support and deepen the learning that was already happening. In some cases, this required a recognition that families were fine on their own, or that the best role for the educator was to step back and provide occasional hints or additional challenges as needed.

Think about these questions in preparation for discussing them in small groups when you meet to participate in Module 1.

1) What expectations do you have about the ways families should interact with exhibits at your institution? How do you respond when they don't quite meet these expectations?

2) Do you find your expectations about a family can fluctuate based on certain characteristics (gender, race, age, group composition, language use)? In what ways?

3) How do you think your assumptions or expectations about a family might affect your interactions with them?

4) In what ways do you gather information about what a family needs or wants out of a particular interaction? What clues do you look for to gauge family mood, goals for the visit, or relationships among individuals?

Module 1

Understanding the Family Context

Module Overview

Objective

In this module, participants will practice noticing and reflecting on the social and educational goals of visiting families and the roles family members take on during their visit. They will consider how to tailor facilitation to take into account the needs and goals of families and build on visitors' ideas, strengths, and interests.

Materials needed

- Module 1 video 1 (https://vimeo.com/user12277459/reveal-module1video1)
- Module 1 video 2 (https://vimeo.com/user12277459/reveal-module1video2)
- Handouts (one per participant)
  - Introducing Module 1: Understanding the Family Context (a few copies in case participants need them)
  - Module 1 Video Discussion
  - Module 1 Reflection Homework
  - Introducing Module 2: Supporting Intergenerational Communication
- Chart paper or whiteboard and markers

Plan for session (80-90 minutes)

1) Warm-up activity, 10 minutes (optional)
2) Introducing the module, 10 minutes
3) Video discussion, 60 minutes
4) Homework for Module 2, 10 minutes

Warm-Up Activity   10 MIN

If you opt to do a warm-up activity, start the session with it. We recommend the Module 1 activity, Red Ball (http://www.nisenet.org/catalog/improv-exercises). In general, an effective warm-up activity for this module will focus on group collaboration, particularly highlighting how the combined efforts of the group have a greater result than individuals working alone.

Introducing the Module   10 MIN

Introduce this module's topic, paraphrasing what is written below. Participants should have already read "Introducing Module 1: Understanding the Family Context" prior to this session.

Introducing the topic

Today's session focuses on understanding the family context—in other words, appreciating who our family visitors are and how they learn together, with or without our help. We'll be watching two videos and then reflecting on family social and educational goals, family member roles during exhibit interactions, and how we can tailor facilitation for individual family needs and interests.

Connecting to previous experiences

In small groups, participants discuss their responses to the questions at the end of the handout "Introducing the Family Context." After a few minutes, continue the discussion in the larger group.

1) What expectations do you have about the ways families should interact with exhibits at your institution? How do you respond when they don't quite meet these expectations?

2) Do you find your expectations about a family can fluctuate based on certain characteristics (gender, race, age, group composition, language use)? In what ways?

3) How do you think your assumptions or expectations about a family might affect your interactions with them?

4) In what ways do you gather information about what a family needs or wants out of a particular interaction? What clues do you look for to gauge family mood, goals for the visit, or relationships among individuals?

Video and Discussion

In this module, you will be using the following two videos:

- Module 1 Video 1 (https://vimeo.com/user12277459/reveal-module1video1)
- Module 1 Video 2 (https://vimeo.com/user12277459/reveal-module1video2)

Introducing the videos

Both of the videos in this module take place at the exhibit *Balancing Art*. Participants should have read the exhibit description as part of their preparation for this session. Before beginning, ask them if they have any questions about the exhibit.

Pass out copies of the Video Discussion handout and give participants a minute or two to review it. Paraphrase the following information about the videos to participants.

In the first video segment you are about to watch (Module 1 Video 1), a facilitator is working with a family of one child and two adults at the Balancing Art exhibit. This video segment starts as the family approaches the exhibit. The second video (Module 1 Video 2) features a different facilitator with a family consisting primarily of one adult and one child at Balancing Art, although another child occasionally joins them.

We will watch each video twice. The first time, ignore the handout and just try to take in the whole interaction. In between the first and second viewing, read over the questions. During the second viewing, I encourage you to notice what clues you can pick up about family members' expectations, needs, and prior experiences. You may also notice how the facilitator picks up on and responds to this information and what he or she says or does to help support the family's goals. Notice how the visitors—both adults and children—respond to this facilitation. After the second viewing of each video, you will have time to jot down responses to the handout prompts in preparation for discussing your observations and reactions.

Key video moments for the session leader

Below are some moments in the video when something particularly noteworthy happens with the families or the facilitators. This is not an exhaustive list of every interesting moment in the interaction. We point these out to help you, the session leader, have evidence to support observations by participants. We do not recommend giving these lists to participants.

Video 1:

0:40	Adult in gray sweatshirt explains that child has his own ideas.
1:24	Facilitator stays back as adult in gray communicates with child.
3:04	Facilitator provides some orientation about balancing.
3:14	Family starts to celebrate; facilitator asks question about reasoning.
3:20	Child has an "extra" piece; adult in black sweatshirt encourages child to respond to facilitator.
4:40	Facilitator focuses on the mathematical relationship in the exhibit.
5:20	Adult in black asks questions.
6:17	Adult in black tests exhibit and discusses with facilitator.

Video 2:

0:27	Adult and children speak to each other in Spanish.
0:40	Facilitator approaches but stands behind family and watches them.
1:00	Facilitator discourages younger children from hanging pieces by telling them that the adult male and older child are "working on something."
1:26	Facilitator orients group to the zone of balance; older child celebrates success.
1:35	Facilitator gives a piece to adult to hang on bar for child to solve, then steps back.
2:14	Facilitator gives mystery weight to adult to hang on bar, then steps back again to observe.
3:00	Adult male gives instructions to older child.
3:52	Facilitator gives mystery weight piece to older child for adult to solve.
4:05	Adult male starts talking primarily in English.
5:18	Facilitator steps back to describe exhibit to another visitor.

Video discussion: Module 1 Video 1

Watch the video segment twice. Then take 3-5 minutes for participants to quietly jot down their answers to questions on the first page of the discussion handout.

Next break into small groups of 2-4 participants (if possible, try to mix up groups from previous discussions) and share answers. Ask one member from each group to share a summary of their discussion with the larger group.

In your discussion, keep track of the strategies participants mention on the whiteboard or chart paper. You may want to write down other group responses as well, but keep those ideas separate from the list of strategies. Some strategies participants might mention include: observing quietly to assess the family's approach, simplifying the challenges for the child, talking separately with one of the adults, and providing orientation or additional challenges to support the facilitation already going on within the family.

1) What did you notice about the attitudes of each adult toward the boy? In what ways are they the same? In what ways are they different?

2) What do you think the child is trying to do in the first several minutes of the video?

3) What do you notice about each of the adults in terms of their physical comfort and "state of mind"?

4) How do the adults react when the facilitator is having an extended interaction with the boy?

5) What do you make of the last interaction between the male adult and the facilitator?

6) What are some strategies the facilitator used to keep the family engaged or to respond to particular aspects of this family context?

Note: If a participant makes assumptions about a person's behavior in the video, try asking, "What did you see that leads you to that conclusion? What did the person do or say that suggests that behavior or attitude?" The goal of these questions is to help the group become aware of underlying assumptions and expectations about families that shape our perceptions and approaches as educators.

Video discussion: Module 1 Video 2

Watch the video segment twice. Then take 3-5 minutes for participants to quietly jot down their answers to questions on the second page of the video discussion handout. (Note that this video includes a family speaking in Spanish. We have chosen not to subtitle the video to simulate the experience of an educator who does not speak the first language of the visitors, which was true of the facilitator in this interaction.)

Break into small groups of 2-4 participants and share answers. Ask one member from each group to share a summary of their discussion with the larger group. Continue to record possible strategies on the chart paper or whiteboard.

1) What did you notice about the way the adult male interacted with the two children at the beginning of the video? What can you tell even if you don't understand Spanish?

2) What do you notice about the relationship among the children?

3) What assumption(s) did the facilitator make in addressing the children in English? In addressing the adult?

4) Why do you think the facilitator decided to bring out the question mark when she did? Why did she decide to bring out the second question mark? Why did she switch tactics on the third question mark?

5) Think of a time when you've interacted with a family who is not speaking English to one another. How have you handled the situation?

Video Discussion for Both Videos

After watching and discussing both videos, continue the group conversation, focusing on the kinds of strategies the facilitators in the videos used and participants' reactions to them.

1) What similarities and differences do you see between the two families in these videos?

2) What challenges might you encounter using facilitation strategies like those highlighted in these videos?

At the conclusion of this module, record the list of strategies generated during the conversations (e.g., take a photo or type the list) and share the ideas with participants to help them incorporate interpretation of family context into their facilitation practice. Other strategies related to understanding the family context that participants might mention include: asking families what they have worked on so far at the exhibit, providing options or choice for family decision-making, and helping to engage some family members to allow others to explore the exhibit more deeply.

Homework   10 MIN

In the time between this session and the next, participants will practice noticing characteristics of the family context both with and without facilitators present. They will also try out some facilitation strategies for clarifying and supporting family goals and needs.

Pass out copies of the Module 1 reflection homework handout to each participant, as well as the background reading for the next module: "Introducing Module 2: Supporting Intergenerational Communication." Allow participants a few minutes to read over the homework handout. Ask for any questions, clarifications, or comments.

For Further Exploration

More Videos

Full-length, unedited versions of the videos from this module (without subtitles) are also available:

- Module 1 Video 1 (https://vimeo.com/203903467)
- Module 1 Video 2 (https://vimeo.com/203904009)

You can also watch videos that were assigned to other modules and the bonus videos, paying particular attention to what the interactions reveal about the family context, including visitor needs, interests, and roles.

Readings

The following books and articles can be useful for continuing to explore the topic of family learning in museums:

Ellenbogen, K., Luke, J. J., & Dierking, L. D. (2007). **Family learning in museums: Perspectives on a decade of research**. In J. H. Falk, L. D. Dierking, & S. Foutz (Eds.), *In principle, in practice: Museums as learning institutions* (pp. 17–30). Lanham, MD: AltaMira Press.

National Research Council. (2009). *Learning science in informal environments: People, places, and pursuits*. Washington, DC: National Academies Press. https://www.nap.edu/catalog/12190/learning-science-in-informal-environments-people-places-and-pursuits (See especially chapter 4, "Everyday Settings and Family Activities")

Pattison, S. A., & Dierking, L. D. (2012). **Exploring staff facilitation that supports family learning**. *Journal of Museum Education, 37*(3), 69–80. https://www.researchgate.net/publication/284569006_Exploring_Staff_Facilitation_that_Supports_Family_Learning

Video 1

1) What did you notice about the attitudes of each adult toward the boy? In what ways are they the same? In what ways are they different?

2) What do you think the child is trying to do in the first several minutes of the video?

3) What do you notice about each of the adults in terms of their physical comfort and "state of mind"?

4) How do the adults react when the facilitator is having an extended interaction with the boy?

5) What do you make of the last interaction between the male adult and the facilitator?

6) What are some strategies the facilitator used to keep the family engaged or to respond to particular aspects of this family context?

Video 2

1) What did you notice about the way the adult male interacted with the two children at the beginning of the video? What can you tell even if you don't understand Spanish?

2) What do you notice about the relationship among the children?

3) What assumption(s) did the facilitator make in addressing the children in English? In addressing the adult?

4) Why do you think the facilitator decided to bring out the question mark when she did? Why did she decide to bring out the second question mark? Why did she switch tactics on the third question mark?

5) Think of a time when you've interacted with a family who is not speaking English to one another. How have you handled the situation?

Both Videos

1) What similarities and differences do you see between the two families in these videos?

2) What challenges might you encounter using facilitation strategies like those highlighted in these videos?

1) Take some time, even just 20-30 minutes, to watch both facilitated and unfacilitated family groups engaging with exhibits at your institution. When you are watching another staff member, first ask him or her for permission to observe. When watching unstaffed interactions, respect the privacy of families by being unobtrusive and ending your observation if families appear to be uncomfortable.

   - For unfacilitated groups: What does each family member do or say at the exhibit? What are the apparent social or educational goals for each family member and how can you tell? If you were to interact with this group, what is something that you could do or say to better understand their context?

   - For facilitated groups: What do the facilitators do or say to get insight into a family's social and educational goals? How do they tailor their facilitation to individual families?

2) Now that you've watched examples of facilitators interacting with families and considered how to incorporate new ideas into your own practice, you can try these strategies out yourself (if needed, refer to the list generated during the video discussion). Before you meet for the next session, try to incorporate a few new strategies into your facilitation with families at exhibits. Observe how visitors react and reflect on ways you can continue to improve the new approaches. Choose one interaction to share with the group during the next module session.

3) To prepare for module 2, please read the handout, "Introducing Intergenerational Communication". Consider how this perspective relates to your facilitation experience by answering the questions on the handout, in preparation for discussing them at the next module meeting.

REVEAL

Introducing Intergenerational Communication
Module 2: Supporting Intergenerational Communication
Handout for participants

Supporting intergenerational communication was a primary goal of the REVEAL facilitation approach. The team believed that by encouraging adults and children to participate together in the facilitated exhibit activities, families would not only have deeper and more satisfying experiences in the moment but would also be more likely to continue to think and talk about the experience long after the museum educator was gone and even after they left the museum. In other words, supporting intergenerational communication was a primary strategy for extending the impact of the often brief experiences at the REVEAL exhibits.

Intergenerational communication—time that family members of different ages spend interacting and talking with each other at exhibits, rather than talking with an educator or acting independently, as well as the quality of the interactions—is a defining characteristic of family learning in museums. As families move through exhibits and galleries, adults point out details, ask questions, provide encouragement and guidance, and express their own interest and curiosity. Children respond to adults and initiate their own conversations, exploring exhibits and participating in programs in collaboration with other family members and sometimes even taking a leading role during the interactions. Innumerable studies over the last several decades have documented the ongoing adult and child dialogues that characterize family learning (Leinhardt et al., 2015; NRC, 2009b; Rigney & Callanan, 2011). Often these conversations are about the exhibits and programs, but families also use the museum setting to explore other topics. And sometimes intergenerational communication is just about the daily necessities of life, like finding the restroom or deciding on a plan for lunch.

As noted in the "Understanding Family Context" module, family learning begins well before the museum visit and continues long after. Intergenerational communication and family conversations are a primary vehicle for this ongoing learning, as children and adults recall memories from the visit, ask curiosity questions that lead to further discussion, and support each other in exploring new or growing areas of interest (Callanan & Oakes, 1992; Falk & Dierking, 2013; NASEM, 2016; Renninger, 2007).

Given the importance of intergenerational communication, a central challenge for museum educators is supporting family learning without inhibiting the natural interactions that occur between adults and children. This is particularly important when facilitating informal, conversational interactions at exhibits, since families may or may not expect a facilitator or staff member to be present and may already be engaged in rich learning conversations of their own. In the REVEAL research study, even educators who were trained in the REVEAL facilitation approach and focused on supporting

intergenerational communication had a slight negative impact on levels of adult-child engagement compared to families who were not supported by a museum educator (Pattison et al., 2017). These results highlight the need for educators to continue to explore strategies and approaches for supporting family learning that might include empowering adult or child family members to take the lead, finding challenges and activities that involve multiple family members, or simply knowing when to step back and give families their own space in which to interact.

Consider the following questions. You will discuss them in small groups when your team meets to explore Module 2: Supporting Intergenerational Communication.

1) In families and multigenerational groups, how do people of different ages usually interact with exhibits at your institution? Are there roles that particular family members tend to take on?

2) How might a family's culture and prior experiences influence how visitors of different ages interact with each other, the facilitator, and an exhibit?

3) Which group members (e.g., adults or kids) do you usually focus on when facilitating with families? Why?

4) What is a time when you have seen facilitators (including yourself) supporting intergenerational communication at exhibits? What specific things were done or said to encourage visitors to interact with one another?

Module 2
Supporting Intergenerational Communication

Module Overview

Objective

In this module, participants will explore the benefits of fostering intergenerational communication within families—that is, encouraging visitors of different ages within the group to interact and talk with each other as they engage with the exhibit. Participants will hone their skills at noticing when and how intergenerational communication happens, reflect on their own role in supporting intergenerational communication, and brainstorm strategies to integrate into their practice.

Materials needed

- Module 2 Video 1 (https://vimeo.com/user12277459/reveal-module2video1)
- Module 2 Video 2 (https://vimeo.com/user12277459/reveal-module2video2)
- Handouts (one per participant)
  - Introducing Module 2: Supporting Intergenerational Communication (a few copies in case participants need them)
  - Module 2 Video Discussion
  - Module 2 Reflection Homework
  - Introducing Module 3: Encouraging Exploration and Inquiry
- Chart paper or whiteboard and markers

Plan for Session (95-105 minutes)

1) Warm-up activity, 10minutes (optional)
2) Homework sharing, 15 minutes
3) Introducing the module, 10 minutes
4) Video discussion, 60 minutes
5) Homework for Module 3, 10 minutes

Warm-Up Activity　　　　　　　　　　　　　　　　　　10 MIN

If you opt to do a warm-up activity, start the session with it. We recommend the improv activity, I Say Hi (http://www.nisenet.org/catalog/improv-exercises). In general, an effective warm-up activity for this module will focus on communication and connections among group members.

Previous Session's Homework　　　　　　　　　　　　15 MIN

In small groups, participants take turns sharing experiences they had doing the homework: one recent experience they had observing a family or one experience they had interacting with a family. After reflecting on the interaction, participants can also share what they might repeat or do differently in the future.

After 10 minutes, ask a few volunteers to share either their own learning or lessons gleaned from their group discussion. You may want to summarize observations, point out dominant themes, or make connections to practices at your institution.

Introducing the Module　　　　　　　　　　　　　　10 MIN

Introduce this module's topic, paraphrasing what is written below. Participants should have already read "Introducing Module 2: Supporting Intergenerational Communication" prior to this session.

Introducing the topic

Today's topic is supporting intergenerational communication. We'll watch two videos and discuss as a group strategies and techniques that facilitators can use in their practice to encourage group members of different ages to talk with each other and interact together at an exhibit.

Connecting to previous experiences

In small groups, participants discuss their responses to the questions at the end of the handout "Introducing Intergenerational Communication." After a few minutes, continue the discussion in the larger group.

1) In families and multigenerational groups, how do people of different ages usually interact with exhibits at your institution? Are there roles that particular family members tend to take on?

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2) How might a family's culture and prior experiences influence how visitors of different ages interact with each other, the facilitator, and an exhibit?

3) Which group members (e.g., adults or kids) do you usually focus on when facilitating with families? Why?

4) What is a time when you have seen facilitators (including yourself) supporting intergenerational communication at exhibits? What specific things were done or said to encourage visitors to interact with one another?

Video Discussion 60 MIN

In this module, you will be using the following two videos:

- Module 2 Video 1 (https://vimeo.com/user12277459/reveal-module2video1)
- Module 2 Video 2 (https://vimeo.com/user12277459/reveal-module2video2)

Introducing the videos

Both of the videos in this module take place at the exhibit Balancing Art. Participants should have read the exhibit description as part of their preparation for Module 1. Before beginning, ask them if they have any questions about the exhibit.

Pass out copies of the Video Discussion handout and give participants a minute or two to review it. Paraphrase the following information about the videos to participants.

In the first video segment you are about to watch (Module 2 Video 1), a facilitator is working at Balancing Art with a family of two adults and three boys between about 7 and 11 years old. The video segment starts partway through the interaction. Up to this point, two of the older children have been handling the exhibit pieces more than the younger child and have been discussing the mathematics of the exhibit. One adult has talked with the boys and interacted with the exhibit several times. The other adult has stayed in the back. The second video (Module 2 Video 2) features a different facilitator with a family consisting of a man with two young children at Balancing Art. This video includes the entire interaction with the family.

We will watch each video twice. The first time, ignore the handout and just try to take in the whole interaction. In between the first and second viewing, read over the handout questions. During the second viewing, I encourage you to look for how the family members interact with each other and how the facilitator encourages intergenerational communication. Notice how the visitors—both adults and children—respond to this facilitation. After the second viewing of each video, you will have time to jot down responses to the handout prompts in preparation for discussing your observations and reactions.

Key video moments for the session leader

Below are some moments in the video when something particularly noteworthy happens relevant to intergenerational communication. This is not an exhaustive list of every interesting moment in each interaction. We point these out to help you, the session leader, have evidence to support observations by participants. We do not recommend giving these lists to participants.

Video 1:

0:29	Facilitator offers a challenge and hands a mystery piece to the adult female.
1:30	Facilitator hands a mystery piece to the adult male.
2:12	Facilitator hands a mystery piece to the adult female.
2:48	Adult female takes a photo.
3:20	Facilitator assigns a role to the youngest boy.
3:50	Facilitator asks adults if they remember the values of the mystery pieces and tells the boys that they can ask adults for that information.
4:09	Facilitator steps to the side to talk with the adults.
4:55	Facilitator gives a job to the adult female.
5:47	Facilitator encourages oldest boy to use white board.
6:28	Facilitator explains to other family what is going on.
6:45	Group celebrates success.

Video 2:

0:55	Facilitator enters conversation by addressing the whole family, then stands back and watches.
2:02	Facilitator provides exhibit orientation to the whole family.
2:25	Adult male is silent for about a minute.
3:48	Adult male makes a suggestion about weight placement to the older child and facilitator supports the suggestion.

Video discussion: Module 2 Video 1

Watch the video segment twice. Then take 3-5 minutes for participants to quietly jot down their answers to questions on the first page of the video discussion handout.

Next break into small groups of 2-4 participants (if possible, try to mix up groups from previous discussions) and share answers. Ask one member from each group to share a summary of their discussion with the larger group.

In your discussion, keep track of the strategies participants mention on the whiteboard or chart paper. You may want to write down other group responses as well, but keep those ideas separate from the list of strategies. Some strategies participants might mention include:

providing roles for adults, such as posing challenges or using the whiteboard to track the group's math reasoning; giving adults additional information about the exhibit to help empower them to become more involved; encouraging children to consult with adult family members; playing a supporting, rather than leading, role; and stepping back to provide space for adult-child interactions.

1) What did you notice happening in this video segment? What evidence did you see of intergenerational communication between adults and children?

2) What did the facilitator try to do to involve the adults in the activity and encourage them to interact with the children?

3) How were these strategies more or less successful?

4) Was there anything the facilitator did that might have inhibited interactions between adults and children?

5) What are some reasons the adults in this group might have been less comfortable becoming involved in the activity?

6) What are other strategies the facilitator might have tried to better support intergenerational communication?

Video discussion: Module 2 Video 2

Watch the video segments twice. Then take 3-5 minutes for participants to quietly jot down their answers to questions on the second page of the video discussion handout.

Break into small groups of 2-4 participants and share answers. Ask one member from each group to share a summary of their discussion with the larger group. Continue to record possible strategies on the chart paper or whiteboard.

1) What did you notice happening in this video segment? What evidence did you see of intergenerational communication between adults and children?

2) What did intergenerational communication look like in the first few minutes of the interaction and what role did the adult play in the group?

3) How did the role of the adult and interactions between the adult and children change over the course of the video segment?

4) Did the facilitator seem to try to involve the adult and support intergenerational communication? Was there anything the facilitator did that might have inhibited interactions between the adult and children?

5) What are other strategies the facilitator might have tried to better support intergenerational communication?

Video Discussion for Both Videos

After watching both videos and having small group discussions about each, continue the group conversation about the broader themes and implications of supporting intergenerational communication.

1) What were some of the similarities and differences between these two video segments? How did the adults in each segment approach the interactions differently? How were the approaches by the two facilitators different?

2) What challenges might you encounter trying to support intergenerational communication for families at your institution?

3) When might you choose not to interact with a family? What clues or hints would you look for that would lead you to take a smaller role in the interaction?

At the conclusion of this module, record the list of strategies generated during the conversations (e.g., take a photo or type the list) and share the ideas with participants to help them explore new ways of supporting intergenerational communication within families. Other relevant strategies participants might mention include: explicitly inviting family members to participate, asking one visitor to explain their ideas to the rest of the group, and posing challenges or activity extensions that require teamwork.

Reflection Homework   10 MIN

In the time between this session and the next, participants will practice noticing aspects of intergenerational communication both with and without facilitators present. They will also try out some facilitation strategies for supporting group engagement and fostering interactions within families.

Pass out copies of the Module 2 reflection homework handout to each participant, as well as the background reading for the next module: "Introducing Module 3: Encouraging Exploration and Inquiry." Allow participants a few minutes to read over the homework handout. Ask for any questions, clarifications, or comments.

For Further Exploration

More Videos

Full-length, unedited versions of the videos from this module (without subtitles) are also available:

- Module 2 Video 1, unedited (https://vimeo.com/203905379)
- Module 2 Video 2, unedited (https://vimeo.com/203905609)

You can also watch videos that were assigned to other modules and the bonus videos, paying particular attention to what the interactions reveal about intergenerational communication.

Readings

The following books and articles can be useful for continuing to explore the topic of intergenerational communication and interactions among adult and child family members:

Bertschi, K., Benne, M., & Elkins, A. (2008). **Creating a learning environment that fosters parent-child interactions: A case study from the Animal Secrets exhibition project.** *briefCAISE, 2008*(4). Retrieved from http://www.informalscience.org/creating-learning-environment-fosters-parent-child-interactions-case-study-animal-secrets-exhibition.

Falk, J. H., & Dierking, L. D. (2013**). The museum experience revisited.** Walnut Creek, CA: Left Coast Press. (See especially Chapter 7, "The Sociocultural Context.")

Leinhardt, G., Crowley, K., & Knutson, K. (Eds.). (2015). **Learning conversations in museums.** Mahwah, NJ: Erlbaum Associates.

Video 1

1) What did you notice happening in this video segment? What evidence did you see of intergenerational communication between adults and children?

2) What did the facilitator try to do to involve the adults in the activity and encourage them to interact with the children?

3) How were these strategies more or less successful?

4) Was there anything the facilitator did that might have inhibited interactions between adults and children?

5) What are some reasons the adults in this group might have been less comfortable becoming involved in the activity?

6) What are other strategies the facilitator might have tried to better support intergenerational communication?

Video 2

1) What did you notice happening in this video segment? What evidence did you see of intergenerational communication between adults and children?

2) What did intergenerational communication look like in the first few minutes of the interaction and what role did the adult play in the group?

3) How did the role of the adult and interactions between the adult and children change over the course of the video segment?

4) Did the facilitator seem to try to involve the adult and support intergenerational communication? Was there anything the facilitator did that might have inhibited interactions between the adult and children?

5) What are other strategies the facilitator might have tried to better support intergenerational communication?

Both Videos

1) What were some of the similarities and differences between these two video segments? How did the adults in each segment approach the interactions differently? How were the approaches by the two facilitators different?

2) What challenges might you encounter trying to support intergenerational communication for families at your institution?

3) When might you choose not to interact with a family? What clues or hints would you look for that would lead you to take a smaller role in the interaction?

1) Take some time, even just 20-30 minutes, to watch both facilitated and unfacilitated family groups engaging with exhibits at your institution. When you are watching other staff members, first ask them for permission to observe. When watching unstaffed interactions, respect the privacy of families by being unobtrusive and ending your observation if families appear to be uncomfortable.

   a. For unfacilitated groups: What roles do family members in the unfacilitated family groups take on? How do members of different generations talk to or interact with each other?

   b. For facilitated groups: What does the facilitator do or say to encourage intergenerational communication among group members? How do the visitors respond?

2) Now that you've watched examples of facilitators interacting with families and considered how to incorporate new ideas into your own practice, you can try these strategies out yourself (if needed, refer to the list generated during the video discussion). Before you meet for the next session, try to incorporate a few new strategies into your facilitation with families at exhibits. Observe how visitors react and reflect on ways you can continue to improve the new approaches. Choose one interaction to share with the group during the next module session.

3) To prepare for Module 3, please read the handout "Introducing Exploration and Inquiry." Consider how this perspective relates to your facilitation experience by answering the questions on the handout, in preparation for discussing them at the next module meeting.

Although the REVEAL project focused on mathematical thinking and, in particular, algebraic reasoning, the goal was not to teach families mathematical facts, formulas, or techniques for "solving for X." Instead, the purpose of the exhibits and the facilitation strategies featured in REVEAL was to engage families in algebraic thinking—a way of exploring and representing mathematical patterns in the world in order to accomplish real tasks and solve creative challenges (Greenes & Rubenstein, 2008). This focus contrasts sharply with other goals a science center might have for different exhibits or different programs. For example, a science center program might focus on helping visitors understand the causes and implications of climate change. However, "increasing knowledge" is only one of many potential ways of learning. In the context of informal science education, the National Research Council (2009b) outlined six learning strands: developing interest in science, understanding science knowledge, engaging in scientific reasoning, reflecting on science, engaging in scientific practices, and identifying with the scientific enterprise. For the REVEAL project, a primary educational goal was promoting a mode of mathematical inquiry, similar to "engaging in scientific reasoning."

Why is encouraging exploration and inquiry an important goal for facilitators? In the context of mathematics, algebraic thinking plays a central role in mathematical literacy and problem-solving, both in life and in school (Kaput et al., 2008; NCTM, 2000). Focusing on exploring the relationships among variables and quantities also may help shift perceptions about mathematics, since many adults and children think about math as solely involving arithmetic and equations. More broadly, across all fields and topic areas, ways of thinking and exploring are critical—consider engineering and design thinking, creativity, problem-solving, scientific inquiry, and more. Educators in formal and informal settings are increasingly recognizing that these ways of thinking are often more important than the bodies of knowledge, facts, and terminology that have traditionally been the priority of formal teaching (IMLS, 2009; NGSS Lead States, 2013).

A focus on supporting inquiry, such as algebraic reasoning, requires a shift in educational strategies and facilitation approaches. Instead of communicating big ideas or key messages, a facilitator must find creative ways to encourage and extend exploration, offer challenges and tasks that promote thinking and reasoning, and tailor the strategies to different family goals, ages, and interests. Facilitators must also let go of some more traditional expectations about teaching and learning, such as a preoccupation with getting a particular correct answer or a focus on terminology and facts. For example, one of the REVEAL exhibits, Balancing Art, is a mathematical version of a classic balancing rod activity. In other situations, the goal of this activity might have been to help visitors understand the physics concept of torque. However, in the case of REVEAL, the goal was to encourage visitors to explore the

mathematical relationship among distance, weight, and balance across the rod, regardless of what they understood about angular force. The ultimate goal was not necessarily that visitors should arrive at the equation that demonstrates the exact relationship among these quantities. For some visitors, realizing that the weights exert different amounts of force depending on their location along the rod was a sufficient reasoning goal. This shift can ultimately be extremely freeing for educators, since they no longer need to be responsible for the "right answer." Instead, they can explore and discover with visitors, including honestly admitting when they are stumped or confused. At the same time, they are modeling interest in how the world works and in the mathematical patterns that underlie everything around us.

Consider the following questions. You will discuss them in small groups when your team meets to discuss Module 3: Encouraging Exploration and Inquiry.

1) Consider one (or more) of the "practice exhibits" you've chosen for this PD program. Think about that exhibit through the lens of "exploration and inquiry" and describe several ways visitors might interact with it that follow quite different paths.

2) How could facilitators support families in these varied interactions with the exhibit you're considering?

3) Think of a time when you yourself interacted with an exhibit without worrying about "getting it right." What did it feel like? How was it different from situations in which you felt there was a right answer?

4) How might a visitor's background or prior experiences (e.g. careers, interests, school experience) affect his or her approach to exploration and inquiry?

Module 3

Encouraging Exploration and Inquiry

Module Overview

Objective

During this module, participants will explore a different approach to facilitating learning outcomes for visitors at exhibits: focusing on exploration, reasoning, and inquiry, rather than the communication of facts and knowledge. Participants will develop their skills noticing how families engage in reasoning and inquiry as they work on an exhibit activity and will identify and practice strategies for supporting open-ended investigations.

Materials needed

- Module 3 Video 1 (https://vimeo.com/user12277459/reveal-module3video1)
- Module 3 Video 2 (https://vimeo.com/user12277459/reveal-module3video2)
- Handouts (one per participant)
    - Introducing Module 3: Encouraging Exploration and Inquiry (a few copies in case participants need them)
    - Module 3 Video Discussion
    - Module 3 Reflection Homework
    - Introducing Module 4: Negotiating Family and Facilitator Goals
- Chart paper or whiteboard and markers

Plan for session (95-105 minutes)

1) Warm-up activity, 10 minutes (optional)
2) Homework sharing, 15 minutes
3) Introducing the module, 10 minutes
4) Video discussion, 60 minutes
5) Homework for Module 4, 10 minutes

Warm-Up Activity

If you opt to do a warm-up activity, start the session with it. For this activity we recommend What's in the Box (http://www.nisenet.org/catalog/improv-exercises). In general, an effective activity for this module will focus on brainstorming and generating ideas without concern for "correct" answers.

Previous Session's Homework

15 MIN

In small groups, participants take turns sharing experiences they had doing the homework: one recent experience they had observing a family or one experience they had interacting with a family. After reflecting on the interaction, participants can also share what they might repeat or do differently in the future.

After 10 minutes, ask a few volunteers to share either their own learning or lessons gleaned from their group discussion. You may want to summarize observations, point out dominant themes, or make connections to practices at your institution.

Introducing the Module

10 MIN

Introduce this module's topic, paraphrasing what is written below. Participants should have already read "Introducing Module 3: Encouraging Exploration and Inquiry" prior to this session.

Introducing the topic

Today's topic is facilitation to support exploration and inquiry, rather than the communication of facts and knowledge. There are many educational goals that facilitators can strive for during interactions with families at exhibits. In the REVEAL project, the focus was on supporting mathematical reasoning—a way of describing and using mathematical patterns in the world around us, not unlike scientific inquiry. Facilitating learning interactions with a focus on goals such as mathematical reasoning or scientific inquiry requires different strategies from those in which the goal is "teaching" visitors particular facts. Although this type of facilitation can be challenging, it can also be very freeing, since the educator's primary focus is supporting exploration, not ensuring that visitors get the "correct answer." In today's videos we will consider what mathematical reasoning and inquiry looks like for families at exhibits and how we as facilitators might help support and deepen that inquiry.

Connecting to previous experiences

In small groups, participants discuss their responses to the questions at the end of the handout "Introducing Exploration and Inquiry." After a few minutes, continue the discussion with the larger group.

1) Consider one (or more) of the "practice exhibits" you've chosen for this PD program. Think about that exhibit through the lens of "exploration and inquiry" and describe several ways visitors might interact with it that follow quite different paths.

2) How could facilitators support families in these varied interactions with the exhibit you're considering?

3) Think of a time when you yourself interacted with an exhibit without worrying about "getting it right." What did it feel like? How was it different from situations in which you felt there was a right answer?

4) How might a visitor's background or prior experiences (e.g. careers, interests, school experience) affect his or her approach to exploration and inquiry?

Video Discussion   60 MIN

In this module, you will be using the following two videos:

- Module 3 Video 1 (https://vimeo.com/user12277459/reveal-module3video1)
- Module 3 Video 2 (https://vimeo.com/user12277459/reveal-module3video2)

Introducing the videos

This module's videos take place at both the Drawing in Motion and Balancing Art exhibits. Ask participants if they have any questions about the exhibit activities. Refer to the exhibit description handout from Module 1, as needed.

Pass out copies of the Video Discussion handout and give participants a minute or two to review the document. Paraphrase the following information about the videos for participants.

In the first video segment you are about to watch (Module 3 Video 1), a facilitator is working with an adult and a child at Drawing in Motion. This video segment begins as the family approaches the exhibit. In the second video (Module 3 Video 2), a facilitator is working with two young adults at Balancing Art. The segment begins as members of the family approach and then skips ahead to later in the interaction.

We will watch each video twice. The first time, ignore the handout and just try to take in the whole interaction. In between the first and second viewing, read over the handout questions. During the second viewing, look for how the family members approach the exhibit activity and content—in this case, the mathematical relationships—and how the facilitator supports their explorations. Notice how the visitors—both adults and children—respond to this facilitation. After the second viewing, you will have time to write down responses to the handout prompts.

Key video moments for the session leader

Below are some moments in the video when something particularly noteworthy happens relevant to supporting exploration and inquiry. This is not an exhaustive list of every interesting moment in each interaction. We point these out to help you, the session leader, have evidence to support observations by the group. We do not recommend giving these lists to participants.

Video 1:

1:28	The facilitator invites the family to try a challenge.
1:41	The facilitator points out the number line.
2:26	The facilitator helps the child use the number line.
3:05	The group celebrates success.
3:15	The family launches a second challenge.
3:22	The adult echoes the facilitator's questioning style.
4:00	The facilitator reinforces the child's recognition of a circle.
5:07	The facilitator provides positive reinforcement.

Video 2:

1:22	The facilitator makes her first comments since greeting the group.
2:00	The young adults continue to explore and hang weights as facilitator observes.
2:25	The facilitator refers back to start with an observation and proposes challenge.
3:14	The facilitator asks about distance as a variable.
4:33	The facilitator encourages one visitor to facilitate for other family members.
6:05	One family member steps back to take a photo.

Video discussion: Module 3 Video 1

Watch the video segment twice. Then take 3-5 minutes for participants to quietly jot down their own answers to questions on the first page of the video discussion handout.

Next break into small groups of 2-4 participants (if possible, try to mix up groups from previous discussions) and share answers. Ask one member from each group to share a summary of their discussion with the larger group.

In your discussion, keep track of the strategies participants mention on the whiteboard or chart paper. You may want to write down other group responses as well, but keep those ideas

separate from the list of strategies. Some strategies participants might mention include: providing open-ended challenges that motivate exploration and inquiry, showing appreciation and encouraging visitors, helping tailor the activity to the abilities and interests of the group, providing timely explanation or guidance as needed (e.g., pointing out an important variable) to help visitors explore the exhibit more deeply.

1) What did you notice happening in this video segment?

2) What approach did the family initially take to exploring the exhibit?

3) What specific strategies did the facilitator use to tailor the activity to the family and encourage exploration?

4) How did the adult respond to this facilitation?

5) What are other ways the facilitator could have encouraged the visitors to freely explore the mathematical relationships and concepts presented in this exhibit?

6) How did the design of the exhibit place limitations on the facilitator's ability to encourage open-ended inquiry?

Video discussion: Module 3 Video 2

Watch the video segment twice. Then take 3-5 minutes for participants to quietly jot down their own answers to the questions on the second page of the video discussion handout

Break into small groups of 2-4 participants and share answers. Ask one member from each group to share a summary of their discussion with the larger group. Continue to record possible strategies on the chart paper or whiteboard.

1) What did you notice happening in this video segment?

2) How did the facilitator's opening line set the scene for exhibit exploration?

3) What specific things did the facilitator do or say to encourage members of the group to explore the mathematical relationships in the exhibit?

4) How did the facilitator's support position the visitors to engage other group members in deeper inquiry?

5) What other strategies might the facilitator have tried to encourage deeper exploration?

Discussion for Both Videos

After watching and discussing both videos, continue the group conversation using the questions about both videos on the second page of the handout.

1) How did supporting exploration and inquiry look different for the two groups?

2) How might you facilitate exploration and inquiry for families at exhibits in your own institution?

3) What are some challenges you might encounter taking this approach to facilitation?

At the conclusion of this module, record the list of strategies generated during the conversations (e.g., take a photo or type the list) and share the ideas with participants. Other strategies participants might mention relevant to encouraging exploration include: orienting the family to how the exhibit works, posing challenges that highlight multiple approaches and multiple answers (e.g., "Can you think of another way to do this?"), and letting visitors choose or create their own challenges.

Reflection Homework   10 MIN

In the time between this session and the next, participants will observe how families explore, discover, and inquire at exhibits without facilitators present. They will also practice incorporating strategies for supporting this exploration and pursuing educational goals beyond communicating content knowledge and facts.

Pass out copies of the Module 3 reflection homework handout to each participant, as well as the background reading for the next module: "Introducing Module 4: Negotiating Family and Facilitator Goals." Allow participants a few minutes to read over the handouts. Ask for any questions, clarifications, or comments.

For Further Exploration

More Videos

Full-length, unedited versions of the videos from this module (without subtitles) are available on the project website:

- Module 3 Video 1, unedited (https://vimeo.com/203905973)
- Module 3 Video 2, unedited (https://vimeo.com/203906945)

You can also watch videos that were assigned to other modules and the bonus videos, paying particular attention to what the interactions reveal about facilitating for exploration and inquiry.

Readings

The following books and articles can be useful for continuing to explore the topic of intergenerational communication and interactions among adult and child family members:

Humphrey, T., & Gutwill, J. P. (2005). *Fostering active prolonged engagement: The art of creating APE exhibits*. San Francisco: Exploratorium. http://www.exploratorium.edu/vre/ape/ape_intro.html.

Institute of Museum and Library Services. (2009). *Museums, libraries, and 21st century skills*. Washington, D.C.: Institute of Museum and Library Services. https://www.imls.gov/assets/1/AssetManager/21stCenturySkills.pdf

National Research Council. (2009). *Learning science in informal environments: People, places, and pursuits*. Washington, DC: National Academies Press. https://www.nap.edu/catalog/12190/learning-science-in-informal-environments-people-places-and-pursuits (See section 1, "Learning Science in Informal Environments")

Video 1

1) What did you notice happening in this video segment?

2) What approach did the family initially take to exploring the exhibit?

3) What specific strategies did the facilitator use to tailor the activity to the family and encourage exploration?

4) How did the adult respond to this facilitation?

5) What are other ways the facilitator could have encouraged the visitors to freely explore the mathematical relationships and concepts presented in this exhibit?

6) How did the design of the exhibit place limitations on the facilitator's ability to encourage open-ended inquiry?

Video 2

1) What did you notice happening in this video segment?

2) How did the facilitator's opening line set the scene for exhibit exploration?

3) What specific things did the facilitator do or say to encourage members of the group to explore the mathematical relationships in the exhibit?

4) How did the facilitator's support position the visitors to engage other group members in deeper inquiry?

5) What other strategies might the facilitator have tried to encourage deeper exploration?

Both Videos

1) How did supporting exploration and inquiry look different for the two groups?

2) How might you facilitate exploration and inquiry for families at exhibits in your own institution?

3) What are some challenges you might encounter taking this approach to facilitation?

1) Take some time, even just 20-30 minutes, to watch both facilitated and unfacilitated family groups engaging with exhibits at your institution. When you are watching other staff members, first ask them for permission to observe. When watching unstaffed interactions, respect the privacy of families by being unobtrusive and ending your observation if families appear to be uncomfortable.

   - For unfacilitated groups: How do families explore the exhibit? Do they focus more on knowledge and understanding or exploration and inquiry? Do they seem to think they need to find a "right answer"?

   - For facilitated groups: Do facilitators focus more on communicating knowledge or supporting exploration and inquiry? What does the facilitator do or say to support and deepen exploration?

2) Now that you've watched examples of facilitators interacting with families and considered how to incorporate new ideas into your own practice, you can try these strategies out yourself (if needed, refer to the list generated during the video discussion). Before you meet for the next session, try to incorporate a few new strategies into your facilitation with families at exhibits. Observe how visitors react and reflect on ways you can continue to improve the new approaches. Choose one interaction to share with the group during the next module session.

3) To prepare for Module 4, please read the handout "Introducing Family and Facilitator Goals." Consider how this perspective relates to your facilitation experience by answering the questions on the handout, in preparation for discussing them at the next module meeting.

REVEAL

Introducing Family and Facilitator Goals
Module 4: Negotiating Family and Facilitator Goals
Handout for participants

In the REVEAL project, a key goal for facilitators was to honor and respect family interests and agendas and look for overlap between the goals of families and those of the educator. Searching for this balance is one of the reasons why the REVEAL facilitation approach focuses on three, equally important educational objectives: (a) supporting intergenerational communication, (b) ensuring visitor satisfaction, and (c) encouraging mathematical reasoning. Finding strategies for helping families explore the mathematical relationships in exhibits was important, but never at the expense of creating a satisfying experience or helping adults and children learn together. Finding this balance involves, first and foremost, listening, observing, and seeking to understand family priorities. Is it critical for the grandfather to spend quality time with his grandchild? Is the mother an expert in the exhibit content and excited about sharing her knowledge with the family? Understanding and appreciating these goals helps us develop empathy for visitors and often helps us to let go of the power and authority we take for granted as educators.

Respecting families and finding a balance between facilitator and family goals are not just philosophical stances. There is emerging research that this balance is critical to creating enjoyable experiences that lead to ongoing, long-term family learning. An educator that pursues his or her goals at the expense of those of the family risks alienating visitors, lowering satisfaction, and undermining the roles and identities of family members. For example, researchers studying interactions between staff facilitators and families in lab spaces at a science center found that adults resisted educator attempts to become involved in the learning experience when these educators were interfering with the facilitation that adults were already engaged in or were not aligning their approaches to family goals (Pattison & Dierking, 2013). In the worst-case scenario, museum educators risk creating a space that is hostile or unwelcoming for visitors, especially those who may be unfamiliar with the museum context (Archer et al., 2016; Farrell & Medvedeva, 2010; Garibay, 2009). For all these reasons, negotiating family and facilitator goals is central to the work of museum educators.

In order to achieve this balance, facilitators must continuously look for clues from families and rapidly adapt their facilitation approaches to each group. In the REVEAL project, this process was called the *cycle of reflective facilitation:*

1) **Observe**—Facilitators look for clues about roles, interests, and agendas of individual family members and the group as a whole, as well as evidence of how the family is already engaging with the exhibit on their own.

2) **Support**—Based on their current understanding of the family, facilitators choose strategies designed to deepen and extend the experience at the exhibit and achieve goals that are shared by both the family and the educator.

3) **Reflect**—Facilitators notice how family members react to their facilitation strategies, reassess their understanding of family interests and goals, and plan their next steps. This final stage necessitates further observation of the family, which launches the cycle again or, in some cases, leads the facilitator to step back from the interaction.

This cycle of reflective facilitation is not a new process—it's likely something that you already do, even if you're unaware of it or call it something else. Experienced educators go through many rounds of the cycle during an interaction with a single family and, at the same time, also reflect about their practice on a larger scale, thinking about lessons learned from each interaction and how they can improve in the future (Pattison et al., 2016). At both scales, the process is closely connected to the more general idea of reflective practice, which is being embraced by educators in museums, schools, and beyond (e.g., Pattison et al., 2013; Preskill, 1999; Schön, 1983). Particularly in learning environments like museums, where families primarily control how, where, and what they learn, this reflective process is a critical tool for ensuring that learning experiences at exhibits meet the needs of both the family and the educator.

After reading this handout, consider the following questions. You will discuss them in small groups when your group meets to explore Module 4: Negotiating Family and Facilitator Goals.

1) What are some of the different goals, interests, and agendas that family visitors seem to have at your institution?

2) What are some of the ways that family goals overlap with your goals as an educator? In what ways don't they overlap?

3) What do you usually think about when you are facilitating for a family group at an exhibit? Is there a thought process you go through to guide your facilitation approach?

4) Describe a time when you changed your facilitation strategies based on what you understood about the family group. Why did you change your approach? What happened as a result?

Module 4

Negotiating Family and Facilitator Goals

Module Overview

Objective

In this module, participants will consider how to balance their own educational goals with the needs, interests, and agendas of family visitors. They will also practice using the cycle of responsive facilitation (observe, support, reflect) as they engage families at exhibits.

Materials needed

- Module 4 Video 1 (https://vimeo.com/user12277459/reveal-module4video1)
- Module 4 Video 2 (https://vimeo.com/user12277459/reveal-module4video2)
- Handouts (one per participant)
  - Introducing Module 4: Negotiating Family and Facilitator Goals (a few copies in case participants need them)
  - Module 4 Video Discussion
  - Module 4 Reflection Homework
  - Final Reflection
- Chart paper or whiteboard and markers

Plan for Session (95-105 minutes)

1) Warm-up activity, 10 minutes (optional)
2) Homework sharing, 15 minutes
3) Introducing the module, 10 minutes
4) Video discussion, 60 minutes
5) Final reflection, 10 minutes

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Warm-Up Activity   10 MIN

If you opt to do a warm-up activity, start the session with it. We recommend the Module 4 activity, Alien Scientist (http://www.nisenet.org/catalog/improv-exercises). In general, an effective activity for this module will focus on the need for individuals to adapt their expectations and actions to achieve a group goal.

Previous Session's Homework   15 MIN

In small groups, participants take turns sharing experiences they had doing the homework: one recent experience they had observing a family or one experience they had interacting with a family. After reflecting on the interaction, participants can also share what they might repeat or do differently in the future.

After 10 minutes, ask a few volunteers to share either their own learning or lessons gleaned from their group discussion. You may want to summarize observations, point out dominant themes, or make connections to practices at your institution.

Introducing the Module   10 MIN

Introduce this module's topic, paraphrasing what is written below. Participants should have already read "Introducing Module 4: Negotiating Family and Facilitator Goals" prior to this session.

Introducing the topic

Today's topic is about finding a balance between the goals of the family and the goals you have as a facilitator—and why striking this balance is important. You will watch two videos, notice how facilitators and family members negotiate the interactions, and discuss strategies and techniques that facilitators can use to reflect on their facilitation choices and customize interactions to best suit the needs of both you and your visitors.

Connecting to previous experiences

In small groups, participants discuss their responses to the questions at the end of the handout "Introducing Family and Facilitator Goals." After a few minutes, continue the discussion with the larger group.

1) What are some of the different goals, interests, and agendas that family visitors seem to have at your institution?

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2) What are some of the ways that family goals overlap with your goals as an educator? In what ways don't they overlap?

3) What do you usually think about when you are facilitating for a family group at an exhibit? Is there a thought process you go through to guide your facilitation approach?

4) Describe a time when you changed your facilitation strategies based on what you understood about the family group. Why did you change your approach? What happened as a result?

Video Discussion   60 MIN

In this module, you will be using the following two videos:

- Module 4 Video 1: (https://vimeo.com/user12277459/reveal-module4video1)
- Module 4 Video 2: (https://vimeo.com/user12277459/reveal-module4video2)

Introducing the videos

This module's videos both take place at the Drawing in Motion exhibit. Ask participants if they have any questions about the exhibit. Refer to the exhibit description handout from Module 1, as needed.

Pass out copies of the Video Discussion handout and give participants a minute or two to review the document. Paraphrase the following information about the videos for participants.

In the first video segment you are about to watch (Module 4 Video 1), a family approaches Drawing in Motion and the facilitator uses the cycle of facilitation to decide when and how to interact with the visitors. This video segment is the first few minutes of the whole interaction. The second video segment (Module 4 Video 2) picks up partway through an interaction and involves a facilitator negotiating two different, unrelated families simultaneously using the Drawing in Motion exhibit.

We will watch each video twice. The first time, ignore the handout and just try to take in the whole interaction. In between the first and second viewing, read over the handout questions. During the second viewing, I encourage you to look for how the facilitators try to balance what they observe about family needs and interests with their own goals. Notice how the visitors— both adults and children—respond to facilitation. After the second viewing, you will have time to write down responses to the handout prompts.

Key video moments for the session leader

Below are some moments in the video when something particularly noteworthy happens relevant to negotiating family and facilitator goals. This is not an exhaustive list of every interesting moment in each interaction. We point these out to help you, the session leader, have evidence to support observations by the group. We do not recommend giving these lists to participants.

Video 1:

0:33	The facilitator observes as the adult leads the interaction.
1:10	The facilitator tries to orient the family to the exhibit.
1:40	The facilitator provides more orientation and the family retries the challenge.
2:30	The facilitator observes the family.
3:11	The facilitator provides deeper explanation for the older child.

Video 2:

0:52	The facilitator tries several approaches to orienting the group to the coordinate points.
2:00	The facilitator provides instruction.
2:05	The facilitator asks the adults for input.
2:32	The facilitator asks the "button pusher" for input.
2:57	One adult suggests a strategy for moving the controls.
4:04	The group celebrates success.

Video discussion: Module 4 Video 1

Watch the video segment twice. Then take 3-5 minutes for participants to quietly jot down their answers to questions on the first page of the video discussion handout.

Next break into small groups of 2-4 participants (if possible, try to mix up groups from previous discussions) and share answers. Ask one member from each group to share a summary of their discussion with the larger group.

In your discussion, keep track of facilitation strategies participants mention on the whiteboard or chart paper. You may want to write down other group responses as well, but keep those ideas separate from the list of strategies. Some strategies participants might mention include: observing to understand family needs and interests, orienting families to the exhibit so that they can take charge of the experience, showing appreciation and encouraging visitors, and supporting adults as facilitators within the group.

1) What did you notice happening in this video segment?

2) Based on what you observed, what do you think were some of the family's goals for the interaction?

3) What did you see the facilitator do or say to indicate that they were using the cycle of facilitation?

4) How did the facilitator engage differently with the different family members?

5) What did you see the facilitator do or say to respect the family's goals and interests? Were there times when the facilitator seemed to prioritize his own goals?

6) How did the visitors respond to the facilitation?

7) What do you think would have happened if the facilitator had tried to impose his own goals in this interaction?

Video discussion: Module 4 Video 2

After watching the video segment twice, take 3-5 minutes for participants to quietly jot down their own answers to the questions on the second page of the video discussion handout.

Break into small groups of 2-4 participants and share answers. Ask one member from each group to share a summary of their discussion with the larger group. Continue to record possible strategies on the chart paper or whiteboard.

1) What did you notice happening in this video segment?

2) Based on what you observed, what do you think were some of the family's goals for the interaction?

3) How did goals differ, if at all, among family members within the visitor group?

4) What strategies did the facilitator use to navigate different family goals?

5) Do you think the visitors were satisfied with this interaction? Why or why not?

Discussion for Both Videos

After watching and discussing both videos, continue the group conversation using the questions about both videos on the second page of the handout.

1) What were some of the similarities and differences between these two video segments? How did the adults in each segment approach the interactions differently? How were the approaches by the two facilitators different?

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2) What are some strategies you could use to understand family goals and interests and find overlap between these and your own educational goals?

3) What challenges might you encounter trying to find this alignment with families?

At the conclusion of this module, record the list of strategies generated during the conversations (e.g., take a photo or type the list) and share the ideas with participants. Other relevant strategies that participants might mention include: giving the family space, asking the family what their goals are for the activity, providing options or choice for family decision-making, and offering different roles or jobs for family members.

Reflection Homework   10 MIN

After this session, participants will observe how families and facilitators negotiate goals while interacting at exhibits. They will also practice incorporating strategies for negotiating family and educator goals in their own facilitation.

Pass out copies of the Module 4 reflection homework handout to each participant. Allow participants a few minutes to read over the handout. Ask for any questions, clarifications, or comments.

Because this is the last module, you may want to schedule one additional, shorter meeting (about an hour) with the group to discuss the Module 4 homework. This can also be a good chance for the group to reflect on the professional development program as a whole. (See the "What now?" section for additional ideas about how to build on the program and continue to promote professional learning within your organization.)

For Further Exploration

More Videos

Full-length, unedited versions of the videos from this module (without subtitles) are also available:

- Module 4 Video 1, unedited (https://vimeo.com/203907190)
- Module 4 Video 2, unedited (https://vimeo.com/203907943)

You can also watch videos that were assigned to other modules and the bonus videos, paying particular attention to what the interactions reveal about how facilitators negotiate their own goals with those of families.

Readings

The following books and articles can be useful for continuing to explore the topics introduced in this module:

Falk, J. H., & Dierking, L. D. (2000). Learning from Museums. Walnut Creek, CA: AltaMira Press. (See especially Chapter 8, "The Contextual Model of Learning")

National Research Council. (2009). *Learning science in informal environments: People, places, and pursuits*. Washington, DC: National Academies Press. https://www.nap.edu/catalog/12190/learning-science-in-informal-environments-people-places-and-pursuits (See section 1, "Learning Science in Informal Environments")

Pattison, S. A., & Dierking, L. D. (2013). **Staff-mediated learning in museums: A social interaction perspective**. *Visitor Studies, 16*(2), 117–143. http://www.informalscience.org/sites/default/files/Pattison%26Dierking_Manuscript 11125.pdf

Porter, T., & Cohen, T. (2012). *Learning Together: Families in Museums Staff Training Curriculum*. Boston, MA: Boston Children's Museum. http://www.bostonchildrensmuseum.org/sites/default/files/pdfs/Learning-Together.pdf

Video 1

1) What did you notice happening in this video segment?

2) Based on what you observed, what do you think were some of the family's goals for the interaction?

3) What did you see the facilitator do or say to indicate that they were using the cycle of facilitation?

4) How did the facilitator engage differently with the different family members?

5) What did you see the facilitator do or say to respect the family's goals and interests? Were there times when the facilitator seemed to prioritize his own goals?

6) How did the visitors respond to the facilitation?

7) What do you think would have happened if the facilitator had tried to impose his own goals in this interaction?

Video 2

1) What did you notice happening in this video segment?

2) Based on what you observed, what do you think were some of the family's goals for the interaction?

3) How did goals differ, if at all, among family members within the visitor group?

4) What strategies did the facilitator use to navigate different family goals?

5) Do you think the visitors were satisfied with this interaction? Why or why not?

Both Videos

1) What were some of the similarities and differences between these two video segments? How did the adults in each segment approach the interactions differently? How were the approaches by the two facilitators different?

2) What are some strategies you could use to understand family goals and interests and find overlap between these and your own educational goals?

3) What challenges might you encounter trying to find this alignment with families?

1) Take some time, even if just 20-30 minutes, to watch another facilitator at your institution interact with visitors. When you are watching other staff members, first ask them for permission to observe.

   - When do you notice the staff member using the cycle of reflective facilitation?

   - What examples do you notice of facilitators aligning their goals with those of the family? What examples do you see of family and facilitator goals being misaligned?

2) Now that you've watched examples of staff and families negotiating goals and considered how to incorporate new ideas into your own practice, you can try these strategies out yourself (if needed, refer to the list generated during the video discussion). Try to incorporate a few new strategies into your facilitation with families at exhibits. Observe how visitors react and reflect on ways you can continue to improve the new approaches. Additionally, try to intentionally incorporate the cycle of reflection into your work, both during and in between interactions with families.

What Now?

Final Thoughts for the Session Leader

Congratulations—you made it to the end of the REVEAL professional development program! If professional development and reflective practice are deeply ingrained within your institution, then you likely already have ideas about next steps for your group. If, however, this was one of the first times educators at your institution have worked through a program like this, you may be wondering what happens now.

There are many ways you can continue the professional reflection and learning sparked by this program. For example, the topics highlighted in these modules are just some of the many issues that could be explored using the REVEAL videos. Working with your team, you could schedule additional times to watch the videos together, focusing on different issues that are important to your institution. The bonus and unedited module videos from this program also offer opportunities to discuss family learning, intergenerational communication, facilitation strategies, and more.

Another possibility is to start a reading group with your colleagues to review and discuss the articles referenced in each module. In the reference section at the end of this guide, you'll find some of the seminal studies and publications in the fields of museum and informal STEM education that have inspired our work. Other ideas for books and articles can be found on the REVEAL project website (http://REVEAL.terc.edu) and through various professional organizations, such as the Center for Advancement of Informal Science Education (www.informalscience.org). Ideally, these types of discussions around video and research could become regular features of your department and team meetings, as critical as other agenda items like hiring and scheduling.

More broadly, you could use your experience with the REVEAL program to help launch a new professional development initiative for educators at your institution. Several resources already exist in the field, such as:

- *Reflecting on Practice* from the Lawrence Hall of Science (http://mare.lawrencehallofscience.org/professional-development/reflect-on-practice);

- *REFLECTS Museum Educator Research Guide* from the Museum of Science and Industry, Tampa; (http://www.informalscience.org/news-views/reflects-model-professional-development); and

- *Learning Together* museum staff training curriculum from the Boston Children's Museum (http://www.bostonchildrensmuseum.org/sites/default/files/pdfs/Learning-Together.pdf).

Each of these have its own particular style and emphasis, so we recommend carefully reviewing the programs before determining which will best fit the needs and interests of your team.

Whatever you decide to do next, remember that professional learning is an ongoing, lifelong process. Just like classroom teachers, educators in museums and other informal learning environments need time to reflect on their work, share ideas with colleagues, and try out new strategies and facilitation techniques. Encourage members of your team to continue to observe each other, be attentive to their own facilitation practices, and gather feedback and input from visitors. Above all, keep finding ways to learn together and improve the experiences visitors and families have at your institution.

References

Allen, S., Gutwill, J. P., Perry, D., Garibay, C., Ellenbogen, K., Heimlich, J., Reich, C., Klein, C. (2007). Research in museums: Coping with complexity. In J. H. Falk, L. D. Dierking, & S. Foutz (Eds.), *In principle, in practice: Museums as learning institutions* (pp. 44–56). Lanham, MD: AltaMira Press.

Archer, L., Dawson, E., Seakins, A., & Wong, B. (2016). Disorientating, fun or meaningful? Disadvantaged families' experiences of a science museum visit. *Cultural Studies of Science Education, 11*(4), 917–939.

Brown, J. C., & Crippen, K. J. (2017). The knowledge and practices of high school science teachers in pursuit of cultural responsiveness. *Science Education, 101*(1), 99–133.

Callanan, M. A., & Oakes, L. M. (1992). Preschoolers' questions and parents' explanations: Causal thinking in everyday activity. *Cognitive Development, 7*(2), 213–233.

Callanan, M. A., Rigney, J., Nolan-Reyes, C., & Solis, G. (2012). Beyond pedagogy: How children's knowledge develops in the context of everyday parent-child conversations. In A. M. Pinkham, T. Kaefer, & S. B. Neuman (Eds.), *Knowledge development in early childhood: Sources of learning and classroom implications* (pp. 52–70). New York, NY: The Guilford Press.

Ellenbogen, K., Luke, J. J., & Dierking, L. D. (2007). Family learning in museums: Perspectives on a decade of research. In J. H. Falk, L. D. Dierking, & S. Foutz (Eds.), *In principle, in practice: Museums as learning institutions* (pp. 17–30). Lanham, MD: AltaMira Press.

Falk, J. H. (2009). *Identity and the museum visitor experience*. Walnut Creek, CA: Left Coast Press.

Falk, J. H., & Dierking, L. D. (2013). *The museum experience revisited*. Walnut Creek, CA: Left Coast Press.

Farrell, B., & Medvedeva, M. (2010). *Demographic transformation and the future of museums*. Washington, DC: American Alliance of Museums. Retrieved from http://www.aam-us.org/docs/center-for-the-future-of-museums/demotransaam2010.pdf?sfvrsn=0

Fender, J. G., & Crowley, K. D. (2007). How parent explanation changes what children learn from everyday scientific thinking. *Journal of Applied Developmental Psychology, 28*(3), 189–210.

Garibay, C. (2009). Latinos, leisure values and decisions: Implications for informal science learning and engagement. *The Informal Learning Review, 94*, 10–13.

Garibay, C., Yalowitz, S., & Guest Editors. (2015). Redefining multilingualism in museums: A case for broadening our thinking. *Museums & Social Issues, 10*(1), 2–7.

Greenes, C. E., & Rubenstein, R. (Eds.). (2008). *Algebra and algebraic thinking in school mathematics: Seventieth yearbook*. Reston, VA: National Council of Teachers of Mathematics.

Gutiérrez, K. D., & Calabrese Barton, A. (2015). The possibilities and limits of the structure-agency dialectic in advancing science for all. *Journal of Research in Science Teaching, 52*(4), 574–583.

Gutierrez, K. D., & Rogoff, B. (2003). Cultural ways of learning: Individual traits or repertoires of practice. *Educational Researcher, 32*(5), 19–25.

Institute of Museum and Library Services. (2009). *Museums, libraries, and 21st century skills* (No. IMLS-2009-NAI-01). Washington, D.C.: Institute of Museum and Library Services. Retrieved from https://www.imls.gov/assets/1/AssetManager/21stCenturySkills.pdf

Kaput, J. J., Carraher, D. W., & Blanton, M. L. (2008). *Algebra in the early grades*. New York, NY: Lawrence Erlbaum Associates/National Council of Teachers of Mathematics.

Leinhardt, G., Crowley, K., & Knutson, K. (Eds.). (2015). *Learning conversations in museums*. Mahwah, NJ: Erlbaum Associates.

National Academies of Sciences, Engineering, and Medicine. (2016). *Parenting matters: Supporting parents of children ages 0-8*. Washington, DC: National Academies Press.

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: National Council of Teachers of Mathematics.

National Research Council. (2000). *From neurons to neighborhoods: The science of early child development*. Washington, DC: National Academy Press.

National Research Council. (2009a). Diversity and equity. In *Learning science in informal environments: People, places, and pursuits* (pp. 209–247). Washington, DC: National Academies Press.

National Research Council. (2009b). *Learning science in informal environments: People, places, and pursuits*. Washington, DC: National Academies Press.

NGSS Lead States. (2013). *Next generation science standards: For states, by states*. Washington, DC: National Academies Press.

Pattison, S. A. (2014). *Exploring the foundations of science interest development in early childhood* (Doctoral dissertation). Oregon State University, Corvallis, OR. Retrieved from http://hdl.handle.net/1957/54783

Pattison, S. A., Cohn, S., & Kollmann, L. (2013). *Team-based inquiry: A practical guide for using evaluation to improve informal education experiences*. Retrieved from http://www.nisenet.org/catalog/tools_guides/team-based_inquiry_guide

Pattison, S. A., & Dierking, L. D. (2013). Staff-mediated learning in museums: A social interaction perspective. *Visitor Studies, 16*(2), 117–143.

Pattison, S. A., Randol, S., Benne, M., Rubin, A., Gontan, I., Andanen, E., Bromley, C., Ramos-Montañez, S., Dierking, L. D. (2016). *Modeling staff-facilitated family learning at interactive math exhibits: A design-based research study*. Manuscript in review.

Pattison, S. A., Rubin, A., Benne, M., Gontan, I., Andanen, E., Shagott, T., Francisco, M., Ramos-Montañez, S., Bromley, C., Dierking, L. D. (2017). *The impact of facilitation by museum educators on family learning at interactive exhibits: A quasi-experimental study*. Manuscript in preparation.

Preskill, H. S. (1999). *Evaluative inquiry for learning in organizations*. Thousand Oaks, CA: Sage Publications.

Renninger, K. A. (2007). *Interest and motivation in informal science learning*. Learning Science in Informal Environments Commissioned Paper. Board on Science Education, The National Academies. Retrieved from http://www2.informalscience.org/researches/Renninger_Commissioned_Paper.pdf

Rigney, J. C., & Callanan, M. A. (2011). Patterns in parent–child conversations about animals at a marine science center. *Cognitive Development, 26*(2), 155–171.

Russell, S. J., Smith, D., Storeygard, J., & Murray, M. (1999). *Relearning to teach arithmetic*. Parsippany, NJ: Dale Seymour Publications.

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic Books.

Appendix: Complete List of Videos with URLs

Below is a complete list of all of the videos available through the REVEAL professional development program. The bonus videos include three additional interactions that program participants can use to discuss the module topics or other issues relevant to their work.

Edited videos with subtitles:

- Module 1 video 1 (https://vimeo.com/user12277459/reveal-module1video1)
- Module 1 video 2 (https://vimeo.com/user12277459/reveal-module1video2)
- Module 2 video 1 (https://vimeo.com/user12277459/reveal-module2video1)
- Module 2 video 2 (https://vimeo.com/user12277459/reveal-module2video2)
- Module 3 video 1 (https://vimeo.com/user12277459/reveal-module3video1)
- Module 3 video 2 (https://vimeo.com/user12277459/reveal-module3video2)
- Module 4 video 1 (https://vimeo.com/user12277459/reveal-module4video1)
- Module 4 video 2 (https://vimeo.com/user12277459/reveal-module4video2)

Unedited videos without subtitles:

- Module 1 video 1 (https://vimeo.com/203903467)
- Module 1 video 2 (https://vimeo.com/203904009)
- Module 2 video 1 (https://vimeo.com/203905379)
- Module 2 video 2 (https://vimeo.com/203905609)
- Module 3 video 1 (https://vimeo.com/203905973)
- Module 3 video 2 (https://vimeo.com/203906945)
- Module 4 video 1 (https://vimeo.com/203907190)
- Module 4 video 2 (https://vimeo.com/203907943)

Bonus videos without subtitles:

- Bonus video 1 (https://vimeo.com/user12277459/reveal-bonusvideo1)
- Bonus video 2 (https://vimeo.com/user12277459/reveal-bonusvideo2)
- Bonus video 3 (https://vimeo.com/user12277459/reveal-bonusvideo3)