A museum and occupational therapy collaboration for youth with autism spectrum disorder

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Presentation Overview

• Science Museums and Occupational Therapy Programs as partners to support students with special needs
• Autism spectrum disorders background information in the context of museum environments
• BEST (Buddies Exploring Science Together) Partnership Program
  ▫ History/Background
  ▫ Goals
  ▫ Components
  ▫ Examples - Social Stories, student worksheets, activities, photos
  ▫ Outcomes
• Best practices for successful field trips for students with special needs
• Suggestions for partnering with other organizations
• Questions?
Partnership
What **Science Museums** Value

- Design with specific learning goals in mind
- Interactive learning that promotes social interaction
- Multiple ways for learners to engage with concepts, practices and phenomena within a particular setting
- Generalization of science learning
- Supporting participants to interpret their learning experiences in light of relevant prior knowledge, experiences, and interests
- Connecting real life experiences to classroom learning
- Mapping exhibits to K-8 core science standards

What **Science Museums** Value

**Inclusion defined:**

- Physically interact with/perceive the space
- Cognitively engage with the materials
- Socially interact with one another

Museum of Science: Philosophy of Inclusion

Social inclusion approach:
Seeks to create environments where individuals with disabilities are welcome to fully participate in activities alongside their non-disabled peers, at any time and any place within the Museum and throughout all of its offerings.
What is occupational therapy?

The therapeutic use of everyday life activities (occupations) with individuals or groups for the purpose of enhancing or enabling participation in roles, habits, and routines in home, school, workplace, community and other settings.

(AOTA, 2014)
What OT Practitioners Value

“Supporting health, well-being, and participation in life through engagement in occupation”

“People need to be able or enabled to engage in the occupations of need and choice...to experience equality, participation, security, health and well being”

Occupational Therapy’s Domain

(© AOTA, OTPF, 2014)
The intersection of Museum of Science and occupational therapy

Museum of Science

Inclusive Environments For Student Learning

Occupational Therapy

SHARED GOAL
Informal Science Learning

Learners who engage with science in informal environments:

- Come to generate, understand, remember, and use concepts, explanations, arguments, models, and facts related to science.

- Manipulate, test, explore, predict, question, observe, and make sense of the natural and physical world.

- Reflect on science as a way of knowing; on processes, concepts, and institutions of science; and on their own process of learning about phenomena.

- Participate in scientific activities and learning practices with others, using scientific language and tools.

Universal Design for Learning

- To support recognition learning, provide multiple, flexible methods of presentation.
- To support strategic learning, provide multiple, flexible methods of expression and apprenticeship.
- To support affective learning, provide multiple, flexible options for engagement.

Universal Design for Learning: Museum Exhibitions
Universal Design for Learning: Museum Programs
Program Development

Repeat and reinforce main ideas
• Explicitly state main idea
• Define program in “chunks”
• Create a content outline for visitors

Multiple entry points
• Use a planning pyramid

Physical and sensory access
• Generate concise phrases to be delivered aurally and visually
Characteristics of Autism Spectrum Disorders

1. Impaired social communication and social interaction

2. Repetitive and unusual behaviors

3. Symptoms present in early childhood

4. Symptoms impair everyday functioning
Difficulties in Social Communication and Interaction

- With conversation, sharing interests, understanding and showing emotions, initiating interactions

- Using nonverbal behaviors to facilitate communication and interaction, such as eye contact or body language, fewer gestures and facial expression

- Developing and maintaining social relationships (beyond caregiver), including less imaginative play and sometimes lack of interest in others, difficulty adjusting behavior to different social contexts
Repetitive and Unusual Behaviors

- Repetitive speech or motor patterns, use of objects
- Insistence on routines, resistance to change
- Fixated interests
- NEW: over- or under-reactivity to sensory input, or unusual interest in sensory aspects of environment
7 Senses

- Auditory (hearing)
- Tactile (touch)
- Visual (seeing)
- Olfactory (smell)
- Gustatory (taste)
- Vestibular (gravity and movement)
- Proprioceptive (muscles and joints)
Sensory Under-Responsiveness

Unaware of or failure to respond to sensory stimuli

- **Auditory**
  - Oblivious to sounds
  - Appear deaf

- **Tactile**
  - No response to pain

- **Visual**
  - Walk through objects
Over-responsive (Sensory Defensiveness)

- Tactile: may avoid touching and crowds
- Auditory: may be reactive to noise
- Vestibular: may fear escalators or elevators
- Visual: may be overwhelmed by bright lights
- Olfactory: may find particular smells aversive
Potential Challenges

• Overwhelmed by sensory experiences
  ▫ Distractible, difficulty regulating behavior
• Difficulty seeing the big picture
  ▫ Focus on minutiae, concrete
• Difficulty understanding social expectations
• Adherence to rules and routines
  ▫ Difficulty with transitions
• Difficulty with perspective taking
  ▫ Understanding another’s point of view
• Difficulty generalizing across settings
Potential Strengths

• Highly knowledgeable about certain topics
• Excellent memory
• Your program may be related to a focused interest
• May ask interesting questions
• May teach you something
• Well intentioned
Potential Strengths: MOS unique

- Individuals impacted by ASD
  - More likely than others to have greater aptitude for analyzing or constructing rule-based systems to explain the world about them
- Particularly relevant for science, technology, engineering, and mathematics (STEM) related fields (Wei et al., 2013)
- MOS a highly interesting and motivating context for students to socialize and succeed in a community setting.
Consultation with Professionals with Expertise in Autism Spectrum Disorders

- Potential collaborators
  - Occupational therapists
  - Special educators
  - Speech language pathologists
  - Psychologists

- Trained to carefully observe and evaluate human behavior in context.
  - Observation of activity demands
  - Checklist of sensory stimuli in environment
Consumer/Patron Perspectives

• Involve parents of young children with an ASD and/or individuals on the spectrum

• They can
  ▫ Help provide in-services and training
  ▫ Review materials and resources developed
  ▫ Be involved in evaluation of new exhibits
  ▫ Work as staff or as volunteers
  ▫ Be included on an advisory committee
Examples of what we’ve learned from observations at Boston Museum of Science

You “use your ears” to listen, “not your eyes.”
Example at Boston Museum of Science

Asked questions or spoke about topics that most other children would consider inappropriate or not of interest.

Are you old?
Are you going to die?
Example at Boston Museum of Science

At the museum we noticed that children with an ASD often got too close to other patrons when waiting to gain access to an exhibit.
Inclusive Practices in a Museum

- Simple language
- Visual images
- Simple demonstrations
- A range of levels of difficulty for interacting with exhibits
- Positive and achievable outcome within the estimated time that a student would spend at the exhibit
- Social story that families can read about the museum before visiting

Staff Training

- Summer Program
- Overnight Program
- Eye Opener (2\textsuperscript{nd} grade) Program

- Elicit experience
- Myths/images
- Videos
- Sensory Profile
- Tips and Strategies
## Tips and Strategies to Promote Inclusion for People with an ASD

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Museum Example</th>
<th>Tips &amp; Strategies</th>
</tr>
</thead>
</table>
| Ritualistic questions | Upon arrival, James seems anxious and repeatedly asks, “What are we doing today?” | • Prepare a simple schedule of the day’s plan on cards, and review the plan with the entire group at the beginning of the visit.  
• Review the museum rules before entering the museum, and provide frequent reminders throughout the visit.  
• Incorporate breaks into the schedule. |
Tips and Strategies to Promote Inclusion for People with an ASD

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Museum Example</th>
<th>Tips &amp; Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensory Processing</td>
<td>Amanda covers her ears during the electricity show.</td>
<td>• Let Amanda know there will be loud noises during the electricity show.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Be aware of exhibits with strong stimuli and crowded spaces.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Bring ear plugs if necessary and map out alternative routes.</td>
</tr>
</tbody>
</table>
Social Stories

- Short, personalized stories to teach children with an ASD how to manage behavior
  - Descriptive, perspective, directive and affirmative sentences to describe activity
    - When it will occur
    - Who will participate
    - What will happen
  - Effectively used in the following settings (Kokina & Kern, 2010)
    - Schools (both self contained and inclusive)
    - At home during homework time
Social Stories

- Research documents their effectiveness in helping children with an ASD (Kokina & Kern, 2010)
  - Decrease inappropriate and undesirable behaviors
  - Play appropriately during free play
  - Learn self monitoring skills
  - Improve social interactions
  - Participate in desired activities
Fun with Friends

- The museum as a *naturally occurring social context*
- Exploring the MoS with Friends
  - OT students co-lead after-school museum exploration group for adolescents with an ASD
  - Strengths Based: math and science
  - Activities structured to facilitate social interaction
    - Mutual exploration of interactive exhibits
    - Building structures together
Fun with Friends
Buddies Exploring Science Together

Program Goal:
To promote inclusion of middle school students impacted by autism spectrum disorders at the Museum of Science by providing opportunities for:

1. Naturally occurring science learning
2. Practice of social interaction skills in a community setting
Buddies Exploring Science Together

- Strength-based perspective
  - Optimize the success
- Capitalize on the naturally occurring, community context of the inclusive and accessible environment of the Museum of Science, Boston
- Responsive to school partners’ needs:
  - Curriculum
  - Students’ abilities
  - Scheduling
  - Personnel resources
Outcomes for students

• Engage in opportunities to learn about science which connect to science learning occurring at school and experiences in everyday life
• Socially interact in a naturally occurring community setting
• Be interested and excited about science
• Feel included in a community setting
# Buddies Exploring Science Together

<table>
<thead>
<tr>
<th>Museum of Science</th>
<th>Classroom Educators</th>
<th>Occupational Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Support students’ to learn about science which connects to science learning at school &amp; experiences in everyday life</td>
<td>1. Provide context to support students’ generalization of learning</td>
<td></td>
</tr>
<tr>
<td>2. Increase students excitement &amp; interest in science topics</td>
<td>2. Engage students in new opportunities for social interaction</td>
<td></td>
</tr>
<tr>
<td>3. Provide science learning experiences beyond what is possible in a classroom setting</td>
<td>3. Relate classroom measurable curriculum goals to museum learning</td>
<td>1. Support students’ social interaction skills</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Increase students knowledge and behavior with regards to community, behavioral &amp; social norms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Support students’ in communicating intentions &amp; ideas to peers during partner &amp; group activities</td>
</tr>
<tr>
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<td></td>
<td>4. Scaffold the entire field-trip experience to maximize opportunities of success</td>
</tr>
</tbody>
</table>
Schools
- Student learning & social goals
- Preparatory science learning
- Application & generalization of learning to classroom & everyday life

Museum of Science
- Contextualized setting for relevant science content
- Small group, interactive learning environment
- Multiple entry points
- Self-directed learning time

Supporting student science learning & social participation in a community setting

Occupational Therapists
- Anticipatory Planning
- Analysis of activity demands in context of MoS
- Scaffolding environment and learning task
- Goal setting & reflection
- Direct facilitation of social interaction
<table>
<thead>
<tr>
<th>Weekly Activities</th>
<th>Primary Facilitator</th>
<th>Explanation/Examples</th>
</tr>
</thead>
</table>
| Modified Social Story at school         | BU MSOT Co-Leaders                       | • Anticipatory planning for field trip  
• Symbolic modeling of behaviors       |
| Goal Setting at School                  | BU MSOT Co-Leaders                       | • Students used adapted worksheets to select a social interaction goal for that weekly visit |
| Schedule Review                         | MOS Educator / BU MSOT                   | • Each week, reviewed schedule with students for museum visit                        |
| Intro & Warm-Up Activity at MOS         | BU MSOT Co-Leaders                       | • Compliment your buddy (using pictorial cue sheets)                                 |
| Science Learning activity at MOS        | MOS Educator                             | • Activity related to science standards  
• Planetarium show, making slime, star lab                                          |
| Social Interaction activity at MOS      | BU MSOT Co-Leaders                       | • Working together in “buddies”  
• Exploring activity boxes; Navigate exhibits with peer                              |
| Sharing/Processing at MOS               | BU MSOT Co-Leaders                       | • “Did you meet your goal?”  
• “What was your favorite activity?”                                                  |
| Generalizing/Applying at MOS            | BU MSOT Co-Leaders                       | • Discussion of other contexts where we can practice social skills                   |
| Lunch at MOS                            | All staff                                | • Socialize with peers is cafeteria                                                  |
| Self-directed learning time in MOS      | MOS Educators/Teachers                   | • Unstructured time for students to explore MOS exhibits on their own (BEST Time)    |
Person-Environment-Occupation Model

Social Learning Theory
- Modeling
- Social Stories

Situated Learning Theory
- Learning in Context
- Experiential Learning

Goal-Plan-Do-Check
- Goal Setting Worksheets
- Self-Appraisal of Performance

Sensory Processing Theory
- Identify Sensory Processing Needs
- Modify Sensory Demands of Museum

Stress Inoculation Training
- Identify Potential Stressful Situations
- Anticipatory Planning

Promotion of Social Participation in Community
Promotion of Naturally Occurring Science Learning
<table>
<thead>
<tr>
<th>Program Features</th>
<th>Supporting Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Features</td>
<td>Supporting Evidence</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Follow-up discussions after partner activities to reflect on whether or not weekly goals were met</td>
<td>Mackay, T., Knott, F., &amp; Dunlop, A. (2007). Developing social interaction and understanding in individuals with autism spectrum disorder: A groupwork intervention. <em>Journal of Intellectual &amp; Developmental Disability, 32</em>, 270-290.</td>
</tr>
</tbody>
</table>
Then our class will get on a **bus** to go to the Museum.

We’ll pick up **friends from another school** on the way!

**Lauren, Allison, and Museum Teachers** will show us our classroom and the bathrooms.

If we have questions, need to go to the bathroom, or want a break, we can **ask** them.

When we get to the museum we will walk together to meet **Museum Teachers**.

**Museum Teachers** wear red coats and they will help us learn about science.

Then we will go over the schedule and **Museum rules** together!
GOALS

Group 1
- I will play games with others.
- I will let my friend know if there is a problem.
- I will stay with the group.
- I will respect my friend’s personal space.

Group 2
- I will listen when a friend is talking.
- I will ask my friends questions about themselves or their interests.
- I will be flexible when making choices with friends.

Group 3
- I will share things with my partner.
- I will say “please,” “thank you,” and “excuse me.”
- I will ask others to do things with me.
1. I will play games with others.

2. I will let my friend know when there is a problem.

3. I will stay with the group.

4. I will respect my friends’ personal space.
At the museum of Science we MUST BEHAVE!

WE WILL:
- listen
- Good hands
- walk
- work with friends
- quiet voices
- ask for help

WE WILL NOT:
- be mean
- run
- leave the group
- yell
- touch things
Who can help me?

1 – My friend

2 – Museum Teacher or BU Leader

3 – My teacher
Today’s Plan

1. Warm Up Activity in Classroom
2. SuperCold Science Presentation
3. Group 1 - Take a Closer Look Exhibit Exploration
   Group 2 - Icy Penguin Design Challenge
4. Switch
5. Goal Reflection in Classroom
6. Lunch in Museum Cafe
7. BEST Time in exhibit halls
8. Get back on bus to school
SPOTTED: Phases of the Moon

I looked at a model of the Moon!
The moon was lit up to show the different phases of the moon (using a special flashlight).

The first phase of the moon I saw was:

Its name is a _______________ moon.

The second phase of the moon I saw was:

Its name is a _______________ moon.
### Living or Non-Living? Let’s Explore Natural Mysteries

*Explore* the Natural Mysteries exhibit. *Find* things that are models of LIVING things and models of NON-LIVING things. *Sort* the things you find by placing a sticker on correct side of the chart.

<table>
<thead>
<tr>
<th>Living</th>
<th>Non-Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>tiger</td>
<td>rock</td>
</tr>
<tr>
<td>lion</td>
<td>sand</td>
</tr>
<tr>
<td>turtle</td>
<td>leaves</td>
</tr>
<tr>
<td>tree trunk</td>
<td>skeleton</td>
</tr>
<tr>
<td>polar bear</td>
<td>snowflake</td>
</tr>
</tbody>
</table>

### Icy Penguins Experiment

I observed an ice cube in the shape of a penguin!

**It was:** (circle what you saw)

<table>
<thead>
<tr>
<th>cold</th>
<th>small</th>
<th>solid</th>
<th>melting</th>
</tr>
</thead>
<tbody>
<tr>
<td>gas</td>
<td>hot</td>
<td>changing</td>
<td>colorful</td>
</tr>
<tr>
<td>boiling</td>
<td>wet</td>
<td>liquid</td>
<td>frozen</td>
</tr>
<tr>
<td>clear</td>
<td>steaming</td>
<td>big</td>
<td>slippery</td>
</tr>
</tbody>
</table>

I protected my penguin using:  

<table>
<thead>
<tr>
<th>AND</th>
<th>AND</th>
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<tbody>
<tr>
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</table>

The other group protected their penguin with:  

<table>
<thead>
<tr>
<th>AND</th>
<th>AND</th>
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<tbody>
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After I put my penguin under the heat lamp, my penguin was:

<table>
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<tr>
<th>cold</th>
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<td>clear</td>
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<td>bigger</td>
<td>slippery</td>
</tr>
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Museum of Science Photo Journal

Take 5 minutes to explore the exhibit.

Then, work with your partner to take pictures in the exhibit:

☐ Take a picture with your partner with your partner’s favorite part of the exhibit.

☐ Ask your partner to take a picture of you with your favorite part of the exhibit.

☐ Take a picture of your partner with a part of the exhibit that you both like a lot.
Inclusion: Sharing the message

Before the Visit: Establish familiarity & comfort levels

- Reach out
- The message:
  - You are welcome here!
  - This is a place for you!
  - We are committed to your success!
- Pre-visits to classrooms
- Social Stories, Photos, Expectations
- Pre-Visit Planning & Communication
- Repeat trips with students
- Additional adults: no caps
Tips for Field Trips: Communication

- Working together with various players:
  - Teachers - Student abilities, science learning goals
  - Museums - Clearly describe activities and exhibit details
  - OT Partners - Analyze demands of educational & social activities

- Shared understanding of goals & essential program components
  - Identify unique needs of students
  - Flexibility & willingness to improvise in the situation of practice
  - Access to contact information, including bus company
  - Web portal for file sharing
Tips for Field Trips: Communication

• Meet with partners to create a plan
  ▫ Explore the space beforehand
  ▫ Review schedule and plans for field trip
  ▫ Identify quiet and safe spaces for breaks
  ▫ Identify processes for students who may need additional support or a break from museum activities
  ▫ Identify amenities: charging stations, closed captioning, assisted listening, etc.
  ▫ Encourage partners in learning from each other
Tips for Field Trips:
Educator Strategies

- Pre-Planning at school
  - Social stories (about trips in general then about the actual trip)
  - Explanations
  - Reminders (behavior boards and reinforcers)
  - Pictures of the actual space
  - Individual student calendar to track the date of the trip
Tips for Field Trips: Peak Students Interests

- Get Students Excited
  - Read, write and research about museum visit
  - Conduct internet research relating to science content
  - Plan out exploration route in exhibit halls
  - Generate questions to ask museum educators
Outcomes

“I’ve been teaching for 9 years and this is the single most important thing that has happened in my career in teaching as far as having integration of community outing, learning about curriculum, and socializing skills.”

--- Boston Public School teacher participant, 2014 BEST program
Outcomes: Interest and Excitement

Students expressed **interest** in science learning by asking and responding to questions

- Live Animal Center: students asked the MOS educator about the kinds of animals at the museum and how they are cared for
- Super Cold Science live presentation: the MOS educator asked students to name some hot and cold things
  - Students replied with comments including “lava from volcanoes,” “hot chocolate,” “ice cream,” and the “North Pole.”

Students expressed their **excitement** in science learning by making unprompted positive:

- Comments such as “awesome” or “cool” while interacting with exhibits and programs.

When given time to **independently engage with exhibits:**

- Students often spent long periods of time at individual exhibits suggesting they were interested in using the exhibition thoroughly
Outcomes: Inclusion

Students were observed engaging in science through many hands-on elements:

- Using buttons, levers, and physically trying activities like the swings and see-saw in *Science in the Park*.

- “He loved the space capsule. He thought it was the coolest thing in the world to go inside. He usually doesn’t participate, but he would go inside. The tornado where you could climb in was great. Spinning things. The hands-on has a bigger benefit to him.”
Outcomes: Social Participation

“Behaviors that are characteristic and expected of an individual within a social system and encompass the individuals’ engagement with peers and friends and community members”

(Khetani & Coster, 2014, p. 731)
Outcomes: Social Participation

- **Taking turns** at exhibit components
  - Between two students from the BEST program
  - Between a student from the BEST program and other visitors in the museum
- **Initiating social interactions** with their peers and teachers
  - One student asked a peer if he wanted to look at the planets exhibit outside the Planetarium.
  - Another student asked his teacher to join him in looking at an interesting shell.
- **Spontaneously shared his observation**
  - “These rocks feel real.”
- **Spontaneously apologized** to another student
  - While exploring the bug drawers, a student from the BEST program accidentally bumped another student.
Outcomes: Social Participation

• Selected items: teachers rated the students’ social behaviors on a 3 point scale
  ▫ School Function Assessment (SFA) (Coster et al., 1998)
  ▫ Children’s Communication Checklist-2 (CCC-2) (Bishop, 2006)
  ▫ Social Skills Improvement System (SSIS) (Gresham & Elliot, 2008)
  before and after the BEST program.
  ▫ **Nine out of 15 students demonstrated increased scores**
  ▫ **Skills that improved:**
    • Participation in group activities,
    • Being flexible in adapting to unexpected situations,
    • Sharing materials with others

• The teachers’ perception of the importance of social skills changed for the majority of the children
  ▫ Value of **practicing social interactions and social conventions in a community setting**
Outcomes: Belonging

Teachers value the Museum as a community setting

- “Our school is in the classroom 7 hours a day. They’re in the classroom enough. As they get older, they need to get out. As they go to high school, they'll get out more, but why not start now?”

- “This surpassed anything that we could have done on our own in the community.”

- “I’m working with static four walls. Here, there’s way more opportunity for language. The students can describe things and ask people, ‘what did you like best?’”
Suggestions for Partnering

• Explore resources in your local community
  ▫ Public schools
  ▫ Specialized private schools for students with special needs
  ▫ University Occupational Therapy programs
  ▫ Advocacy Organizations

• Develop an understanding of the perspectives of each partner

• Collaborate with existing programs

• Start small - Establish feasibility (Can it be done)

• Develop mechanisms for program evaluation and measuring outcomes
References


References, continued


References, continued


References, continued


