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Journal of Museum Education

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/rjme20

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To cite this article: Jordan M. Lukins & Susan Szendrey (2024) Access and Inclusion Go to the Zoo, Journal of Museum Education, 49:4, 486-497, DOI: 10.1080/10598650.2024.2405772

To link to this article: https://doi.org/10.1080/10598650.2024.2405772

Published online: 07 Oct 2024.

JOURNAL OF MUSEUM EDUCATION
2024, VOL. 49, NO. 4, 486–497
https://doi.org/10.1080/10598650.2024.2405772

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ABSTRACT
Organizations such as zoos and museums offer educational experiences, along with opportunities for leisure and enjoyment, which should not be denied due to lack of access. In this case study, we present a process through which professionals in disability-related fields collaborated with a local community zoo to improve accessibility and inclusive experiences for visitors with disabilities. Recommendations are provided for conducting needs assessments and identifying and implementing new initiatives. We posit a four-stage process for accessibility improvement: Compliance, Commitment, Capacity, and Change. Organizations can use this framework to engage in meaningful work around disability access and inclusion.

ARTICLE HISTORY
Received 19 April 2023
Revised 20 August 2024
Accepted 13 September 2024

KEYWORDS
Disability; inclusion; accessibility; zoos; continuous improvement

Nonformal education environments, such as zoos, aquariums, and museums, offer unique opportunities for lifelong experiential science education. Furthermore, these settings simultaneously provide entertainment, stimulate curiosity, and facilitate social interaction among their visitors.[1] All these benefits can and should be available to everyone, regardless of ability or disability status. With recent data suggesting that approximately one in four Americans experience a disability,[2] nonformal education environments are increasingly seeking ways to better include a population with diverse needs. This paper describes our experience working to improve accessibility in a local community zoo and presents a framework through which to view this improvement process.

Background and rationale

Accessibility to all public places has been a societal goal for decades, with 2020 marking the 30th anniversary of the passage of the Americans with Disabilities Act (ADA).[3] Early accessibility work tended to prioritize ADA compliance, primarily focusing on physical access to buildings and other infrastructure.[4] Others extended these ideas into special programming for people with disabilities.[5] For example, "Morning at the Museum" events offered at the Smithsonian family of museums allow families of children with disabilities to visit before the space opens to the public and to access additional sensory-friendly activities.[6] Notably, while the ADA prohibits discrimination based on disability, fully inclusive spaces require more than the absence of discrimination. True inclusion extends the concept of access into meaningful integration and participation within the

community.[7] Such participation in community settings and activities is considered to be a fundamental human right and is recognized as an indicator of the quality of life and well-being.[8]

Increasingly, museums, zoos, and other nonformal educational settings are seeking to build accessibility into their everyday operations.[9] Zoos can present several unique challenges to access due to their physical environment and the nature of their experience. For example, natural terrain and vast open space can introduce barriers to mobility and endurance. Adaptations to the built environment, including architectural improvements (e.g. ramps, curb cuts, paving) and the installation of benches or other rest areas, can facilitate improved physical access.[10] Additionally, the zoo environment is inherently full of sensory stimulation, with the smells and sounds of animals surrounding visitors. Other sensory challenges can include crowds, noise, and the natural elements of an outdoor setting.[11] Individuals with autism and other disabilities may struggle to cope with such sensory conditions without adequate preparation or adaptation.[12]

Because the zoo experience typically relies heavily on visual observation of animals in designed habitats with supplemental written signs, visitors with visual, cognitive, or learning disabilities may also experience significant barriers to accessing a traditional zoo visit.[13] Improved accessibility often involves the reconsideration of exhibit design. Unimodal elements, such as a sign with only written text or a tour given only verbally, will not be accessible to many visitors for varied physical, cognitive, and social reasons.[14] However, exhibits can be made more inclusive through the introduction of multisensory elements like movement, manipulation, sound, and visuals.[15] Offering multiple ways to interact with a space aligns with the principles of universal design, defined as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for specialized design."[16] Rather than developing new, "special" programming for disabled visitors, this approach improves the standard environment to enable "all visitors to have the same experience to the highest degree possible."[17] Guidelines for universal design include planning for flexibility in use based on individual preferences and abilities, offering varied modes of presentation (e.g. tactile, visual, auditory), and anticipating variability in visitors' experience, knowledge, and language and literacy skills.[18]

Case of the community zoo

In response to an expressed interest in improving accessibility, we formed a partnership with a rural community zoo in the southeastern United States. Our partner zoo is an educationally focused, non-profit zoological park that houses more than seventy animals representing about twenty global species. Located in a rural area, it serves a population that generally has limited access to educational and experiential opportunities within the region. The zoo prides itself on providing interactive educational programming. Unlike a typical self-guided zoo visit, each small group of visitors receives a guided tour in which a trained tour guide relays information about each animal species as the group moves together from exhibit to exhibit. Visitors converse directly with their guide as they view animals as close as five feet away and are often treated to the sounds of howling wolves and roaring lions.

The first author began volunteering at the zoo several years prior to this project during her career as a special education teacher. This partnership eventually led to discussions with executive leadership about improving accessibility for visitors with disabilities. The

second author brought her expertise as an occupational therapist to the project when informal conversations transitioned to a purposeful program improvement process. Although neither of us identifies as disabled personally, we both have considerable experience working with individuals with disabilities in a professional capacity and seek to center the lived experiences of disabled people as we approach our work. We present our process here as a model for other zoos, museums, parks, and nonformal education settings interested in creating a more inclusive environment. Our experience is particularly applicable to smaller, community-based organizations working with limited resources and financial constraints.

Identifying needs

Although the zoo's leadership had ensured ADA compliance, they had not previously targeted the improvement of accessibility and inclusion in a broader sense. As a result, we began by conducting a needs assessment to establish priorities. See Table 1 for the questions that guided the needs assessment. In an effort to include perspectives at all levels of the organization, we gathered input through an interview of the Assistant Director, an anonymous survey of staff members, and a focus group with four individuals who worked closely with members of the public as tour guides or customer service associates. In addition, to ensure that new initiatives were informed by the audience we intended to serve, we used a community survey to seek perspectives from people with disabilities and their families.[19]

It was very common for initial reactions from organizational staff to highlight challenges to accessibility, such as gravel pathways and the group nature of the tour program. The Assistant Director shared the history of the executive team's focus on compliance with the ADA, which was also noted by staff who cited organizational policies around wheelchair access and service animals. There was a general recognition that financial realities would limit large-scale changes to the physical environment like paving the tour pathway or adding high-tech exhibits, so stakeholders instead asked for recommendations of alternative accommodations that might be made for individual visitors. One tour guide summarized this need by asking for both "organizational ground rules" to establish formal policies where needed and "flexibility in accommodating different needs."

Table 1. Needs assessment questions.

Organization level
What barriers might visitors with disabilities face here?
What policies or procedures are currently in place to address the needs of visitors with disabilities?
What strengths can the organization leverage in the realm of accessibility?
Capacity
How familiar are staff with common disabilities and their characteristics?
How comfortable are staff with personally interacting with children and/or adults with disabilities?
How comfortable are staff with modifying their own behavior or the environment in order to accommodate visitors with disabilities?
Visitor experience
How do you help visitors feel safe and welcome?
In what ways do visitors physically interact with the space?
In what modalities (e.g. written, audio, images, tactile objects, video) can visitors access information?
How do you account for varied cognitive abilities among visitors?
How do you account for varied background knowledge among visitors?
Where is the space the most/least interactive or dynamic?

Staff almost unanimously expressed a need for more information about disabilities in order to make such decisions on a case-by-case basis. Many noted their own uncertainties and lack of experience interacting with disabled people. The Assistant Director indicated "we need to have the language and understanding, the language sensitivity" to interact with visitors with disabilities. Additionally, tour guides repeatedly requested specific guidance for how they might adapt a standard tour for a visitor with a visual or hearing impairment or a child with autism. Although they were not always sure how to do so themselves, many staff recognized that the zoo was especially well-positioned to provide more individualized support to visitors because of the direct interaction afforded by the guided tour structure.

Finally, neither executive leadership nor front-line staff were interested in developing special, standalone programs or events for visitors with disabilities. The consensus seemed to be that the organization instead needed to build capacity for supporting these visitors on a day-to-day basis within the programs that already existed.

Twenty community members responded to the survey of needs. One respondent had a disability themselves, with the remaining nineteen identifying as a family member of someone with a disability. Fifteen were parents of children with disabilities including autism, intellectual disabilities, attention deficit hyperactivity disorder, and visual and hearing impairments. Community members were invited to describe barriers and supports to their family's participation in community settings broadly. A large portion of the responses noted difficulties related to sensory stimuli (e.g. bright lights, loud music, small spaces, and large crowds). Other challenges noted included a lack of quiet places to regroup when needed, long waiting times, and a lack of public acceptance of needs related to disability.

Many families, especially parents of children with autism, reported accessing special events in the community such as "sensory-friendly" nights. However, most suggestions for desired supports involved everyday accommodations rather than separate programming. For instance, community members suggested ensuring that written materials used easy-to-read fonts and simple language, offering audio options, designating "quiet spaces," and ensuring the availability of ramps. Several also noted that increased public awareness of disability has facilitated their ability to participate more readily in community spaces and activities and that staff sensitivity and understanding are vital to inclusion.

Implementing new initiatives

The feedback provided by organizational staff and community members coalesced around several areas for change. As a result of these conversations, we identified priorities in the areas of staff training, organizational policies, and universally designed resources. Although other organizations may identify alternative areas for growth, these three pursuits represented the necessary foundation for improving access and inclusion in the zoo's current context.

Staff training

Basic disability training was prioritized as a method for building necessary capacity within the organization. As many stakeholders cited low confidence and a lack of experience with people with disabilities, creating a shared knowledge foundation became

immediately necessary before any further inclusion efforts could be pursued. In alignment with professional recommendations, we elected to train all staff and volunteers, including customer service employees, tour guides, and administrative staff. Especially in a small organization, all these individuals have some degree of interaction with visitors and, therefore, need an awareness of and sensitivity to the needs of those with disabilities.[20] As a special educator and an occupational therapist, we were able to leverage our specific expertise to provide this training.

We developed a one-hour training session using materials adapted from the Mid-Atlantic ADA Center.[21] This training introduced basic information about common disabilities and how they might impact a person's experience at the zoo. For example, some people with autism may experience auditory sensitivities, which could make hearing lions roaring an overwhelming experience. We also reviewed the basics of the ADA to ensure staff were aware of the ways people with disabilities are legally protected in public spaces. Additionally, we shared tips for initiating and maintaining respectful interactions with disabled visitors. Lastly, we reviewed key principles of universal design and discussed changes that could be made with disabled visitors in mind that would also benefit other visitors and staff. See Table 2 for a selection of free resources that can be used when developing staff training.

After introducing these topics, we led an interactive discussion to brainstorm specific accommodations for individual visitor needs that may arise. We recognized that, while a working knowledge of disabilities is important, the ability to adapt and accommodate an individual's specific needs is likely to have the most direct, positive impact on a visitor's experience.[22] While staff largely did not feel confident in their ability to identify and

Table 2. Recommended training resources.

Resource	Description	Link
The Mid-Atlantic ADA Center's Serving Customers with Disabilities training	Designed for front-line customer service staff, this PowerPoint presentation offers a starting point for developing training.	https://www.adainfo.org/trainings/serving-customers-disabilities/
The District of Columbia Office of Disability Rights' Disability Sensitivity training video	Approximately four minutes long, this light-hearted video features disabled people sharing ways to treat them with respect.	https://youtu.be/Xkz-UNuvve0
The National Disability Institute's Disability Sensitivity Guide	This guide introduces basic information about common disabilities along with tips for communicating with people with various disabilities.	https://www.nationaldisabilityinstitute.org/wp-content/uploads/2018/11/supplemental-guide-sensitivity.pdf
Easter Seals' Disability Etiquette webpage	These brief suggestions offer some do's and don't's when interacting with people with disabilities.	https://www.easterseals.com/support-and-education/facts-about-disability/disability-etiquette.html
The Mid-Atlantic ADA Center's At Your Service film	Available in English and Spanish, this twenty-minute film addresses best practices in accessible customer service.	https://www.adainfo.org/hospitality/at-your-service/
The RL Mace Universal Design Institute's Universal Design Principles	These seven principles of universal design can be applied to the built environment and the visitor experience.	https://www.udinstitute.org/principles
The DO-IT Center's Equal Access: Universal Design of Informal Learning guide	This checklist is designed to help organizations and staff apply universal design principles to informal learning activities, facilities, and policies.	https://www.washington.edu/doit/equal-access-universal-design-informal-learning

provide accommodations prior to the training, this discussion helped them to recognize examples of adjustments they had made in the past. For example, one tour guide shared a story about recognizing a child's sensitivity to noise and making sure to alert them before entering a particularly loud area of the zoo. Another mentioned a time that a class of blind students visited and the guides integrated multisensory enhancements like animal sounds and fur samples into the tour. Several were able to share specific ways they increased visitor engagement on their tours through questioning, adjusting the level of vocabulary, and tailoring information to individual interests. This sharing of experiences allowed participants to gain validation from the group for successful accommodations and collaborate around how to better their responses in the future. Following the training, all twenty-eight participating staff reported feeling more knowledgeable about disabilities and more confident in their ability to interact with, assist, and accommodate visitors with disabilities at the zoo.

Accessibility webpage revision

Additionally, we collaborated with executive leadership to review and revise the zoo's policies around accessibility. The existing accessibility information primarily addressed ADA compliance, especially the use of mobility devices and service animals, and was presented in a largely legalistic manner on the visitor-facing website. Therefore, we revised this webpage to use more welcoming and inclusive language. For example, the page was previously introduced by the Frequently Asked Question, *Do you have handicapped access?*. We removed this outdated language and revised the question to read, *Is the zoo accessible to visitors with disabilities?*. The original response to this question began quite abruptly with a statement about being ADA compliant, so we added an introductory paragraph stating: *We are proud to welcome visitors of all abilities and happy to collaborate with you to ensure your meaningful access to the zoo. Please use the following information when planning your tour and visit.*

Furthermore, to diminish the compliance-focused nature of the information provided, we replaced the statement, *The building is ADA compliant,* with, *The visitor building, including the check-in area, gift shop, restrooms, and education room, is wheelchair accessible*. Because the previous accessibility webpage did not mention sensory access at all, we added a bullet point reading: *Our tours provide a unique multisensory experience, with views of our animals often as close as five feet and the sounds and smells of animals surrounding you! For visitors who may find this sensory environment challenging, sensory support kits containing noise-reducing headphones, fidget items, and visual supports are available for checkout in the gift shop.* Finally, we concluded the page with a specific invitation for visitors to contact the zoo ahead of their visit to discuss any specific needs and ensure staff are prepared to provide appropriate accommodations.

Universally designed resources

Lastly, using input from leadership and other staff, we explored resources to support accessibility through universal design.[23] Voice amplification for tour guides was identified as a priority. Portable microphone systems were purchased for tour guides to begin using on all tours. This simple and relatively low-cost addition introduced benefits for a range of visitors, including those with hearing impairments, attentional

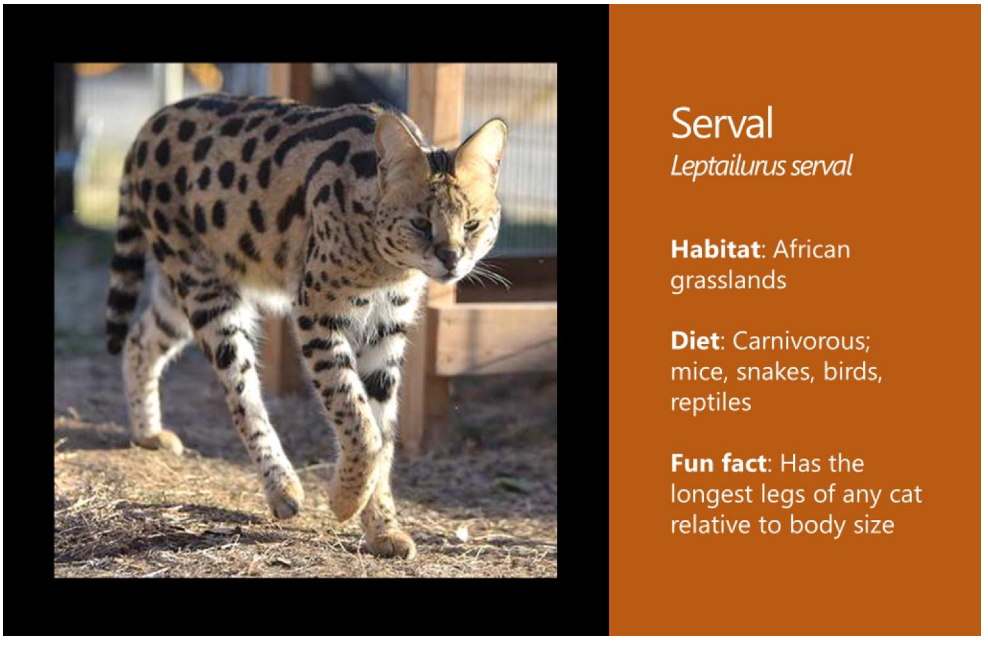

Figure 1. Sample visual support card.

challenges, and those individuals simply located furthest away from the tour guide. Additionally, the zoo recently installed new signs with large photographs of animals alongside brief informational text, maps of geographical ranges, and representations of the size of body parts like paw prints. Visitors also now have opportunities to engage with tactile objects such as fur samples, faux teeth and claws, and models of skeletons.

The zoo purchased materials to develop sensory support kits that visitors with sensory sensitivities can borrow and use. Each kit includes noise-reducing headphones, several fidget items, sunglasses, and a set of photo information cards for each species at the zoo to supplement the verbal tour (see Figure 1 for an example). We are currently developing a social narrative, a simple story written from a visitor's perspective to explain what they can expect from the experience. These narratives are useful for individuals with autism, anxiety, and other disabilities.[24] The text in Figure 2 will be supplemented with photographs of the zoo and posted on the zoo's website as a resource to help visitors prepare. Although these examples were selected for the specific environment and nature of a visit to this zoo, other zoos and museums may introduce flexibility into their exhibits in a variety of additional ways, such as adding captioning to video presentations or designating "touchable" artifacts or hands-on activities.[25]

Stages of accessibility improvement

In the words of Ross Edelstein (2022), "slow, solid work changes attitudes."[26] Organizations cannot expect to change overnight but must embrace accessibility and inclusion as core values they will continually seek to advance. As a result of our

Going to the Zoo

I am going to take a tour at the zoo!

When I get to the zoo, I will check in for my tour at the desk inside the building.

When it is time for my tour, a tour guide will get our group together. There could be up to twenty people in the group, but there might be less. We will all stay together.

The tour guide will tell us their name and what the tour will be like. If I have questions during the tour, I can ask my tour guide.

When the tour starts, we will walk through a gate into the zoo. If I need to use the restroom or take a break during the tour, I should ask my tour guide. They can help me get back to the building.

The tour guide will lead the group through the park. They will tell us information about each animal we see.

It is important to always stay with my group. I will walk on the gravel path and follow my tour guide.

The animals in the zoo live in habitats made just for them. There is a fence between me and the animals' homes. I will keep my whole body on my side of this fence. This keeps me and the animals safe.

Sometimes the animals might be noisy. The lions might roar and the wolves might howl. This is how they say hello! If the noise is too loud, I can cover my ears or wear headphones.

Animals also have different smells. I might like or dislike these smells. One animal even smells like popcorn! If I don't like the smell in part of the zoo, I can hold my nose.

Some animals might be playful, but others might be sleeping or hiding. That's okay—I will still get to see lots of different animals on my tour.

Altogether, the tour will last about one-and-a-half hours. I will learn a lot on my tour of the zoo!

Figure 2. Text for social narrative.

experiences, we suggest organizations engaging in accessibility improvement are likely to encounter four stages of growth: (1) Compliance, (2) Commitment, (3) Capacity, and (4) Change (see Figure 3). Notably, we situated compliance before commitment. Typically, organizations recognize ADA compliance as a non-negotiable component

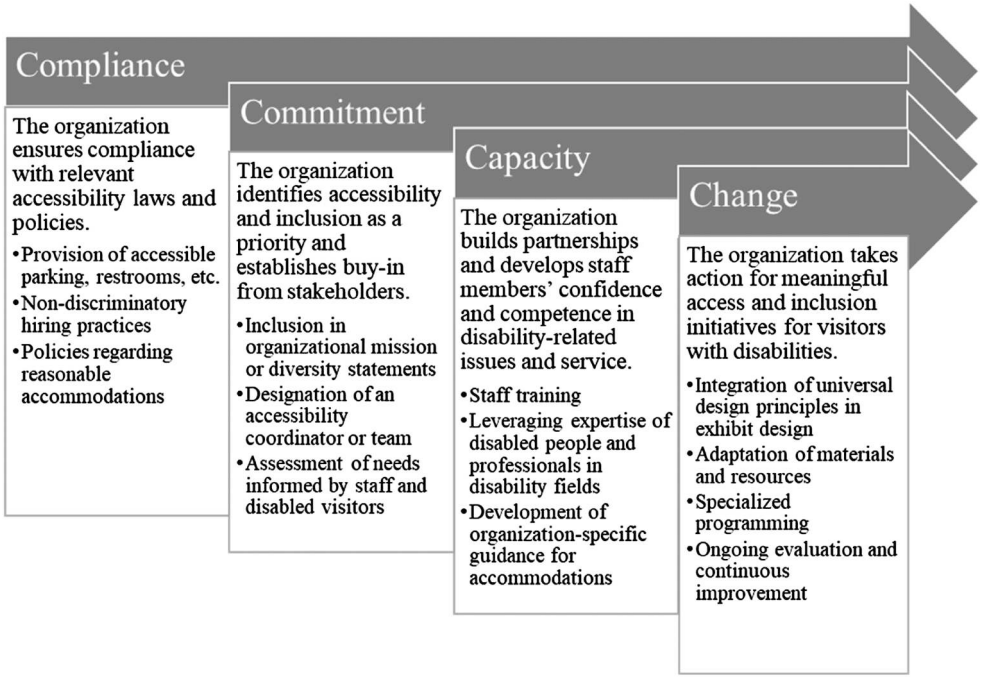

Figure 3. Four stages of accessibility improvement.

of running a business even if they do not express an organizational commitment to accessibility and inclusion on more ethical or personal grounds.[27] However, the gap between compliance and larger-scale change must be bridged by building a commitment to accessibility and developing the necessary capacity to underpin new initiatives. These steps are key to ensuring changes are not made in a "performative" manner but are undertaken thoughtfully and with purpose.[28] We suggest that organizations foster their commitment and capacity for inclusion in partnership with individuals with disabilities and professionals in disability-related fields working in local universities, public school systems, or organizations.[29]

We acknowledge that these stages are unlikely to unfold in a fully linear process. The arrows for every stage extend fully across the model to highlight that an earlier stage does not stop once the next one begins. Particularly as an organization begins making changes, there may be successes and failures that require revisiting the previous stages to ensure the foundations of accessibility are strong. Additionally, the capacity stage is one that requires constant attention as new people join the staff or new leaders emerge. Once the existing staff are trained in disability and accessibility considerations, we recommend adding the same basic training to the initial onboarding of all new staff members. If an organization experiences shifts in key players in executive or administrative roles, it may need to re-establish the commitment to access and inclusion with new leaders. In fact, we navigated some of these very transitions during our work with the partner zoo. Keeping these four stages of growth in mind can help organizations identify areas of strength and need beginning with the early stages of change and throughout the continuous improvement process.

Concluding thoughts

Zoos and museums offer vital opportunities for community participation and have the unique opportunity to engage visitors of all ages and abilities in lifelong learning. These nonformal educational settings are increasingly seeking ways to make their spaces more inclusive of disabled visitors. Some organizations may find it challenging to know where to begin when making these changes, especially when met with monetary, staffing, and other resource limitations. Using a case study of our experiences collaborating with a small zoological park, we were able to identify four stages of improvement: Compliance, Commitment, Capacity, and Change. Addressing these critical components can help guide organizations in their creation of more inclusive experiences for visitors with disabilities.

Notes

1. Fraser et al., "An Integrated Approach," 4–5; Rennie and McClafferty, "Using Visits," 175–6.
2. Centers for Disease Control and Prevention, "Disability Impacts All."
3. Americans With Disabilities Act of 1990, Pub. L. No. 101-336, 104 Stat. 328.
4. Moon, "The Inclusive Intention," 125; Moussouri, "Implications of Social Model," 93–94.
5. Edelstein, "New Foundations," 199–200; Reich et al., "Inclusion," 17–18.
6. Access Smithsonian, "Morning at the Museum."
7. Reich et al., "Inclusion," 15–16.
8. World Federation of Occupational Therapists, "Position Statement: Human Rights."
9. Gilling, "You're Welcome"; Trainer et al., "Museum Accessibility."
10. Trieglaff, "Universal Design," 432–4.
11. Bruce and Walker, "Modeling Visitor-Exhibit Interaction," 682; Kong et al., "Community-Based Sensory Training," 3.
12. Kong et al., "Community-Based Sensory Training," 1–3.
13. Bruce and Walker, "Modeling Visitor-Exhibit Interaction," 682–83; Trieglaff, "Universal Design," 435–8.
14. Reich et al., "Inclusion," 18–19; Wysocki, "Museums' Inclusive Education Practices," 207.
15. Leist et al., "Visitor Voices," 40–41.
16. The RL Mace Universal Design Institute, "What is Universal Design?"
17. Stringer, "Accessibility in Museum Education," 184.
18. The RL Mace Universal Design Institute, "Universal Design Principles."
19. Edelstein, "New Foundations," 195–8.
20. Stringer, "Accessibility in Museum Education," 184.
21. Mid-Atlantic ADA Center, "Serving Customers with Disabilities."
22. Stringer, "Accessibility in Museum Education," 185.
23. The RL Mace Universal Design Institute, "Universal Design Principles."
24. Fortuna et al., "Pre-Visit Materials," 3.
25. Stringer, "Accessibility in Museum Education," 185; Trieglaff, "Universal Design," 435–8.
26. Edelstein, "New Foundations," 199.
27. Moon, "The Inclusive Intention," 125.
28. Edelstein, "New Foundations," 199–200.
29. Edelstein, "New Foundations," 195–8; Holzworth, "Disability is Diversity;" Stringer, "Accessibility in Museum Education," 184.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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