

Chapter 14

Zoos and Aquariums and Their Role in Education for Sustainability in Schools*

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Education in Zoos and Aquariums

Zoos have been around for hundreds of years. Historically, animal collections were amusements for royalty or the very rich; gradually, these collections became amusements for the masses (Baratay & Hardouin-Fugier, 2004). The modern zoo or aquarium is an intentional collection of animals used to further the cause of conservation through systematic education and research (Rabb, 2004). Today, the four goals of contemporary, Association of Zoos and Aquariums (AZA)-accredited institutions include (1) conservation, (2) research, (3) education, and (4) recreation (Churchman, 1987). These goals push institutions to present conservation education in ways that inspire visitors and audiences to take environmentally responsible action (Brewer, 2001).

*This chapter describes the active role that zoos and aquariums play, providing educational services to schools and the public. Zoos and aquariums respond to global challenges as well as contribute to local education for sustainability.

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Over the last few decades as education has become critical to the role of zoos and aquariums, technology, which traditionally focused on displays to maximize animal viewing, has begun to be used for media designed to communicate directly with visitors (Kisling, 2001).

Zoos and aquariums have a conservation mission at their core, and their education efforts are designed to further that mission. Although few offer programs named strictly as education for sustainable development, the intersection of conservation and sustainability ensures that many of the conservation messages are tied to the sustainability elements of people, finances, and the animal and its habitat, placing these programs squarely in the education for sustainable development (ESD) arena.

Although there are many issues that impact sustainability, one issue in particular that zoos and aquariums tend to focus on quite heavily is the topic of habitat loss. Habitat destruction remains the greatest threat to wild animals (Ehrlich & Ehrlich, 1981; Simberloff, 1984; Wilcove, Rothstein, Dubow, Phillips, & Losos, 1998; Wilson, 1988). This destruction is often due to sprawling communities, extraction of resources, farming, or ranching (Hansen et al., 2002). Thus, people collectively create situations, often unintended, in which demand for space or resources causes the loss of habitat for wildlife in an interconnected and interdependent web among social, environmental, and economic considerations.

Zoos and aquariums have diverse audiences to consider when planning how to meet their conservation mission. For most zoos and aquariums, the general visitors tend to be intergenerational groups, usually families. However, zoos and aquariums also have on-site educational programs for schools, teachers, youth groups, community groups, early childhood, and others. Most zoos and aquariums have outreach programs that go into local communities and schools as well as distance education programs, which connect distant school groups with the institution's educational programming and animals. Nevertheless, of the many audiences, schools have historically been a major focus and priority for educational programming. Even as schools have experienced budget cuts that resulted in reduced support for field trips and as schools have increasingly been required to focus on state adopted curriculum standards, school programming remains an important component in their education programs and departments. Zoos and aquariums have also experienced budget cuts in recent years that have necessitated reductions in school outreach programs.

Zoos and Aquariums and Schools

Although most zoos and aquariums have their own unique relationships with local schools, there are six commonly used approaches for engagement with schools:

1. Outreach to schools,
2. Field trips,
3. On-site programs,
4. On-site courses,

5. Electronic education/distance learning, and
6. Teacher workshops/training.

Outreach to schools involves the zoo or aquarium education staff visiting a school. These outreach programs are often shaped around specific state or national grade level standards. Institutions often elect to focus on a particular grade, theme, or geographic region based on the needs of local schools. Strategies for providing outreach to schools include one-time classroom presentations, multiple-classroom visits, grade-based and class-based visits, and large group assemblies. Most outreach programs are science-based. Many utilize education program animals, which are animals presented either within or outside of their normal exhibit or holding area and intended to have regular proximity to, or physical contact with trainers, handlers, or the public, or to be part of an ongoing education/outreach program.

Field trips are outings for groups organized by a school where the students typically leave the school grounds. Field trips usually engage the students in an informal visit, sometimes including activities or educational programs designed by the zoo or aquarium but conducted by the classroom teacher. On some occasions, field trips include a short introductory program presented by the zoo or aquarium staff followed by students' free exploration of the exhibits. A common approach for field trips is for the institution to provide to the teachers an exploratory activity such as a scavenger hunt as a way to assist in utilizing the institution in some organized fashion.

On-site programs are usually one-time experiences for a class. These experiences are often up to three hours in length and include lessons taught by zoo or aquarium educators at the zoo or aquarium; this staff-led lesson is the primary distinction from the field trip. On-site programs are often tied to educational standards (e.g., state or school district) as this provides additional justification for the schools to take trips to zoos or aquariums.

On-site courses are courses offered by and/or at the zoo or aquarium for middle-school, high-school, or college credit. In many cases, the high-school courses are higher-level science courses. For college credit, many courses are codesigned by the zoo or aquarium and the school. "Zoo school" is another model of interaction with on-site courses. In some "zoo schools," the zoo offers a specific series of courses within science and social science disciplines. In other programs, the "zoo school" offers a comprehensive high-school experience.

Electronic education programs are usually live, real-time programs transmitted to schools via the internet or other media in which zoo or aquarium staff, with animals, interact with the class(es). Electronic delivery strategies have been used to extend the reach of zoos and aquariums into schools for decades. Today, some zoos and aquariums offer special distance learning opportunities such as veterinary, animal nutrition, and animal enrichment programs. Other institutions offer live interaction with prerecorded animal interactions.

Teacher workshops and teacher professional development programs are offered by most zoos and aquariums. These workshops often relate to biology, conservation, or

environmental science and are built around a topic of interest to teachers. Depending on the relationship of the institution with the school district(s) in its area, some workshops can provide either professional development or college credit, and some include accreditation or license renewal hours. In a few instances, zoos and aquariums offer graduate level courses and collaborate with local universities in degree programs such as Miami University's Advanced Inquiry Masters Program offered through Brookfield Zoo, Cleveland Metroparks Zoo, Cincinnati Zoo, and Woodland Park Zoo in Seattle.

Past Education for Sustainability Efforts in Zoos and Aquariums

Historically, zoos and aquariums have worked together, often with external partners, to create shared conservation education programs. Some of these programs have strong connections with education for sustainable development. In addition to the in-house programs that many institutions have developed to address ESD, there have been a number of efforts at the national level that will be described briefly here.

Suitcase for Survival. *Suitcase for Survival* is an outreach program developed primarily for teachers to use in their classrooms (USFWS, 2011). This partnership among the US Fish and Wildlife Service (USFWS), AZA, World Wildlife Fund, National Oceanic and Atmospheric Administration (NOAA), Fisheries Services' Office for Law Enforcement, and TRAFFIC North America was designed to address the need for a national education program focused on wildlife trade and biodiversity. Since 1991, the program has raised awareness about the devastation caused by illegal wildlife trade worldwide and has helped consumers understand the importance of biodiversity and how their buying habits affect biodiversity. The USFWS and NOAA provide wildlife trade artifacts that have been confiscated at ports of entry including such items as carved ivory, tiger bone items, crocodile skin products, and sea turtle jewelry. After all litigation involving a confiscated artifact has concluded, it is placed in the "Suitcase" program for loan to teachers through zoos and aquariums. The kit also contains an education module, *Wildlife for Sale: An Educator's Guide to Exploring Wildlife*, focusing on environmental, economic, and social issues. Teachers can request the kit from over 175 institutions to use the lessons, activities, and artifacts with their classes.

Aquatic Invaders. Working with the NOAA extension program Sea Grant, a consortium of aquariums developed an on-site theatrical program designed to incorporate local endangered aquatic species and invasive species that have been introduced into local waterways. *Aquatic Invaders* has themes of sustainability woven into it, but the focus is principally on individual activity to reduce human introduced threats in the water.

Bushmeat Crisis. The Bushmeat Crisis Task Force (2009) was a strong, shared program related to sustainability that was implemented across zoos and, to a lesser degree, aquariums. Zoos developed many on-site and school-based programs around the mes-

sages of reducing illegal poaching for bushmeat. The program tied together local and individual economies, social issues such as survival of local villages, and environmental issues. The manner in which the program interwove the environmental, economic, and societal nature of poaching resulted in a strong program focus on sustainability.

Amphibian Conservation. In 2008, the international zoo and aquarium community coordinated a campaign addressing the global amphibian conservation crisis. Professionals from the conservation world met, discussed, and gathered resources in an effort to slow the decline of amphibian populations due to habitat destruction and the concurrent spread of the deadly *Chytrid* fungus. Specifically, AZA specialists gathered resources to assist members in the areas of conservation, husbandry, grassroots advocacy, and public education. They pulled together field biologists, experts in animal management under human care, advocacy groups focused on gaining government support, and educators focusing on engaging school and community support from each region. Educators conducted teacher workshops, education programs at their institutions, and special events dedicated to inspiring personal action and sustainable practices. As a result of these efforts, programs on amphibians at zoos and aquariums around the world were strengthened, and students across North America became aware of the interdependency of life on earth (Pavajeau, Zippel, Gibson, & Johnson, 2008).

Through efforts of individual AZA-accredited educators, an activity kit was produced through the AZA's Conservation Education Committee. This kit contains lesson plans and activity materials to assist zoos and aquariums in offering programs and experiences to all guests, including school groups, on the issue of global amphibian conservation. Zoo and aquarium staff focused heavily on education for sustainability throughout the programs and activities tied to this campaign using amphibians as a conduit to discuss local environmental, social, and economical activities. Although 2008 was declared to be the Year of the Frog by the zoo/aquarium community, the work to address this global crisis continues as can be seen in the ongoing "Spring Forward" events celebrated at zoos and aquariums in conjunction with the changing of daylight savings time, many of which continue to feature amphibian sustainability programs.

Earth Day Events. Every year, more than 120 AZA-accredited institutions across the USA celebrate AZA's *Party for the Planet*TM, making it the largest multisite Earth Day (April 22) celebration in North America (Association of Zoos and Aquariums [AZA], 2010). The *Party* event is an opportunity to connect zoo and aquarium visitors, schools, youth groups, and families throughout the country with nature and conservation. Festivities feature environmental education activities at the institutions, traveling educational programs conducted by educators at schools and community events, animal encounters, festivals showcasing environmental and sustainability groups, lectures, and many other conservation-related experiences. Support materials are provided annually to all participating AZA-accredited zoos and aquariums as a way to support and encourage shared, consistent messages tied to the specific theme of that year. EarthFest, the longest running Earth Day Festival in the nation held annually at Cleveland Metroparks Zoo, attracts up to 50,000 urban, suburban, and

rural attendees; 175 exhibitors; and 900 volunteers (Earth Day Coalition, 2011). The Zoo's partner, Earth Day Coalition, has organized the event since its inception. Activities include the EcoPassport Tour, which takes visitors through exhibit areas such as local and organic foods, waste reduction, and green home improvement. The participants visit five areas where they are introduced to key concepts through hands-on activities and receive take-home sustainability tips from experts. Prior to the *Party for the Planet* day itself, K-12 students are able to participate in an annual art, poetry, and essay contest addressing an environmental issue.

Seafood Watch. One of the most widely used education for sustainability programs among zoos and aquariums is *Seafood Watch*. This program, which is managed by the Monterey Bay Aquarium, is designed to raise consumer awareness about the importance of buying seafood from sustainable sources. Seafood Watch materials offer recommendations regarding which seafood to buy or avoid as well as providing help to consumers interested in becoming advocates for environmentally friendly seafood (Beggs, 2006). Some zoos and aquariums have incorporated the use of Seafood Watch into their school and youth programs including high-school sustainable seafood recipe contests (Koldewey, Atkinson, & Debney, 2009), teen volunteer interpretive programs, and handheld aquarium inquiry activities tested by California school environmental clubs (Aleahmad & Slotta, 2002). A number of aquariums, and even some zoos, have also incorporated sustainable seafood messaging into exhibits, interpretive signs, and experiences.

Climate Change. Much work is taking place in the arena of climate change not only at an AZA level but also in individual institutions, consortiums of organizations, and a variety of targeted partnerships. The AZA has identified two goals as part of their climate change initiative: (1) member institutions will reduce the climate impacts of their own operations and (2) AZA will develop a national education, communications, and marketing program (AZA, 2009). A number of individual zoos and aquariums are coordinating their efforts to ground interpretation about climate change with information from research in social and cognitive sciences, including conservation psychology, in order to find effective ways to translate climate change information to be salient, relevant, and actionable for their audiences. A primary outcome of this intense collaboration is to engage visitors, including teachers and students, in ways that lead to sustainable actions that ultimately combat climate change. Numerous studies, such as the NOAA-funded "National Coalition of Aquariums Educating about Climate Change," are expected to further this work and ultimately result in usable tools, resources, and materials.

Palm Oil Crisis. The number one threat to wild orangutans is unsustainable palm oil production practices. The *Palm Oil Crisis* program, as conducted by many zoos and aquariums, includes focusing on in situ methods of farming and community livelihood programs as well as a focus on consumer activity in the USA. Efforts to address this problem from a consumer perspective have primarily been led by the AZA Orangutan Species Survival Plan (SSP) as well as a number of individual AZA zoos, in particular the Cheyenne Mountain Zoo. To encourage positive conservation actions connecting to this issue, online educational materials have been produced for use

with teachers and students. Additionally, zoos host annual special events focused on this issue as another way of increasing awareness. One resource used in these programs is the Palm Oil Shopping Guide, which raises consumer awareness about the importance of making good choices when shopping by identifying products made from palm oil (Cheyenne Mountain Zoo, 2011). Currently, work is underway to coordinate all these efforts in a more strategic approach to reach a broader audience. The Web presence of the program is geared specifically toward teachers and students, in part to connect students in the USA with students in the countries where this issue is most critical and where these animals are found.

Arctic Ambassador Centers. Polar Bear International's (PBI) *Arctic Ambassador Centers* program includes 37 zoos and aquariums that provide leadership for carbon emission reduction in their communities, support research projects to help conserve wild polar bears, and play a key role in the PBI Sustainability Alliance, a frontline team helping save polar bears in a rapidly warming Arctic.

Through their research, stewardship, and education programs, the centers address the issues that are endangering polar bears, including sea ice loss due to global climate change and environmental impacts of industry (Mielson, 2007). PBI Arctic Ambassador Centers participate in programs that spread the word about polar bears and sea ice loss and inspire individual action.

PBI Leadership Camps, organized by the centers, are intended to motivate individuals who want to advocate, either personally or through their organization, for conservation and sustainable lifestyles. *Arctic Ambassador Centers* send staff and students to the leadership camps in the tundra near Churchill, Manitoba, to focus on polar bears, their arctic habitat, and what needs to and can be done to safeguard the well-being of polar bears and their habitat after these representatives return to their own centers (Polar Bears International, 2011a, 2011b).

PBI Tundra Connections broadcasts, sponsored by both PBI and the Ambassador Centers, provide opportunities to participate in exclusive Webcasts to meet and talk with leading scientists and educators. Video conference sessions are available for school groups, zoos, aquariums, green clubs, or business and community leaders. The content targets primary and secondary school and universities but easily adapts to general audiences. As an example, a Cleveland Metroparks Zoo keeper connected via distance learning to the zoo and discussed her experience at Leadership Camp. A week later, a communicator connected via distance learning from Leadership Camp to an elementary school in El Paso, Texas (Buchanan, 2007).

Resources to Support Zoo and Aquarium Sustainability Efforts

Zoos and aquariums also rely on resources produced by other types of organizations to facilitate education for sustainability. One resource many zoos and aquariums have identified as being of great use for creating and supporting educational as well as operational programs focused on sustainability is *The Fostering Sustainability*

Behavior Daily Digest which has over 7,000 program subscribers (McKenzie-Mohr, 2011). The subscription includes books, articles, programs and case studies, journal articles, and a forum for questions and discussions.

An additional resource supporting zoo and aquarium professionals to work collaboratively on issues of sustainability is the AZA's Green Scientific Advisory Group (SAG). This group focuses on the technical issues related to the operations of AZA-accredited institutions and the development of resources that address the impact that each institution has on its local environment. They also provide a mechanism to coordinate expertise already in AZA, to centralize information, expedite communication, and identify resources both within AZA and outside the organization. Most recently, the Green SAG has been developing brief statements on key topics (e.g., waste, energy use, and purchasing) in order to frame priority areas. One specific area of focus is at the institutional level where zoos and aquariums work to raise awareness about their own institutional green practices and increasing employee/contractor/guest awareness about what they are doing in the green arena. The work of this group provides opportunities for zoo and aquarium educators to share real stories of sustainability efforts happening at their own institutions and connect this information to the education programming being offered to all guests, including school groups.

Education for Sustainability in Zoos and Aquariums

The nature of zoos and aquariums is such that each museum has a different collection of fauna and flora. Some zoos and aquariums have collections focused on particular parts of the world (e.g., North America or Africa), while others offer broad collections across continents. Zoos more than aquariums, have, over time, presented the animal collections taxonomically, geographically, behaviorally, and thematically (Hanson, 2002). Although zoos and aquariums share many philosophies about animals, collections, and education, each institution has a unique personality, and its educational programs reflect that zoo's specific mission. A survey of zoo and aquarium education programs was conducted to explore the range of education for sustainability.¹ Seventy-eight of the 212 accredited zoos in the USA responded to the questionnaire. The data in this section refer to this exploratory study. We found the topics offered by zoos and aquariums are primarily designed and taught with or containing concepts of sustainability, even though they may not be viewed as ESD by the zoo or aquarium. The unique condition of having wild animals in a human-constructed facility creates the social and environmental

¹The online survey included six questions about outreach programs and on-site programs for pre-school; grades K-4, 5-8, 9-12, 13+; and intergenerational audiences. Item included check all that apply responses for common sustainability themes (e.g., recycling/reuse and biodiversity). The survey also queried teacher workshops. Open-ended responses were collected related to successful sustainability-related program and useful resources.

relationships necessary for ESD. Furthermore, the school-based topics in zoos and aquariums must address economical impacts of environmental action as that is relevant to the world of conservation.

Most of the zoos and aquariums in our study indicated that biodiversity is the dominant topic linked to sustainability across all ages and grades, from early childhood through university programming, in both outreach and on-site school efforts. Biodiversity is also the dominant message sustained across intact, intergenerational visitors (families). Even though this audience is not in “school,” the experiences created for these visitors including signage, animal encounters, shows, and interpretation programs are shared by school groups on field trips. Over half of all zoos and aquariums surveyed use biodiversity as a frame for sustainability for pre-K programming, and over 90% do so for middle-school and high-school programming.

The second most dominant conservation message identified by the zoos and aquariums in our survey is recycling or reusing. As with the topic of biodiversity, this is consistent in zoos and aquariums across all ages, grades, and on-site and outreach programs. However, for teacher workshops, biodiversity is equal to water conservation as the second most common topic. For other ages, grades, and contexts for zoo and aquarium school interactions, water conservation is the third most dominant topic.

Increasingly, zoos and aquariums are incorporating topics into their educational programs that are much more clearly aligned with ESD. Societal issues such as energy, transportation, carbon neutrality, and social capital are becoming common in zoo and aquarium programming and are likely to be conducted for school audiences. For most zoos and aquariums, on-site school programming, with the exception of pre-K programming, includes sustainability topics. Fewer than 5% of zoos and aquariums do not offer such programming. For outreach programs, far fewer zoos and aquariums offer sustainability topics, and over a third do not offer sustainability topics to college and university classes, reflecting the more specialized role of the animal science or animal behavior content the zoo or aquarium provides for higher education.

Challenges to Education for Sustainability in Zoos and Aquariums

Education for sustainability faces several challenges in zoo and aquarium programming. With on-site school approaches, as well as in school programs, the biggest challenges include proximity to the message, agency to action, and immediacy of relevance to the individual.

Proximity. For zoos and aquariums, connecting the zoo or aquarium collection to the overarching principles of sustainability or to actions that promote sustainability in learners’ lives is often a challenge. Consider the Suitcase for Survival program and the Bushmeat programs. Both of these programs are central to the work of zoos and aquariums but poorly related to the daily lives or experiences of most of the

children in school programs or visitors to the institution. However, there have been successful efforts that relate distanced issues to life at “home.” One example, the *Seafood Watch* program from Monterey Bay Aquarium, has been adapted to regional and national lists maintained by the Aquarium and other national partners in the USA such as Audubon Society.

Agency. For zoos and aquariums, conservation actions desired as outcomes from their school programs must align with the conservation mission of the zoo or aquarium. The challenge for translating mission to visitor/student messages is that when an individual is asked to take action, or change a routine set of behaviors, the likelihood that the individual will actually take the action is affected by her or his ability to control the decision factors related to the action. This is known as *agency* (Heimlich & Ardoin, 2009). Children rarely have agency to make decisions on behaviors for a family due to a host of factors including cognitive development, position in family, or economics. Likewise, individuals in complex systems like schools or universities, zoos or aquariums, businesses, or social organizations often do not have agency to institute organizational change.

Although most desired outcomes for these institutions do relate to sustainability, some educational programs focus more heavily on environmental aspects of the issue, and indeed, in many cases with school programs, they must focus on the environmental science aspect of the issue. The social and the economic aspects of ESD are usually present but with less attention. A primary key to influencing change is providing and supporting a very specific action that the receiver of the information can actually undertake.

Immediacy. As with agency, immediacy is an important aspect for application of behavioral intentions that must be transferred to an individual’s life. Immediacy relates to relevance of the topic to the individual’s life and to the ability of the person to immediately apply the learning. Schools have long struggled with immediacy of information in the classic “why do I have to learn that?” complaint of a student for whom the information being learned has no perceived immediacy. For zoos and aquariums, challenges include transference of concern/interest for the often exotic animal to concern/interest in local wildlife. The challenge is to identify actions a child has agency to do at home, in the community, and at school to immediately apply what they learn.

Conclusion

Although considerable success has been achieved in connecting school audiences with issues of sustainability, there are ample opportunities to add to these efforts with anticipated success in light of the fact that zoos and aquariums are such great “classrooms” for exploring and learning more about our natural world and the ways we can positively impact it.

The shared mission of animal conservation for zoos and aquariums is clearly grounded in the tenets of education for sustainable development even if the institutions do not necessarily label their school education programs as such. By focusing on anthropocentric causes of habitat loss, the educational programs are squarely placed in the social, environmental, and economic considerations necessary for ESD.

As zoos and aquariums move toward engagement in other environmental issues such as climate change, carbon footprint, and alternative energy sources, their engagement with carrying sustainability messages to schools can only increase.

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