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A Salamander Tale: Effective Exhibits and Attitude Change

Abstract

Little information exists regarding intention behind the design and development of Extension outreach and educational exhibits. An evaluation of response to the exhibit *A Salamander Tale* indicates that the methods used to develop the exhibit resulted in an effective way to present information to an adult audience. Survey questions were based on research literature on attitudinal learning, especially literature discussing cognitive, affective, and behavioral learning components. Of 409 survey respondents, 69% or more reported positive changes in attitude about eastern hellbender salamanders and their habitats. Perhaps most important to hellbender conservation efforts, 73% of survey respondents claimed they would change their behavior and 70% claimed they would tell others what they learned from the exhibit.

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Introduction

The Purdue University Exhibit Design Center (EDC) develops science-based exhibits for Purdue's College of Agriculture and Purdue Extension. EDC exhibits typically premiere at the Indiana State Fair and then travel to museums throughout the United States. The EDC developed the exhibit *A Salamander Tale* (Figure 1) to educate the public about the eastern hellbender salamander, the largest amphibian native to North America. Misconceptions about the species may lead to antagonistic behavior from humans and hinder conservation efforts (Mullendore et al., 2014). The exhibit's purpose is to raise awareness about amphibians in general and hellbenders in particular, thereby positively affecting the public's attitude about this unique species.

Figure 1.

A Salamander Tale Exhibit



In August 2015, the exhibit was part of Purdue Extension's presence at the Indiana State Fair. For most attendees, the Indiana State Fair is simply entertainment, but fairs also provide significant opportunities for education (Looker, 2011). During the exhibit's time at the state fair, visitors were surveyed regarding their reactions to the exhibit, their understanding of hellbenders and their habitats, their feelings toward hellbenders, and possible changes in their behavior after learning about hellbenders.

Exhibit Development

Theoretical Framework

Exhibits are often used for Extension outreach and education. Past studies on the effectiveness of Extension exhibits have incorporated tools such as logic models in the design of the evaluation (McCurdy et al., 2010). Others have involved quantitative methods for analyzing data (Carrozzino & Smith, 2008). However, there is little information available about the intention behind the design and development of the exhibits. The EDC developed *A Salamander Tale* on the basis of the works of two sociocognitive theorists: Lev Vygotsky's zone of proximal development (ZPD) and Jean Piaget's stages of cognitive development (DeVries, 2000). The exhibit's content was written in three layers. The first, or bottom, layer was developed for young learners in the kindergarten through grade 2 range. This content is focused on matching images with labels. For instance, amphibians are compared with reptiles through images of reptiles' feet with claws on their toes and amphibians' feet without claws. This first-level information was developed to appeal to the abilities of learners described in Piaget's preoperational stage; learners at this stage are expected to understand symbols and shapes. The second, or top, layer of content was developed for the adult learners who typically accompany younger learners and includes content focused on Piaget's formal operations stage. Learners at this stage are expected to understand abstract ideas and be capable of strategy and planning. Information presented at this stage is about threats to hellbender habitat, the range of the species, and what may be done to help protect the hellbender. The third, or middle, layer of content was developed to address Vygotsky's ZPD. This content encourages adult learners to interact with younger learners to help them understand more complex ideas of space (habitat) and quantity (dwindling numbers of hellbenders) and elevate them to Piaget's concrete operational stage. These layers of content are not abstractions; the printed text and images on the exhibit are

also layered, with the lower-level content near the bottom, the upper-level content near the top, and the content targeted at ZPD in the middle. In addition to images and text, the exhibit includes a diorama showing a life-sized replica of the hellbender, hinged flip labels (Figure 2), and a video game.

Figure 2.
Hinged Flip Labels



A Multimedia Approach

A combination of text, images, and hands-on interactivity appeals to learners on many levels, and it makes sense that learners gain more from images and text than from text alone. This idea is supported by theories on multimedia learning (Mayer, 2009). Larger exhibits with concrete characteristics such as tactile elements, sound, and visually attractive three-dimensional shapes are best at attracting visitors; exhibits with smaller hands-on interactive elements have a higher holding power (Boisvert & Slez, 1995). Holding power (the time visitors spend at an exhibit) is important and can be used as a measure of an exhibit's effectiveness. According to John Falk, holding power is bimodal (1982). Visitors either spend very little time with an exhibit (30 s or less) or a lot of time (120 to 180 s) (Falk, 1982).

Extension programming has little value unless it is effectively communicated to the public, and it is important to deliver content in various formats (Stafne, 2015). The video game developed for the exhibit (Figure 3) is titled "Hellbender Havoc" and incorporates the learning objectives of the exhibit into the game play. The game addresses the following objectives:

- Learn how large the eastern hellbender can grow.
- Learn what the eastern hellbender eats.
- Learn what hellbender habitat looks like.
- Learn what pollutants negatively affect hellbenders.
- Learn what to do if you catch a hellbender with a fishing pole.

Figure 3.
Hellbender Havoc



Anthropomorphism

As noted previously, large, attractive three-dimensional exhibits are effective for attracting visitors (Boisvert & Slez, 1995), and *A Salamander Tale* has those traits. The exhibit also incorporates some degree of anthropomorphism. Anthropomorphism is a tool frequently used by designers to attract younger visitors (Horowitz & Bekoff, 2007). In the case of the eastern hellbender, it is particularly useful. The hellbender is not an attractive animal; greenish-brown, mottled, slimy, and somewhat aggressive-looking, it does not have endearing qualities. The exhibit diorama shows a lifelike replica of the hellbender so that visitors can see what the animal really looks like. The exhibit furniture, however, shows a hellbender with human-like eyes and a smiling mouth along with a softer, more approachable, shape. Aside from being an effective design technique, anthropomorphism can be useful in other ways. The anthropomorphism of wildlife creates empathy among exhibit visitors toward exhibit subjects (Chan, 2012). For the hellbender, increased empathy is especially important. As with many creatures, erroneous information about hellbenders is common and often passed on from one generation to the next (Muris, Van Zwol, Huijding, & Mayer, 2009). One often-repeated myth is that the hellbender's bite is poisonous. Increased knowledge and empathy may decrease the spread of misinformation. Raising awareness of and changing attitudes about hellbenders has significance in another critical area: affective factors may have more influence on public perceptions than scientific or environmental factors. People are more willing to support funding for conservation if the subject of the funding is something they feel strongly about (Martín--López, Montes, & Benayas, 2007).

Purpose and Methods

Exhibit Survey

The purpose of the author-created survey was to measure the attitudinal effect the exhibit had on state fair visitors regarding the eastern hellbender. The survey questions were based on research literature on attitudinal learning, especially literature discussing cognitive, affective, and behavioral learning components (Kamradt & Kamradt, 1999; Simonson & Maushak, 2001). The survey was administered for 9 days via a touch screen computer kiosk at the Indiana State Fair.

Data Collection

The kiosk had signage asking visitors passing through the Purdue exhibits area to take a brief survey. An introduction screen asked whether participants were 18 years old or older and explained that participant input was valuable in helping with future exhibits at Purdue's EDC. The introduction screen explained that the survey

was voluntary. The participants had to agree to take the survey and confirm their age. If participants indicated that they were not 18 years of age or older, interaction ceased and a screen appeared explaining that a person must be 18 or older to participate. For those who chose to participate in the survey, onscreen instructions provided directions for how to participate in the survey by touching check boxes. Subjects could stop participating in the survey at any time. Following questions designed to collect basic demographic information were nine questions about the cognitive, affective, and behavioral effects of the exhibit on respondents.

Results and Discussion

During 9 days at the 2015 Indiana State Fair, 409 visitors completed the survey. The results are presented in Table 1. Slightly less than half of survey respondents became aware of eastern hellbenders for the first time. The Indiana State Fair staff estimates annual attendance at the Purdue Extension building to be 95,000 (B. Blackford, personal communication, August 2013). Although the percentage of building attendees who took the survey is unknown, given the estimated attendance numbers, the impact of the exhibit likely was significant.

Table 1.
Survey Data from the 2015 Indiana State Fair (*N* = 409)

Survey item	Responses				Text # (%)
	Yes # (%)	No # (%)	Video game # (%)	Images # (%)	
Did you enjoy the salamander exhibit?	330 (81)	79 (19)			
Did you know what a hellbender was before visiting the exhibit?	202 (51)	207 (49)			
Has your perspective towards hellbenders changed as a result of visiting this exhibit?	162 (80)	40 (20)			
My feelings about hellbenders have changed as a result of this visit.	283 (69)	126 (31)			
I feel more connected to hellbenders and the environment as a result of this visit.	298 (73)	111 (27)			
I feel that protecting hellbender habitat is important.	320 (78)	89 (22)			
I plan to change my behavior to help protect hellbenders and their habitats.	301 (74)	108 (26)			
I plan on telling others about what I've learned about helping hellbenders and their habitats.	287 (70)	122 (30)			
What part of the exhibit did you find most informative?			172 (42)	150 (37)	87 (21)

The responses to questions 1 through 8 indicate that *A Salamander Tale* had a positive effect in informing the public and changing attitudes about hellbenders. Though 49% of survey respondents did not know what a hellbender salamander was before visiting the exhibit, in all categories, 69% or more reported positive changes in attitude or understanding about hellbenders and their habitats. Perhaps most important to hellbender conservation efforts, 73% of survey respondents claimed they would change their behavior and 70% claimed they would tell others what they learned by visiting the exhibit.

The positive response to the video game as the most informative part of the exhibit reinforces the effectiveness of presenting information by using a multimedia approach (Mayer, 2009). Whereas other methods are somewhat effective, "multimedia materials other than games do not usually require the rapid responding that is typical of action games, nor do they evoke the same levels of motivation" (Mayer, 2005, p. 776). Compared to a simple multimedia lesson, playing games has been demonstrated to increase learning by 69% (Coe & Merino Soto, 2003; Mayer, 2009).

Video games may or may not be the best tool for conveying exhibit content; the constraints of some exhibit designs may dictate that an exhibit use no electricity, or the exhibit budget and timeline may not allow for the development of an electronic interactive. When conditions for a video game do exist, the learning objectives of the exhibit or the learning objectives from the specific exhibit area can serve as a guide for game design.

Conclusions

Large, one-topic exhibits are effective vehicles for communicating natural science topics, and using text, images, and video games reinforces simple learning objectives. The survey described here was limited to respondents 18 years of age or older, and the positive responses to the survey indicate that the content directed at learners in the formal operational stage was very effective. Extension professionals interested in using learning theories to guide the development of exhibits should consider the design process tested by the EDC as an effective way to present information to an adult audience. Using Piaget's stages of development and a scaffolded delivery of content focused on Vygotsky's ZPD should be effective for exhibits with one message or in each area of exhibits with multiple messages. In addition, survey questions can be modified for use in various exhibit settings through the insertion of language referring to different Extension topics.

To test the effectiveness of the scaffolding of content, further evaluation of the exhibit should include input from the target learners in the preoperational and concrete operational stages of development. Future evaluations should be conducted to reach younger learners through the use of face-to-face survey techniques. Conducting face-to-face surveys will provide an opportunity to ask parents and guardians to sign consent forms giving permission for their children to speak to evaluators. Collecting the responses of those in the lower age ranges will give the EDC and Purdue Extension information critical for making design decisions for content targeted at that audience. Outcome evaluation is important, but process evaluation is the key to improving future projects (Adedokun, Parker, Loizzo, Burgess, & Robinson, 2011). Face-to-face interaction will also provide an opportunity to do pre- and post-visit surveys. By observing families in a venue, evaluators can ask pre-visit questions of children and their families as they move into the exhibit area and post-visit questions as they exit the exhibit area. Although the survey described here is valuable as a measurement of overall increases in awareness and changes in attitude, a pre-visit/post-visit survey format in future studies would provide more insights into specific exhibit features and elements.

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