# Children's Conception of Color in Wildlife

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## ABSTRACT

**W***hat do five-year-olds think?* During the planning for *In Living Color*, a new exhibit at the Wildlife Conservation Society's Prospect Park Zoo, we conducted a front-end evaluation to learn how our average young zoo visitor—a 5.1 year old—thinks and feels about animal coloration. The results supported the developmental appropriateness of the subject matter and confirmed that color is a point of access for children who are viewing animals. However, we also found that there is variation in children's conception of animal coloration and that they had little knowledge of the function of color in wildlife. This information, combined with the children's positive affective reactions to the animals' colors, supported a need to interpret the exhibit's message that color plays an important role in animal survival. This study also suggested that the exhibit will be accessible and of interest to visitors.

## INTRODUCTION

**L**et's face it, we all go to a zoo looking for fun. Most of us don't go hoping to memorize the geographic range of every charismatic mega-vertebrate or be inundated with conservation messages or learn about our poor consumer habits (we'd rather be gently reminded about those!). Nor do we go to zoos expecting to have an "aha" experience and suddenly comprehend molecular biology through a graphic.

An AZA study, as reported by Fraser (1999), found that 91% of visitors to zoos are there to have fun, yet 68% of these visitors come to the zoo because they believe it helps children learn more about endangered species and 77% come because it helps children develop a love for the natural world and build awareness of conservation.

This information, in conjunction with support from general museum literature, such as Graburn's (1977) observation that the public is often looking for "productive leisure time" at cultural institutions and Rand's (1996) suggestion that visitors want to learn something new at museums, confirm that some visitors consider zoo visits as educational opportunities and view the zoo as an institution which imparts scientific knowledge. Confirmation of zoo visitors' expectations for a fun social experience, as well as an object-based experience, was also found in research conducted at the Smithsonian Institution's National Zoological Park (Doering, 1999).

Zoos have come a long way from their original menagerie exhibit style and mentality. They now impart scientific knowledge, use proper animal management, conduct scientific research both *in situ* and *ex situ* and work toward building respect and conservation of the natural world. Even so, people still roam the zoo to gawk at the wild and exotic animals. Let's admit it—many of us go to the zoo to "ooh" and "aah" over our favorites (probably something fuzzy) or what's rare and exotic and cannot be found in pet shops or our immediate surroundings.

This is probably why one of the exhibits at the Prospect Park Zoo, *Animals in Our Homes,* has failed to meet guests' expectations. We know from guests' comments and a visitor study conducted in 1997, that animals exhibited in *Animals in Our Homes*, i.e., parakeets, mice and chickens, simply do not meet visitors' zoo expectations. To replace *Animals in Our Homes*, we're planning a new exhibit called *In Living Color*, which will use the attractive aesthetic dimension of animal coloration to build understanding of animal survival strategies. So that *In Living Color* meets expectations, we conducted a front-end evaluation to help inform the exhibit plan.

In preparation for the evaluation, the aforementioned results from the AZA study (Fraser, 1999) and Smithsonian Institution studies (Doering, 1999) were considered, as well as literature on entrance narratives in the design of museum exhibits (Doering & Pekarik, 1996) and the importance of considering prior knowledge when interpreting scientific information and concepts (Roschelle, 1995). For our study, we wanted to learn more about children and their families' prior knowledge in relation to color in wildlife.

## EVALUATION GOAL AND OBJECTIVES

**O**ur overall evaluation goal was to collect information on visitor knowledge, beliefs and feelings regarding color in the animal kingdom (including human use of color).

**Specifically, our cognitive objectives were to**

- gather information regarding young visitors' knowledge of color

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and color in the animal kingdom (including human use of color)
- investigate emergent questions young visitors have about color and color in the animal kingdom
- identify vocabulary used by visitors to explain and discuss colors and patterns, in general and in relation to animals' and their survival strategies.

**Our affective objectives were to**
- observe visitors' reactions to color in animals and their general response to color and to animals
- identify familiarity and popularity (and holding power) of animals we could possibly exhibit
- investigate personal meaning when considering color in animal life and in visitors' own lives.

**In addition, we designed the evaluation to**
- identify which animal may best support each topic
- recognize any trends in preferred visitor learning styles
- gain visitor insight about exhibit narrative, design, animal preferences and connective experiences
- investigate visitor knowledge on the concept of sexual dimorphism/display
- estimate children's knowledge on color gradients, multi-coloration, patterns and superlative grammar.

## METHODS

A literature search revealed only a few studies that had evaluated older children's basic concept of color, providing no example of methodology in exploring our specific topic. Therefore, our methods were founded on Piagetian child development principles and interview guidelines, such as building rapport, active listening and validation, as described by Kvale (1938). Specific models for questions were influenced by Payne (1951) and Kvale (1938).

In constructing the tool for the interview, the importance of what D.D. Hilke (1993) described as "immediately useful" was recognized and helped focus the questions. Most of the questions were designed to elicit two different types of responses—either descriptive or explanatory answers. Below are examples.

**Descriptive Inquiries**
*Can you tell me about this picture?*
*What is different about these monkeys?*

**Explanatory Inquiries**
*Why do you think the animal is this color?*
*Why do you think these monkeys look different?*

As you see from the example, sometimes the descriptive inquiries asked a child to describe one animal. Sometimes the questions were couched in a comparative context, i.e., describing and rationalizing color differences between animals.

The use of "why" questions was formatted as a game, which helped to create a non-interrogative atmosphere for the participants. The interview began with rapport-building and led into inquiry through the guise of the animal photographs as a game.

Families were approached and interviewed in an outdoor seating area. Because we were interested in the family experience, adults were invited to stay and could choose their proximity to the children. Adults were directly included through questions asking them how they would broach certain topics about animal coloration with their children. The study was conducted from September through November 2001. Our sample included 28 participants: 17 girls and 11 boys, ages 3 to 9 (average 5.1). Seventeen of the participants were repeat zoo visitors.

The first "game" sequence included four photographs of camouflaged animals in which children had to find the hidden animals. Subsequent photographs were shown with questions similar to the examples above. The final interview included a 10-question evaluation tool, 8" x 12" color photographs as visual aides and an opportunity for children to draw their ideas during the conversation with adults. Though the drawings were not analyzed, researchers capitalized on this opportunity to casually investigate certain topics of interest to the study, such as affective response or pattern recognition.

Although there were many more topics that the researchers would have liked to explore further—information that Hilke (1993) termed as "interesting but of little immediate practical value"—it is hoped that our evaluation methodology and results will contribute to a larger body of knowledge that explores children's concept of color in wildlife.

## RESULTS & APPLICATIONS

Given the small sample size, data was analyzed qualitatively. We did not look for intra- or inter-subject trends or relationships. The total number of responses were scored, not the total number of children who answered, i.e., not each child got a data point. For example, when asked to describe an animal, if a child mentioned its color, then its environment, then its shape, each one of the comments was recorded and added to each respective categorical total. Numbers reported compare total sums of answers or responses, not total sums of children (or adult) respondents.

Responses were grouped into the following three categories: descriptive, rationale and affective. These response categories were developed directly from the questions that were designed to meet the cognitive and affective evaluation objectives.

The cognitive responses were grouped into descriptive and rationale categories based on differences in the thought processes children engage in when providing these two types of answers.

**Descriptive answer subcategories**

- named colors: "red" "blue"
- used the word or form of the word "color"
- established an analogy: "looks like a snake"
- mentioned physical features: "has four legs"
- described other attributes: "moves slow"
- commented on animal's environment: "trees"

**Rationale answer subcategories**

- fundamental: "because it's a turtle"
- egocentric: "because I like that color"
- functional: "to hide"
- conjecture: "because it stayed in the sun"
- off-topic: "looks like that tree"
- provocative: "I don't know"

For descriptive answers, children rely on the evidence in front of them and their vocabulary to describe something; for rationale answers, children rely on their vocabulary, but not on immediate evidence. Instead, children answer rationale questions by needing to either recall the reason from memory or create an explanation of their own: some aware of their lack of knowledge, some not. No single child-development theory or theorist was considered in this categorization of responses.

A combination of many learning theories and experience influenced the further subcategorization of the answers.

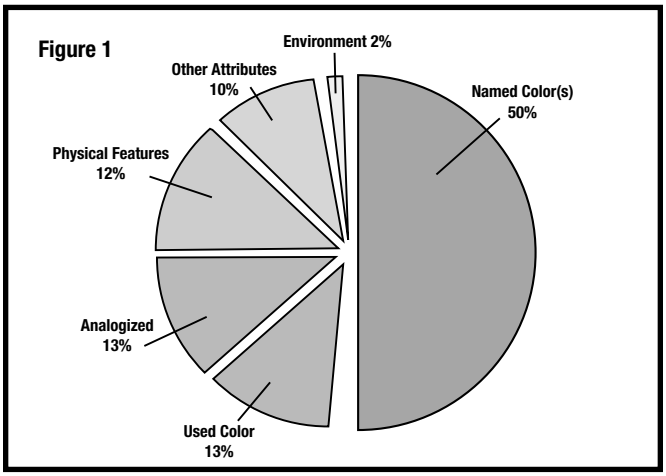
Placing the descriptive and rationale responses in these subcategories, especially the rationale responses, enabled the researchers to identify the type of thinking or rationalization that children were generating, and which type or types was most often used.

The affective responses did not require further categorization due to the minimal information collected and similarity of responses.

Suggestions provided by the children's guardians were tallied within the separate categories of camouflage, mimicry or warning coloration.

These results, explained in detail below, provided the exhibit team with an idea of children's access point concerning color in wildlife.

**Figure 1. Shows the descriptive responses by subcategory.**




## Descriptive responses

Out of 136 total descriptive responses, 63% (87) included naming colors or using the word "color." Thirteen percent (17) were analogies, 12% (16) were physical features, 10% (13) were other attributes and 2% (3) were about an animal's environment. These results confirmed the developmental appropriateness of the subject matter and confirmed that color is a point of access for children when viewing and understanding animals. The turtle and anole lizard were identified by name the most, possibly an indication of their popularity or connectivity to the children's learning environments.

Though analysis of the descriptive responses determined that color was an access point for children, due to a minimal number of responses that mentioned pattern, color gradient or superlative grammar, the exhibit plan will emphasize only basic color recognition. Also due to the complete absence of any child-generated response that included or hinted at the concept of sexual dimorphism/display, this topic was dropped from the exhibit plan.

The other topics investigated included camouflage, species recognition, sexual dimorphism, mimicry and warning coloration. Important ideas were raised in relation to the topic of sexual dimorphism and are explained below. The exhibit team will interpret some concepts at higher or lower levels due to variations in knowledge found in the descriptive answers.

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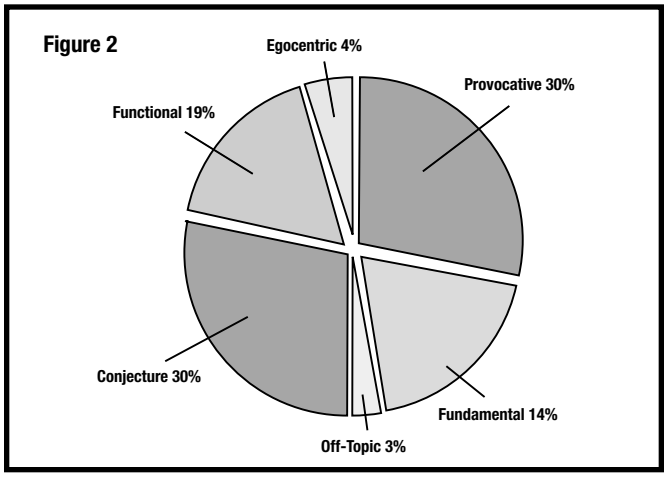
Also gleaned from the descriptive responses was vocabulary level. Vocabulary used in explanations revealed that 9% of responses included a correct usage for "camouflage" and about 16% for "poisonous." Variations in children's knowledge of related vocabulary will be considered in the layering of interpretive graphics.

**Figure 2. Shows the rationale responses by subcategory.**




### Rationale responses

Out of 105 total rationale responses, 60% (63) each were the conjecture or provocative type. About 19% (20) was functional—indicating a need to interpret the exhibit message that color plays an important role in animal survival. Additionally, 14% (15) of the responses were fundamental, 4% (4) were egocentric and 3% (3) were off-topic. Overall, analysis of the rationale responses suggested that our target audience has little knowledge concerning the function of color in wildlife, confirming both the general need to interpret this topic for the visitors and the possible need to address certain misconceptions.

While investigating knowledge of sexual dimorphism through both descriptive and rationale responses, an unexpected and interesting animal color and gender recognition issue was discovered. To explain further, children were shown pictures of a male, female and an albino pheasant. A few children explained that one of the pheasants was a boy because it had "boyish colors" or because it was blue and that one was a girl because girls are pink or have "girlish colors." This also occurred with the tamarin comparisons. This misconception is one that the exhibit plan may address in the interpretive graphics. An additional observation was that children engaged in these animal comparison exercises easily and happily. This learning situation will be recreated in the exhibit in some capacity.

### Affective responses

Casual observations of children's affective response to the animal photographs were noted. Special attention was paid to any animal that repeatedly caused children to react in a strong manner, either positively or negatively. General reaction to color and animals suggested that color will be an accessible and interesting topic.

There were no noticeable differences in holding power or attention to certain animals or colors. The researchers would have liked more time to evaluate which animals may best support each topic and to gain more information regarding children's recognition of their own personal use of color or general human use of color. The minimal expression of personal use of color indicated by the children supported the need to incorporate the human connection into the exhibit plan. Unfortunately, limited time and personnel resulted in the capability of only the aforementioned casual observations.

### Children's drawings

Drawing was intended as a culminating experience for children and as an opportunity for the researchers to pilot other questions and speak with the adults. Therefore, the drawings were not analyzed (one more example of information that is "useful but of little immediate practical value," which the researchers would like to explore in the future).

### Adults' suggestions

Adult responses included suggestions for phraseology and exemplary animals to use in the interpretation of camouflage and warning colors, but no ideas were provided for mimicry. When adults were asked for mimicry ideas, responses were either "I don't know" or addressed warning coloration. Interestingly, most adults provided ideas in the first-person voice of the animal, e.g., to suggest warning color interpretation a parent responded, "Go away—I have to protect myself!"

Additional provocative comments made by adults included, "urban kids don't have a lot of contact with animals who use warning colors," "we tend to think of colors to hide—that's the contrast" and "complicated because poisonous frogs are bright green (usually think red means stop)." These provocative comments confirmed the challenge that the exhibit team has in interpreting this topic. The common use by adults of the first-person voice may influence interpretive graphics' text to mimic this narrative voice. Specific phrases supplied by the adults may also be incorporated into the exhibit graphics.

We are considering providing phrases for adults on interpretive graphics to help them explain these concepts to young children.

## CONCLUSION

Descriptive responses provided information on children's access point for color in wildlife and guided the exhibit plan to

1. emphasize color and not pattern or gradients
2. delete the topic of sexual display and
3. interpret some concepts at higher or lower levels due to variations in knowledge.

Rationale responses suggested that the target audience, 5-year-old children, has little knowledge concerning the function of color in wildlife.

Affective responses revealed that color is an accessible and interesting topic and that the concept of human use of color needs to be explored as we plan the exhibit.

Overall consideration of descriptive, rationale and affective responses confirmed the need to interpret the exhibit's message that color plays an important role in animal survival and suggests *In Living Color* will be of interest to visitors.

Our front-end evaluation has helped us hopefully to design *In Living Color* to meet our visitors' expectations, match their prior knowledge and assist the Wildlife Conservation Society in achieving its mission to move people toward a conservation ethic.

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