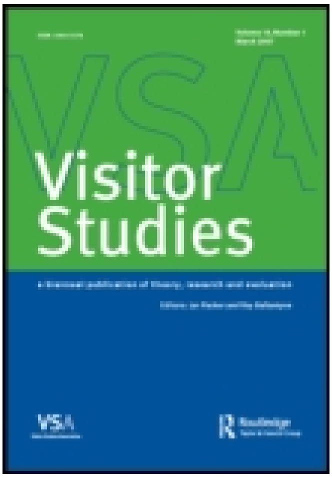

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Parent–Child Conversations About Animals in Informal Learning Environments

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ABSTRACT

A large body of empirical research has focused on understanding children's biological knowledge development. However, limited research has investigated the informal learning experiences through which children actively construct biological concepts. The current study focused on examining whether parents provide information that supports and shapes children's emerging biological knowledge within settings that provide opportunities for biological learning about animals. We observed parent–child interaction within informal learning environments about two different types of animals: A penguin exhibit at a zoo and an insect exhibit at a science museum. Fifty-two families with preschool and school-aged children participated. Parents more frequently provided important, unobservable information such as predictions and causal inferences to the youngest children, potentially supporting the development of children's knowledge. However, parents seldom explicitly supported their children's knowledge by providing explanations of readily observable biological processes. Further research examining these and other direct and indirect animal experiences in informal learning settings can help us better understand how to support children's early biological learning.

A large body of empirical research has focused on the development of children's biological understanding. Indeed, children exhibit significant changes over the course of early childhood in their understanding of biological properties such as contamination (Kalish, 1996; Myant & Williams, 2005; Siegal, 1988; Solomon & Cassimatis, 1999), inheritance (Solomon, Johnson, Zaitchik, & Carey, 1996; Springer, 1996; Taylor, Rhodes, & Gelman, 2009), growth (Inagaki & Hatano, 1987; Rosengren, Gelman, Kalish, & McCormick, 1991), and death (Slaughter, 2005; Slaughter, Jaakkola, & Carey, 1999). To better understand how biological knowledge develops over the course of early childhood, researchers have increasingly focused on examining the content of children's daily experiences relevant to biological knowledge development, including interactions with live animals (Geerdts, Van de Walle, & LoBue, 2015; Inagaki, 1990;

Prokop, Prokop, & Tunnicliffe, 2008) and conversations with parents (Crowley et al., 2001; Gelman, 2009; Gelman, Taylor, & Nguyen, 2004; Rigney & Callanan, 2011). In the current research, we build upon and extend these findings by exploring conversations about different kinds of animals between parents and their preschool and school-aged children in two informal learning environments. We evaluated the extent to which dyads engage in biologically relevant and causal explanatory conversations with the goal of adding to the growing body of work highlighting the importance of exploring informal experiences for understanding and supporting children's learning in everyday contexts.

Children's Biological Knowledge Development

Over the past 30 years, the nature of children's understanding of living things has been hotly debated. A central focus of the argument has revolved around the origins and development of children's early understanding of fundamental biological concepts such as *animal*, *plant*, and *living thing*. Early research suggested that young children reason about the living world anthropocentrically—that is, their view of the biological world is human-centered and psychologically based—whereas adults reason biologically, recognizing that humans are one animal among many (Carey, 1985, 1995). Over time, children's biological knowledge gradually becomes reorganized around a specifically biological framework rather than around their knowledge of human behavior (Carey, 1985; Solomon & Johnson, 2000). In this view, the role of experience is to move children's knowledge of living things away from anthropocentrism and toward a more sophisticated biological theory.

A major criticism of early work on children's biological knowledge development is its failure to take into account variability in children's experience with animals and the natural world, focusing only on urban majority children in the United States. More recent work focusing on cultural comparisons suggests that differences in experience, language, and environment all influence the development of children's domain-specific biological reasoning (e.g., Anggoro, Medin, & Waxman, 2010; Ross, Medin, Coley, & Atran, 2003; Waxman & Medin, 2007). Even before formal schooling begins, children's folkbiological reasoning reflects beliefs about nature and biology that are specific to their culture (Unsworth et al., 2012; Waxman, Medin & Ross, 2007). For instance, children from rural and Native American communities, where both exposure to and interest in wildlife is presumably higher compared to other communities, show more advanced biological reasoning at younger ages than their urban peers (Medin, Waxman, Woodring, & Washinawatok, 2010). Importantly, recent research with young children suggests that anthropocentrism, instead of providing an early-developing foundation for the development of biological knowledge, may be learned by older urban children because of their lack of experience with real animals and increased exposure to fictional, anthropomorphic animals (Ganea, Canfield, Simons, & Chou, 2014; Hermann, Waxman, & Medin, 2010; Waxman, Herrmann, Woodring, & Medin, 2014). Furthermore, differences in animal exposure within cultural groups is associated with differences in biological knowledge; pet ownership, which affords daily opportunities to observe and interact with animals, relates to increased factual and conceptual biological knowledge (Geerdts et al., 2015; Inagaki, 1990; Melson & Fogel, 1989; Prokop et al., 2008; Williams & Smith, 2006). Overall, this growing body of research highlights the significant role that early exposure to animals and cultural discourse plays in understanding the development of anthropomorphic and biological reasoning over the course of early childhood.

Parent–Child Interaction in Informal Learning Environments

Importantly, at young ages, children are not exploring the world independently; parents almost certainly provide a major source of information about causally relevant perceptual, behavioral, and biological properties of animals, both through what they say and in what they do with their children (e.g., Callanan, 1985; Callanan, Rigney, Nolan-Reyes, & Solis, 2012; Gelman, Coley, Rosengren, Hartman, & Pappas, 1998; Gleason & Schauble, 2000; Jaswal & Markman, 2007; Jipson & Callanan, 2003; Jipson & Gelman, 2007; Masur, 1997; Tarlowski, 2006). One area in which the relationship between parent–child interaction and learning has received considerable attention is in informal learning environments (ILEs)—settings such as museums or zoos where learning opportunities are intentionally made available to visitors. For children growing up in urban environments, zoos and museums are two of the relatively few places to encounter unfamiliar, live animals, making these sites an important focus for studying informal, family-based biological learning.

A growing body of research has examined how parents and children interact at live animal exhibits in both zoos and science museums (Allen 2002; Ash, 2003; Kisiel, Rowe, Vartabedian, & Kopczak, 2012; Kopczak, Kisiel, & Rowe, 2015; Patrick & Tunnicliffe, 2013; Rigney & Callanan, 2011; Rowe & Kisiel, 2012). Surprisingly, few studies of family engagement at live animal exhibits have focused on conversational analyses specific to the development of biological or anthropomorphic knowledge about animals. One study conducted at a marine exhibit in a science museum analyzed parent–child conversations for content (biological, psychological, and physical properties) and pronouns (animate such as "he" and "she" and inanimate such as "it") to investigate whether parents differentiate between animals considered "typical" (with faces and movement, such as fish, sharks, and eels) and "atypical" (animals that lack faces and movement, such as sea stars, urchins, and anemones; Rigney & Callanan, 2011). They found that parents were more likely to talk about the intentions and psychological states of the typical than the atypical animals, but parents were equally likely to talk about the two kinds of animals' physical and biological properties. Similarly, parents referred to atypical animals with inanimate pronouns but used both animate and inanimate pronouns to refer to typical animals. Thus, parents do appear to selectively support an anthropocentric view of more typical animals, which may impact children's developing knowledge of animals. However, this study focused on typical and atypical marine animals that were housed in the same exhibit, and families discussed the typical animals more than the atypical animals *overall* during their interactions. It may be that the typical animals simply draw attention away from the atypical animals, preventing extended conversation about the atypical animals. In addition, parents may be less likely to anthropomorphize marine animals than other types of animals. In the current study, we aim to extend this work to other types of typical and atypical animals housed in independent exhibits to further explore differences in conversational content and pronoun references for animals, both of which may shape children's developing biological and behavioral knowledge about animals.

Parents may use other methods to support children's biological learning in ILEs, including encouraging children to find connections to the exhibits and supporting scientific reasoning skills more generally. Prior museum literature has highlighted the importance of language to the development of scientific reasoning, such as making, challenging, and testing claims and seeking information and evidence in parent–child interaction in ILEs (Allen, 2002; Ash, 2003; Kisiel et al., 2012; Rowe & Kisiel, 2012). This type of language, which I refer to as *conceptual language*, provides an important foundation for the development of scientific learning and reasoning (e.g., Michaels, Shouse, & Schweingruber, 2007). Crowley et al. (2001) posit that conceptual talk may be "one of the direct mechanisms through which parents and children co-construct scientific thinking in everyday settings" (p. 191). Research also points to the importance of comparative talk to both adults' and children's learning (e.g., Namy & Gentner, 2002). Eliciting emotional responses can further help visitors make connections between the exhibit, their personal lives, and their prior experiences (Chiodo & Rupp, 1999; Rupp, 1999), increasing retention, understanding, and transference (Caine & Caine, 1994). Thus, in the current study, our conversational analysis focuses on both biologically specific content and content more generally relevant to learning to see how family conversations about animals may support learning.

Another important way that parents may foster biological learning in informal settings is through engaging in explanatory conversations. A large body of empirical research illustrates the beneficial role of explanation in learning (e.g., Coleman, Brown, & Rivkin, 1997; Legare, 2014; Legare & Lombrozo, 2014; Lombrozo, 2006; Rittle-Johnson, Saylor, & Swygert, 2007), especially within the domain of biological knowledge (e.g., Au et al., 2008; Keil, Levin, Richman, & Gutheil, 1999; Wellman, Hickling, & Schult, 1997). In particular, parent explanations during informal science activities may help children practice formal scientific thinking, develop deeper and more coherent scientific theories, and acquire scientific problem solving skills (Crowley, 2000; Fender & Crowley, 2007). Within ILEs, parents often use exhibit explanatory text about a biological process, reading aloud and reframing the information (Tare, French, Frazier, Diamond, & Evans, 2011). However, no prior research has studied family engagement in causal explanatory conversations about biological properties at live animal exhibits.

In addition, little is known about how family factors, such as motivations and children's age, affect parent–child interaction during these informal learning experiences. Previous research found that an individuals' motivations for visiting a museum exhibit correlated with their learning outcomes. Falk, Moussouri, and Coulson (1998) asked participants about their reason for visiting the museum that day, and coded their responses for reference to fun, educational, social, practical, or location-specific reasons. They found that visitors with only educational motives exhibited increased conceptual learning, whereas visitors with both educational and entertainment motives exhibited increased conceptual, vocabulary, and mastery learning. In the current research, it is possible that parents' motivations for bringing their families to ILEs may affect the kinds of conversations they engage in with their children during the visit. For instance, parents who report educational goals for their visit may be more likely to provide biological, conceptual, and/or explanatory information to their children, as opposed to parents who report other kinds of goals. However, previous research on family interactions at live animal exhibits has not incorporated measures of motivation.

Children's age may also impact the kinds of conversations parents and children engage in. Very few studies have examined developmental differences in family interaction, often using a wide age range including both preschool and school-aged children. Surprisingly, Rigney and Callanan (2011) found no age differences in parents' use of biological or anthropomorphic language with older (ages 5–9 years) and younger children (ages 1–4 years) in conversations about marine animals. However, preschool and school-aged children almost certainly differ in skills and knowledge; as children begin formal schooling, they are exposed to increasingly sophisticated factual knowledge about biological entities. In addition, the introduction of observation and measuring skills in the context of science education increases children's ability to incorporate information into their biological concepts (Gelman & Brenneman, 2004). Prior research in ILEs has found that parents use more conceptual language with children who have less factual knowledge about an exhibit (Palmquist & Crowley, 2007). Whether parents' conceptual and explanatory language use about animals in informal learning settings reflects sensitivity to typical differences in knowledge and scientific reasoning between older and younger children has yet to be explored.

Current Study

In the current study, we examined parent–child interaction at live animal exhibits in ILEs to better understand how interactions within these common, informal experiences may support the development of biological knowledge for both preschool and school-aged children. Although previous research has separately examined parent–child interaction at live animal exhibits in either zoos or science centers, we examined conversations in both types of ILEs. We carefully selected two animals, penguins and stick insects, that differ across several domains, including familiarity, typicality, and resemblance to humans, to see whether the content of parent–child conversations differs across animal types. Penguins, like humans, have distinguishable facial features, a bipedal posture, and wings that bear some resemblance to human arms. Penguins have been featured as anthropomorphized main characters in a number of popular children's movies, including *Happy Feet, Surf's Up, Madagascar,* and *March of the Penguins,* which demonstrates how easy it is to anthropomorphize them. Stick insects, on the other hand, more closely resemble plants than other animals (even other insects), and their characteristic motion patterns differ dramatically from that of humans. Parents often exhibit domain blurring with such atypical animals, referring to them as inanimate objects, which may in turn affect their children's developing knowledge of animals and objects (Jipson & Gelman, 2007; Rigney & Callanan, 2011).

Our study aims to address the following research questions:

1. Does family conversation (in both content and pronoun use) differentiate animal kinds and support biological learning?
2. Are these differences consistent across early development?
3. What is the influence of visitor motivations on family conversations?
4. Do parents explicitly support biological learning through engagement in explanatory conversations about biological processes?

Table 1. *Sample sizes and average ages for children in age groups by location*

Group	*n*	*M*	*SD*
Science museum			
Preschool	14	4 years, 1 month	0.60
School-aged	24	6 years, 5 months	0.81
Zoo			
Preschool	21	3 years, 11 months	0.62
School-aged	13	6 years, 2 months	0.82

METHOD

Participants

Participants in the study were families who visited one of our two research sites: a small, regional zoo and a science museum. Twenty-six families participated at each research site. Each family had between 1 and 3 children between 3 and 8 years of age. Parents provided gender and age information for their children (ages were missing for four children). Our final sample included 76 children (41 girls) ranging in age from 2 years, 10 months to 7 years, 11 months ($Mdn = 4$ years, 11 months). Because information about the children's school status was not available, the most common regional cutoff date for entering kindergarten was used to separate children by birthdate into preschool and school-aged groups (see Table 1).

Forty-two mothers and 22 fathers accompanied their children. About half the families were accompanied only by their mother (57.7%). The rest were accompanied by either only a father (19.2%) or both a father and mother (23.1%). Table 2 shows a breakdown of family types by parent and by child age at the two research locations.

Setting

At each site, we recorded families' interactions at one animal exhibit. At the science museum, the animals were part of a larger exhibit on the prey–predator relationship, which highlighted biological themes such as camouflage, natural toxins, hunting strategies, and survival mechanisms. We focused specifically on one collection of

Table 2. *Count of family types by parent and child age at the science museum and zoo*

Family types	Preschool children	School-aged children	Both preschool and school-aged children
Mother only			
Science museum	3	7	3
Zoo	9	4	3
Father only			
Science museum	1	2	1
Zoo	4	1	0
Both parents			
Science museum	2	2	3
Zoo	0	2	2

Note. Three families are missing age data (one mother, one father, one both parents).

tanks that featured insects that use camouflage to avoid prey, including stick and leaf insects and firefly-mimic cockroaches. Multiple prominent signs directly next to or above the insect tanks provided written information for visitors on the insects and how their camouflage properties helped them trick and escape predators. The glass tanks were low enough to be easily visible to even younger visitors.

At the zoo, we chose to focus on the *Penguin Coast* exhibit, a habitat featuring multiple African penguins. The habitat consisted of a large swimming area and rocks and branches for the penguins to climb up on. The exhibit was surrounded by a glass wall so young children could easily view the penguins, even underwater. In addition, an interactive sign off to the side of the exhibit encouraged children to stand in front of scale drawings of penguins to see which penguin they most closely resembled in size, though only one family we recorded visited this sign. No other information or signage was present at the exhibit.

Procedure

A recruitment booth was set up at each site entrance, and parents were invited to participate in a study of families in informal learning environments. Parents were told that we were interested in the kinds of conversations that families have and we would be recording their interactions while at a target exhibit. Families who agreed to participate signed a consent form and were given a questionnaire to complete at home and return by mail to minimize interruption to their visit. The questionnaire included demographic information and a question asking why the family chose to visit the site that day (used for visitor motivation measure).

Stickers were used to identify families participating in the study. When a participating family arrived at the exhibit, a researcher handed the parent a small wireless microphone to wear around his or her neck. Parents were instructed to spend as much time at the exhibit as they wanted, to explore the exhibit as they normally would, and to return the microphone whenever they were ready to leave. A video camera unobtrusively recorded families' progress through the exhibit. Families at both sites demonstrated similar levels of engagement, averaging 3 min, 31s at the exhibit (range = 1 min, 3 s to 7 min, 35 s). The average amount of time families spent at the zoo exhibit did not differ from the museum, $t(50) = 1.13$, $p = .27$.

Undergraduate research assistants who were familiar with both exhibits transcribed all videotapes. Two research assistants jointly reviewed any portions of the recordings that were difficult to understand.

Coding Conversations

Transcripts were broken down into individual utterances and labeled with respect to speaker (parent or child). Each utterance was then coded for content and pronoun use. In addition, the museum transcripts were coded for explanations related to the exhibit's explicit biological focus—camouflage. Visitor motivation was coded from self-report on the questionnaire. Megan S. Geerdts served as the primary coder for each type of coding. In addition, for each coding type, at least 20% of the transcripts were randomly selected for coding by a second coder and inter-rater agreement was calculated. Cohen's kappa was .96 (99% agreement) for pronoun codes and .78 (85% agreement) for biological explanation codes. These kappas all indicate a good level of agreement (Fleiss, 1981). Agreement for visitor motivation codes was 90% and for content codes was 83%.[1] In any instances of disagreements, the primary coder reviewed disagreements and selected a final code.

Speech Content

A total of 18 content codes were organized into five categories (see the Appendix):

- *Perceptual*: This category encompassed references to readily perceptible visual properties intended to direct attention to the animal or exhibit, including drawing attention to the animal (“Look at these guys!”), labeling the animal (“Oh, is that a stick bug?”), or describing a physical feature of the animal or exhibit (“What color are they?”).
- *Conceptual:* Conceptual utterances provided information beyond the physical aspects of the exhibit, including the provision or elicitation of interpretations (“Do you think they can glow?”), causal inferences (“Why do they stick to the wall?), and predictions (“He’s going to jump in [the water]”).
- *Biological:* Participants provided information that was specifically biological in nature and/or highlighted the animal’s status as a living thing, including references to an animal’s motion (“He’s swimming in the water”), natural habitat (“Do penguins live where it’s warm or where it’s cold?”), or biological processes including eating, growth, and death.
- *Social:* These types of anthropomorphic references imbued social and/or psychological properties to the animals, such as inferring social interactions between the animals (“Oh here comes his little penguin friend!”), attributing mental states (“Maybe he’s scared”), labeling the animals with social or family terms such as *friend*, *mom*, *baby*, and so on, or attempting to directly interact socially with the animals (“Say goodbye to them”).
- *Connections:* Connections were statements that explicitly related the exhibit to existing knowledge or prior experiences, such as making comparisons to another animal or object (“Do you think penguins can fly like other birds?”), referencing prior experiences (“Do they look like the penguins we saw in the movie?”), or making emotional reactions to the display (“Wow!”; “I like to see when they swim”).

Only talk about the animals was coded (i.e., talking about exhibit navigation, child behavior, or unrelated aspects of the environment was not coded). The total number of utterances within each category was summed for each participant. To represent the complexity of parent–child conversation, the content coding scheme was designed so that the categories were not mutually exclusive. Thus, one utterance could receive more than one content code. For example, “That bug *likes* to *eat*” would be coded as both *Biological* and *Social*.

Pronouns

Transcripts were also coded for the use of animate and inanimate pronouns in referring to the animals, to determine whether speakers’ language use subtly differentiated the two types of animals as biological entities (Rigney & Callanan, 2011). All pronominal references to the animals in the exhibit were coded as:

- *Animate*: he, him, his, himself, she, her(s), herself
- *Inanimate*: it(s), itself

The frequency of animate and inanimate pronoun use by each participant was calculated. Additionally, each individual was categorized with respect to the consistency of his or her pronoun use: *inconsistent* (using both animate and inanimate pronouns to refer to the same animals), *consistent animate* (exclusive use of animate pronouns), or *consistent inanimate* (exclusive use of inanimate pronouns). Exclusively using animate pronouns to refer to an animal provides stronger evidence of viewing the animal as humanlike than the absolute number of pronoun usage for each animal.

Biological Explanations

Because the stick bug exhibit featured extensive signage explaining the function and benefits of camouflage and because it was embedded in a larger installation explicitly focusing on predator–prey relationships, we also chose to examine whether parents visiting this exhibit directly supported their children's learning by drawing attention to or explaining this perceptually salient biological property. We first examined every transcript for explicit comparisons between the stick and leaf insects and actual tree branches, sticks, or leaves. For those transcripts in which the comparison was present, we categorized the conversation into the following three hierarchical levels:

- *Ignored/Confirmed:* After the comparison was initiated, the other party ignored the comment, walked away, changed the topic, or simply acknowledged and confirmed the initiation without engaging in any further conversation about the visual comparison.
- *Engaged:* In this type of interaction, the family members engaged in a dialogue after the introduction of the visual comparison, expanding on the initial observation. However, neither party offered up an explanation for why the visual similarity exists.
- *Explained:* Here, an explicit rationale for the insects' resemblance to sticks was solicited and/or offered. The child explicitly received or generated the key fact of the exhibit and, ostensibly, left the exhibit with some understanding of the camouflage mechanism.

If more than one type of conversation took place in the transcript, the highest level of sophistication was counted. In addition, it was noted whether the parent or child initiated the conversation.

Visitor Motivations

Parents were asked to describe why they chose to visit the site that day. Following prior literature on visitor motivation (Falk et al., 1998), we coded families' free-response answers for visiting the site into the following six categories:

- *Fun:* The parent cites a leisure or entertainment related reason for visiting (e.g., having fun, enjoying themselves, or relaxing).
- *Educational:* The parent cites a desire to engage in educational activities (e.g., they want to learn something, either generally or specifically, during their visit).

- *Social:* The parent cites a social reason (e.g., a family day out, a special social experience such as a visiting relative or a birthday, or to spend time with friends or family).
- *Life Cycle/Duty:* The parent refers to the event as an important part of certain life stages, such as a child's first museum trip or a memorable event for the parent when he or she was a child. Also, responses in this category may reflect a sense of duty (e.g., noting that zoos are "good" for children or saying that parents "should" take their children there).
- *Place:* The parent refers to anything specific to the location itself (e.g., what the site represents, how it is particular to the region, or what it contains).
- *Practical:* The parent cites any practical concerns (e.g., the weather, vacation day from work or school, proximity to home, membership).

A response could receive more than one category code. For instance, the response, "The *children are off from school* so I wanted to *take them someplace fun*, *educational*, and *close to home*," was coded as reflecting *fun*, *educational*, and *practical* motivations.

RESULTS

First, we present data on the content of parent–child conversations across different animal types. Specifically, we focus on how families distinguish animals by analyzing the frequency of specific property types as well as pronoun usage. Next, we addressed whether specific family characteristics, including child age and visitor motivation, relate to the frequency of specific property types. Finally, we analyzed whether parents and children engage in explanatory conversations about the focal biological property in one of the animal exhibits.

Comparing Conversations Across Animal Type

In our first research question, we ask whether the content of family conversations about penguins and insects are different. First, we analyzed differences in speech content categories for both adults and children. Next, we examined differences in animate and inanimate pronoun usage for penguins and insects.

Differences in Content in Conversations About Penguins and Insects

Descriptive statistics for parent and child speech for the two animals are presented in Table 3. To address whether the content of family conversations differed across the two types of animals, data on conversational content was analyzed using a 2 (animal: penguins, insects) $\times$ 3 (speaker: parents, preschool-aged children, school-aged children) $\times$ 5 (speech category: perceptual, conceptual, biological, connecting, social) repeated measures analysis of covariance (ANCOVA), with animal and speaker as between-subject variables and controlling for total number of utterances by each participant. The results indicated a significant interaction between animal and speech category, $F(4, 504) = 12.71$, $p < .001$, $\eta_p^2 = .092$, and a significant three-way interaction between speech category, speaker, and animal, $F(8,504) = 2.65$, $p = .008$, $\eta_p^2 = .040$. To investigate the three-way interaction, separate 2 (animal: penguins, insects) $\times$ 5 (speech category: perceptual, conceptual, biological, connecting, social)

Table 3. Means (and standard deviations) of the number of coded utterances in five speech categories as a function of speaker and animal type

Speaker and animal type	Perceptual	Conceptual	Biological	Social	Connecting
Parent					
Insect	13.53 (12.38)	2.74 (2.67)	4.71 (6.11)	1.85 (2.35)	7.53 (7.56)
Penguin	12.66 (13.27)	7.07 (8.91)	11.31 (12.16)	7.38 (6.91)	4.48 (3.98)
Preschool children					
Insect	4.31 (4.09)	0.54 (0.66)	1.31 (1.60)	0.54 (0.97)	2.54 (2.63)
Penguin	4.90 (5.51)	1.30 (1.63)	2.35 (2.39)	3.20 (3.12)	1.25 (1.94)
School-aged children					
Insect	5.58 (4.48)	0.50 (0.83)	1.63 (3.13)	1.21 (1.77)	2.71 (2.56)
Penguin	3.00 (2.65)	2.85 (3.36)	3.85 (5.11)	2.08 (2.60)	2.00 (2.77)

repeated-measures ANCOVAs were conducted for parents and children, controlling for total number of utterances. For parents, we found a significant interaction between speech category and animal type, $F(4,240) = 11.75$, $p < .001$, $\eta_p^2 = .164$. Follow-up two-tailed comparisons using a Bonferroni corrected alpha level of .01 examined the differences between the penguins and insects separately for each type of speech category. Parents made significantly more perceptual, $t(62) = 4.32$, $p < .01$, $d = 1.10$, and connecting statements, $t(62) = 3.76$, $p < .01$, $d = 0.96$, about the insects than the penguins. Parents' conceptual, biological, and social speech use did not differ as a function of animal, all p values $> .01$.

For preschoolers, the 2 (animal: penguins, insects) × 5 (speech category: perceptual, conceptual, biological, connecting, social) ANCOVA revealed a significant interaction between speech and animal, $F(4, 120) = 3.44$, $p = .011$, $\eta_p^2 = .103$. Follow-up two-tailed comparisons using a Bonferroni corrected alpha level of .01 were used to examine the differences between the animals within each type of speech category. Preschool-aged children did not significantly differ in rates of any speech category between the two animals, all p values $> .01$.

For school-aged children, the 2 (animal: penguins, insects) × 5 (speech category: perceptual, conceptual, biological, connecting, social) ANCOVA also revealed a significant interaction between speech and animal, $F(4, 136) = 7.65$, $p < .001$, $\eta_p^2 = .184$. Follow-up two-tailed comparisons using a Bonferroni corrected alpha level of .01 were used to examine the differences between the penguins and insects separately for each type of speech category. School-aged children made significantly more perceptual, $t(36) = 4.00$, $p < .01$, $d = 1.33$, statements about the insects than the penguins. There was no difference between the animals for school-aged children's conceptual, biological, social, or connecting speech use, all p values $> .01$. Overall, both parents and children talked about penguins and insects similarly, especially in terms of biological and social functioning.

Differences in Pronoun Usage in Conversations About Penguins and Insects

To further investigate differences in conversations about penguins and insects, we looked at animate and inanimate pronoun usage for the two types of animals, reflecting differences in how human-like participants see each of these types of animals. Participants used a total of 344 animate pronouns and 177 inanimate pronouns across the two sites (see Table 4). To address differences in rates of animate and inanimate

Table 4. *Means (and standard deviations) of the number of animate and inanimate pronouns used as a function of speaker and animal type*

Speaker and animal type	Animate	Inanimate
Adult		
Penguins	7.83 (7.97)	1.83 (7.79)
Insects	1.26 (1.68)	2.44 (3.47)
Overall	4.29 (6.41)	2.16 (5.82)
Child		
Penguins	1.61 (2.22)	0.39 (0.66)
Insects	.57 (1.26)	0.76 (1.32)
Overall	1.06 (2.22)	0.39 (0.66)
All participants		
Penguins	4.52 (6.44)	1.06 (5.35)
Insects	0.90 (1.50)	1.56 (2.70)
Overall	2.59 (4.87)	1.33 (4.14)

pronoun usage for the two types of animals, we compared (a) differences in frequencies of animate and inanimate pronouns and (b) whether participants consistently referred to each animal as animate or inanimate.

To analyze differences in overall pronoun usage, a 2 (pronoun: animate, inanimate) × 2 (speaker: parent, child) × 2 (animal: insect, penguin) repeated measures ANOVA was conducted.[2] Of particular interest was whether pronoun usage differed between animals. We found a significant three-way interaction between pronoun, animal, and speaker, $F(1{,}129) = 7.90$, $p = .006$, $\eta_p{}^2 = .058$. To examine the three-way interaction, separate 2 (pronoun: animate, inanimate) × 2 (animals: penguin, insect) ANOVAs were conducted for parents and children. For parents, there was a main effect of pronoun, $F(1{,}61) = 5.30$, $p = .025$, $\eta_p{}^2 = .080$, a main effect of animal, $F(1{,}61) = 9.04$, $p = .004$, $\eta_p{}^2 = .129$, and an interaction between pronoun and animal, $F(1{,}61) = 11.72$, $p = .001$, $\eta_p{}^2 = .161$. Follow-up pairwise comparisons revealed that parents were more likely to use animate pronouns when talking about the penguins than the insects, $t(61) = 4.43$, $p < .05$, $d = .1.13$. Inanimate pronoun usage did not differ between the animals, $p > .05$. Similarly, for children there was a main effect of pronoun, $F(1{,}68) = 4.15$, $p = .046$, $\eta_p{}^2 = .057$, and an interaction between pronoun and animal, $F(1, 68) = 7.79$, $p = .007$, $\eta_p{}^2 = .103$. Follow-up pairwise comparisons revealed that, like parents, children were more likely to use animate pronouns when talking about the penguins than the insects, $t(68) = 2.92$, $p < .05$, $d = .71$. Inanimate pronoun usage did not differ between the animals, $p > .05$. Overall, patterns of usage were similar across participants, with both parents and children using animate pronouns proportionately more for penguins than insects.

Next, we examined whether participants consistently referred to each animal using animate or inanimate pronouns. This offers a stronger test of whether participants view each animal as more human-like. Ninety-three participants used pronouns to refer to the animals in the exhibit—50 participants at the zoo and 43 participants at the museum. Each participant's pronoun use was categorized as consistently animate (exclusive use of animate pronouns), consistently inanimate (exclusive use of inanimate pronouns), or inconsistent (Figure 1). To test whether parents and children differed

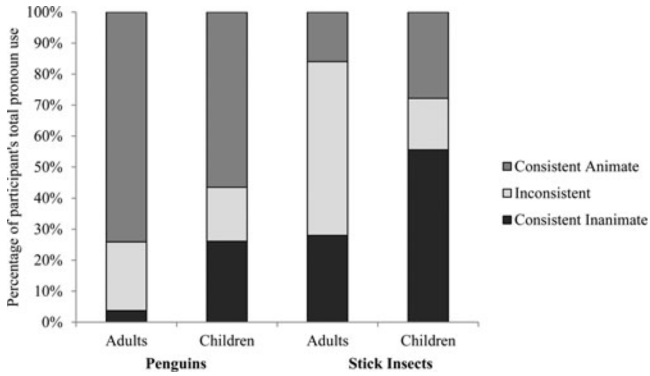

Figure 1. *Percentage of participants who used inconsistent, consistent animate, and consistent inanimate pronouns as a function of speaker and animal type.*

in their characteristic pronoun use between insects and penguins, a series of separate chi-square statistics were calculated for adults and children. First, a chi-square analysis compared consistent and inconsistent pronoun use between the penguins and stick insects. The relationship was significant for parents, $\chi^2(1, N = 52) = 4.91$, $p = .027$. Most parents who demonstrated inconsistent pronoun usage did so for the stick insects (70%). Children's pronoun use did not differ between animals, $\chi^2(1, N = 41) = .004$, $p = .95$.

Focusing exclusively on those who consistently used one type of pronoun, separate chi-square analyses for parents and children examined whether participants were more likely to use inanimate or animate pronouns consistently for penguins or insects. The relationship was significant for parents, $\chi^2(1, N = 32) = 10.39$, $p = .001$; almost all parents who consistently used inanimate pronouns did so for the insects (87.5%) whereas 83% of parents who consistently used animate pronouns did so for the penguins. The pattern was similar but not significant for children, $\chi^2(1, N = 34) = 2.85$, $p = .091$; 62.5% of children who consistently used inanimate pronouns did so for the insects, whereas 72% of children who consistently used animate pronouns did so for the penguins. Thus, parents' pronoun usage in particular reflects a consistent emphasis on the animate status of penguins in contrast to insects, supporting and extending our findings from analyzing pronoun usage frequency.

Comparing Conversations Across Development

In our second research question, we asked whether parents tailored their language use based on the age of the child. Specifically, do parents provide different amounts of information within each type of speech category (perceptual, conceptual, biological, social, and connecting) to older and younger children? For this analysis, we focused exclusively on families with only school-aged (science museum $n = 11$; zoo $n = 7$) or only preschool-aged (science museum, $n = 6$; zoo, $n = 13$) children (Fig. 2), using two-tailed planned comparisons with a Bonferroni corrected alpha level of .01. For each of the five speech categories, rates of parental speech to preschool and school-aged children were compared. Parents of preschool and school-aged children did not differ in their rates of perceptual comments, $p = .21$, or connections, $p = .34$. However, parents of preschool children made more conceptual statements, $t(34) =$

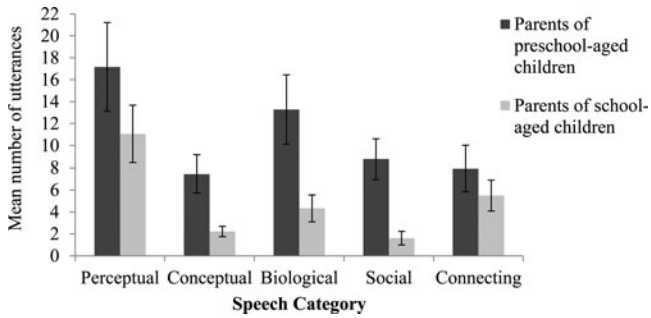

Figure 2. *Mean number of utterances that parents made to preschool and school-aged children by content code type.*

2.93, $p = .009$, $d = 1.00$; marginally more biological statements, $t(34) = 2.63$, $p = .015$, $d = 0.90$; and more social statements, $t(34) = 3.70$, $p = .001$, $d = 1.27$, than did parents of school-aged children.

Importantly, age-related differences in conversations were not driven by differences in children's *own* speech production. Two-tailed independent-samples *t*-tests using a Bonferroni corrected alpha level of .01 also compared the speech rates of older and younger children for each of the five speech categories. These analyses yielded no significant differences between preschool and school-aged children in their production rates (all p values $> .24$). Thus, within all coded speech categories, preschool and school-aged children made similar contributions to conversations with their parents.

Visitor Motivation

Our third research question asked whether parents with specific motivations for visiting the museum or zoo differed in the kinds of conversations they engaged in with their children. Half of the families returned the visitor motivation questionnaire, 12 at the science museum and 14 at the zoo. Reasons for visits were coded into one or more of the following categories: Fun, Educational, Social, Life cycle/Duty, Place, and Practical. Because each family's response could receive more than one code, 40 codes were recorded (see Table 5). Over half of the families (57.7%) cited practical reasons for their visit, such as the weather or that the kids were on vacation from school. Fun was the next most common reason, with 38.5% of families saying that it was a fun thing to do with their kids. About a quarter (26.9%) cited reasons specific to the place, such as a specific exhibit or an animal the child liked. A few parents (15.4%) mentioned social reasons for visiting, and only one parent placed the visit in the life cycle context, saying it was her child's "first visit to a science museum." Very few families (11.5%) cited educational reasons for their visit and no parent offered

Table 5. *Count of parental reported reasons for visiting each location*

Location	Fun	Education	Social	Life cycle	Place	Practical
Science museum	4	1	2	1	2	9
Zoo	6	2	2	0	4	6

Table 6. Percentage of references to insect camouflage initiated by either the parent or the child and how they responded

Initiator	Ignored/confirmed	Engaged conversation	Explanation of biological property
Parent	37.5	20.8	25
Child	12.5	0	4.2

education as the only reason for visiting; every parent who mentioned educational motivations also said that it was a fun activity.

To test our third research question, separate 5 (speech category: perceptual, conceptual, biological, connecting, social) × 2 (reason cited: yes, no) repeated-measures ANCOVAs controlling for total speech were calculated for each of the six reasons. None of the main effects or interactions were significant for any of the six reasons, all p values $> .18$, suggesting that language use did not differ based on reporting specific visitor motivations.

Explanations About Biological Properties

Our final research question asked whether parents explicitly supported biological learning by providing explanations about a readily visible biological property. To address this question, conversations about visual comparisons between the stick and leaf insects and actual sticks and leaves were coded for the presence of biological explanations of camouflage (see Table 6). Not surprisingly, nearly all families (24 out of 26) explicitly referred to the fact that the insects look like plants. Parents initiated a majority of these visual comparisons (83.3%). However, half (50%) of these statements were ignored or simply confirmed by the conversational partner and the conversation moved on. The following exchange presents a typical example:

Mother: "Look at the bug. He looks just like the branch."

Daughter: "Yeah."

Mother: "Isn't that cool?"

[Daughter walks away from the mother to another area.]

Here, the mother drew her child's attention to the visual comparison, but failed to engage her daughter in any further conversation about the visual similarities.

About a quarter (20.8%) of these initiated conversations led to additional discussion in which parents did not explicitly explain why the insects look like sticks. For instance:

Mother: "Are they hard to tell where they are when they're on the sticks?"

Daughter: "No. I can tell because of their legs."

Mother: "Yeah, they do have legs. What do their legs look like?"

Daughter: "Sticks. But they're eating."

Mother: "How many legs do they have?"

Despite the extended, reciprocal conversation about the visual and biological similarities and differences between the sticks and the insects, the dyad never talked about why these living insects are visually similar to an inanimate object in their environment.

Less than a third of parents (29.2%) gave any kind of camouflage explanation. Most parents who offered an explanation tended to offer very simple ones, such as the following:

> Father: "Why do you think these look like sticks?"
>
> Daughter: "Cause they're sticky."
>
> Father: "No, so that they don't get eaten by birds."

Very few parents provided detailed, pedagogical explanations, such as the following conversation between a schoolteacher father and his daughter:

> Father: "Ok, [reading the sign] stick insects and dead leaf mantids rely on their looks to find a meal and not to become one for someone else. So they want to, they're looking for a meal. And they're also trying to hide from other things that want to gobble them up. Umm, [reading the sign] it says that if an enemy comes near them they can sit as motionless as a twig. Okay? And then they can sway like a leaf in the breeze. Did you see this one wobbling a bit?"
>
> Daughter: "Yes."
>
> Father: "That makes them look like a twig rather than a real live animal. And then, uh ... and then, but if you take them away from like where they live, then, uh, birds and other things will gobble them up straight away if they can't hide. See? Look it, they're all hanging from the tree. See how they're hanging? See they really do look like branches, don't they?"

Here the father conveyed information from the sign about the function of camouflage. He also encouraged his children to look at the insects and to observe the behavior that he read, connecting the information in the sign to the example right in front of them.

Interestingly, parents did not always provide the explanation. In two cases, children explained why the insects would look like sticks. One child suggested, "animals use that so that they can not get eat-ed and help hunting." However, neither parent went on to elaborate upon the child's explanation.

DISCUSSION

In the current study, we examined the types of conversations in which parents and preschool and school-aged children engage when viewing live animals in ILEs to shed light on how everyday, informal learning experiences may inform our understanding of children's developing biological knowledge. Prior research has found that differences in early opportunities for direct experience with animals (e.g., Anggoro et al., 2010; Medin et al., 2010; Ross et al., 2003; Unsworth et al., 2012; Waxman & Medin, 2007) and conversations with parents (e.g., Tarlowski, 2006) impact early biological reasoning. Especially for urban children who may have few opportunities to encounter live animals, zoos and museums are an ideal setting for exploring the content of parent–child interaction about animals (Allen, 2002; Ash, 2003; Kisiel et al., 2012; Kopczak et al., 2015; Patrick & Tunnicliffe, 2013; Rigney & Callanan, 2011; Rowe

& Kisiel, 2012). Thus, exploring parent–children interactions about animals in these ILEs can reveal the kinds of opportunities for learning that can impact the development of children's early biological and psychological theories about living things.

In our first aim, we analyzed parent–child conversations about different kinds of animals, specifically penguins and insects. Differences in conversational content may impact how children come to reason about different kinds of animals, shaping their biological and psychological knowledge of specific kinds of animals. To address this, we looked at the kinds of comments made (e.g., biological, social, perceptual) and animate and inanimate pronoun usage. We found some differences in how families talked about penguins and insects. Parents commented more on the perceptual features and made more connecting statements about the insects than the penguins. These differences stemmed primarily from attempts at finding the camouflaged animals (e.g., "See if you can find the stick bugs."), and the many visual comparisons between the insects and plants (e.g., "He looks just like the branch"). Surprisingly, parents used conceptual, social, and biological comments at similar rates when talking about the penguins and the stick bugs. Given previous findings that parents referred more frequently to psychological and social properties of typical marine creatures than atypical ones (Rigney & Callanan, 2011), we had expected to find increased levels of explicit social language about the penguins; however, this was not the case. It may be that some features of the stickbugs in our research (e.g., presence of legs, size differences suggestive of the potential for growth) rendered them somewhat less object-like than the atypical marine animals in Rigney and Callanan's research (e.g., sea anemones). In the future, comparisons of parent–child interactions about different kinds of atypical animals may shed more light on the specific kinds of features that give rise to more (or less) social interpretations.

Parents' and children's pronoun use, however, did reflect a differentiation in perceived social status between penguins and insects. Both adults and children were more likely to use animate pronouns such as "he" or "she" for the penguins than the insects. Furthermore, parents were more likely to *consistently* refer to the penguins using animate pronouns, whereas they were more likely to consistently use object pronouns such as "it" for the insects. This distinction does not reflect differences in ability to discern gender between the animals; neither the gender of stick bugs nor that of penguins is readily visually apparent. Instead, this subtle language bias likely reflects a stronger tendency to see penguins as more animal-like or perhaps as more human-like. Both parents and children used more animate pronouns in discussing the penguins than the insects, consistent with Rigney and Callanan's (2011) findings, suggesting that they may be at least subtly biased to think of typical animals as more human-like than atypical animals.

Our second research question asked whether parents tailor their language differently to preschool and school-aged children. Parents did in fact engage in different types of conversations with children of different ages, making more social, biological, and conceptual utterances to preschool children than to school-aged children. The only categories that did not differ were related to observable physical properties of the exhibit and connections to prior experiences and other entities. Further, conversational differences between younger and older children did not simply result from older children contributing more to certain kinds of conversations than younger children; younger and older children's own language production did not differ in any speech category. Parents more frequently provided important, unobservable information such as predictions (e.g., “How big do you think the little ones are going to get?”) and causal inferences (e.g., “Do you know *why* they’re birds?”) to the youngest children, supporting the development of children’s knowledge at a time when significant revision in children’s biological knowledge is occurring (e.g., Hickling & Gelman, 1995; Rosengren et al., 1991). Importantly, parents are not simply fostering an anthropocentric conceptualization of animals for their youngest children, but scaffolding their knowledge by providing biological and conceptual information in addition to this social information. The simultaneous provision of both biological and social information may assist children in drawing relations between animals and people more broadly by facilitating the extension of children’s knowledge of human biological processes to non-human animals (Inagaki & Hatano, 1987, 2002).

In our third research question, we asked what parents’ motivations for visiting informal learning sites are and if these differences relate to the content of their conversations. Prior research suggests that differences in an individual’s motivational agenda for a museum visit is reflected in the kinds and amount of knowledge gained from the visit (Falk et al., 1998). Most parents across both locations characterized their motivations for their visit as fun and practical but rarely as educational. Thus, parents’ goals in visiting zoos and museums, even science museums, may not primarily be pedagogical but rather to spend time together with their children engaged in an entertaining activity. The interactions we observed, therefore, may reflect other types of informal, everyday activities in which parents and children routinely engage, such as storybook reading, rather than reflecting the kinds of learning that occur in more explicitly pedagogical activities, such as homework completion. However, one concern is that the relatively low return rate on surveys might reflect response biases rather than being representative of our entire sample. We also failed to find a difference in the frequency of using each speech category based on reporting specific motivations, which again may be due to the small number of responses.

Finally, we asked whether parents explicitly support biological learning by engaging in explanatory conversations about readily observable biological properties. Prior research suggests that parent explanations during informal science activities are particularly important for fostering the development of children’s scientific knowledge and thinking (Crowley, 2000; Fender & Crowley, 2007). Even children as young as 2 years are motivated to actively seek causal information in parent–child conversation, helping them to learn about the world (Frazier, Gelman, & Wellman, 2009). However we found that most parents failed to take the opportunity to explain camouflage at the insect exhibit, despite the fact that parents and children nearly always mentioned this prominent feature of the exhibit. That so few parents offered explicit explanations of the utility of camouflage is surprising given the prominent signage at the exhibit that provided detailed information on the benefits of camouflage. Indeed, the larger exhibit of which the insects were a part explicitly targeted prey/predator relationships and the sign directly adjacent to the insects had the tag line “Some insects survive because they don’t stick out.” This finding does fit well with the finding that parents rarely mentioned educational goals as the reason for their visit to either site. Nonetheless, both findings stand in contrast to the fact that these environments are deliberately designed to encourage educational conversation. Another missed learning opportunity was seen in the few children who provided the explanation themselves. Their parents never expanded on the child's simple explanations, perhaps because parents interpreted their children's explanations as evidence that they already knew about camouflage. However, parents could have taken the opportunity to elaborate upon the child's comment and to provide additional information, especially by incorporating the information contained in the museum signage. It is important to note that although we purposefully selected a museum exhibit focused on a readily observable biological property with supporting signage, we cannot determine in the current context whether explanatory conversations would be more or less frequent in exhibits with different types of educational goals or informational signage. Previous research has shown that when signs are present at museum exhibits, parents are more likely to describe evidence and make appropriate inferences in conversations with their children, and in turn both parents and children exhibit increased learning (Kim, 2008). An important goal for future research would be to see whether manipulation of the content or format (e.g., traditional versus interactive digital signs) of signs results in different kinds of parent–child conversations at live animal exhibits.

There are a few limitations to the present study. First, it is conceivable that differences in the content of parents' and children's discussion of the two types of animals under investigation in the current study arose at least in part from the fact that the animals were housed in distinct types of informal learning environments—a children's zoo and a science museum. Although we did not find any differences in engagement or motivation across the sites, it is possible that the types of families that choose to visit each of these sites differ in other important ways that we failed to capture. In the current research, a convenience sample of families who chose to visit each site was used, and many of these families had visited the site before. Previous research has found that parents who had been to museums in the past use more explanations than parents who had never visited a museum (Tenenbaum & Callanan, 2008), meaning that the experiences recorded here may have been even richer than we would observe from a truly random sample of families. Thus, it would be important for future research to study families who do not typically frequent these sites to examine whether their experiences and conversations are qualitatively different.

In addition, these observations present just a brief glimpse into parents and children's visit to the site that day, and reflect just a small portion of their day-to-day direct and indirect experiences with animals. Although we made every attempt to maximize the chances of capturing explanatory talk by selecting an exhibit with explanatory signage, it is possible that families talked about these things at other parts of the exhibit that we did not record or even after, reflecting on their visit (Fivush, Hudson, & Nelson, 1984). Incorporating complimentary methodological tools to capture a wider understanding of their visit, such as visitor diaries (Leinhardt, Tittle, & Knutson, 2000), interviews (Housen, 1987), or recording families in multiple exhibits, can help paint a more complete picture of parent–child interaction about animals within ILEs.

It remains to be investigated how the patterns of parent–child interaction that we observed affect children's knowledge of animals and science more generally. Previous work has focused heavily on the content and sophistication of children's biological reasoning (e.g., Carey, 1985, 1995; Inagaki & Hatano, 2002; Wellman et al., 1997) with comparatively little attention to characterizing the content of specific experiences that may contribute to the acquisition of biological knowledge (e.g., Crowley et al., 2001; Geerdts et al., 2015; Gelman et al., 2004; Rigney & Callanan, 2011). The current study did not evaluate whether or not children's biological knowledge actually improved as a result of these interactions. Ongoing work in our lab suggests that the input children receive about animals within other types of parent–child interactions such as storybook reading or joint engagement in child-directed media is highly anthropomorphic—focusing primarily on animals' social and behavioral properties—and that children's own reasoning reflects this input. In addition, we are empirically investigating the impact of exposure to biological information within both factual and anthropocentric frameworks to determine the type of framework from which children learn best, and whether anthropomorphism enhances children's biological reasoning and/or causes children to hold unrealistic expectations about real animal behavior.

The current study also highlights the importance of collaborations between cognitive developmental psychologists and practitioners. Future work that both characterizes children's actual experiences and experimentally measures learning outcomes can help designers of ILEs better understand both what is and what should be happening in family interactions to optimally support early learning. In the current study we observed families engaging in anthropomorphic language in ILE animal exhibits. However, we do not know how this contributes to learning. Anthropomorphic language may enhance attention and memory (Geerdts, Van de Walle, & LoBue, in press) or it may increase incorrect, anthropomorphic reasoning (Ganea et al., 2014; Waxman et al., 2014). Designers of informal learning environments can use results from future research to modify exhibits, providing information in signage or other informational support for parents that encourage parent–child conversations that will optimally support early learning about animals.

Notes

1. Kappa statistics were not calculated for visitor motivation and content codes because they do not meet the assumption for mutually exclusive categories.
2. Preliminary comparisons revealed no difference between preschool and school-aged children in terms of their animate or inanimate pronoun usage, both p values $> .55$, so all children were analyzed together.

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APPENDIX: SCHEME USED TO CODE THE CONTENT OF PARENTS' AND CHILDREN'S SPEECH

Category	Content code	Examples from speech
Perceptual	Directing Attention	"Oh, look at this guy."
		"Right there!"
		"Where are the penguins?"
	Describing Evidence	"He's on the rock."
		"How many penguins are there?"
		"Look how big that one is!"
	Quotation	"This sign says, 'These bugs live in Australia'."
	Labeling	"What is that?"
		"Those are penguins"
Conceptual	Interpretation	"What do you think they use their antlers for?"
	Causal Inference	"He doesn't want to go swimming *because* it is too cold."
		"He got hungry *so* he ate."
	Prediction	"What do you think he's *going* to do?"
		"He is *going* to jump into the water now!"
Biological	Animate Motion	"The bugs are crawling on the wall"
		"Look, he's swimming."
	Ecology	"I think penguins live in Antarctica"
	Biological Processes	"They eat fish."
		"Those ones are dead."
		"Is it a boy or a girl?"

(*Continued on next page*)

APPENDIX (*Continued*)

Category	Content code	Examples from speech
Social	Social Relationships	"That's the baby bug and that's the mommy bug!"
		"He's a teenager."
		"He's a strong boy."
	Mental State Reference	"He *wants* to play with the other bug."
		"I bet they *think* it's really warm."
		"Oh look, he *wants* to get out to go eat."
	Direct Social Interaction	"Say hi to the penguin."
		"Hey penguin, what are you doing?"
	Naming	"I want to name him *Swimmy*."
		"What should we call that one?" "*Sally*"
Connecting	Life Connection	"I have stick bugs in my classroom!"
		"Remember the spiders that Mr. Smith has?"
	Compare/Contrast	"The penguin looks like a duck!"
		"These are not those."
		"Are they penguins or birds?"
	Human Comparison	"He looks just like you when you jump!"
		"Do you think it's lunch time for them?"
		"It's like preschool for the bugs."
	Expressing Emotion	"That flying one was so cool."
		"My very favorite is duckbill."