EMOTIONS IN FAMILY VISITS TO THE EMÍLIO GOELDI ZOO BOTANICAL PARK

EMOÇÕES EM VISITAS FAMILIARES AO PARQUE ZOOBOTÂNICO EMÍLIO GOELDI

EMOCIONES DURANTE LAS VISITAS FAMILIARES AL ZOOLOGICO Y PARQUE BOTÁNICO EMÍLIO GOELDI

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How to reference this paper:

| Submitted: 12/01/2023 |
| Revisions required: 11/04/2023 |
| Approved: 19/09/2023 |
| Published: 26/12/2023 |

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ABSTRACT: In this exploratory study with a qualitative approach, we investigated how families emotionally engage in the experience of visiting the Emílio Goeldi Zoobotanical Park in Belém. Visits were recorded, and interactions and conversational content were coded with emotion descriptors. Subsequently, with an inductive analysis, we identified four themes of interest: 1) Meaning construction and pieces of evidence of learning in science; 2) Role of adults in promoting engagement; 3) Anthropomorphism and empathy for the animals 4) Previous experiences. The results show that the visit experience generated positive emotions for the families and negative ones, with the potential to leverage the construction of meaning and learning experiences. In addition, the results suggest that the families’ emotional connection favored a sense of identity, in which visitors developed more confidence in the learning process and the relationship with their world through the recognition of the native species on display.


RESUMO: Neste estudo exploratório de abordagem qualitativa, investigamos como as famílias se engajam emocionalmente na experiência de visita ao Parque Zootópico Emílio Goeldi, em Belém. As visitas foram gravadas e as interações e os conteúdos conversacionais codificados com descriptores de emoção. Posteriormente, com uma análise inductiva, identificamos quatro temas de interesse: 1) Construção de significado e evidências de aprendizagem em ciência; 2) Papel dos adultos na promoção do engajamento; 3) Antropomorfismo e empatia pelos animais e 4) Experiências anteriores. Os resultados evidenciam que a experiência de visita gerou emoções positivas para as famílias, mas também negativas, ambas com potencial para alavancar a construção de significado e experiências de aprendizagem. Além disso, os resultados sugerem que a conexão emocional das famílias favoreceu o sentido de identidade, em que os visitantes desenvolveram mais confiança no processo de aprendizagem e na relação com seu mundo, por meio do reconhecimento das espécies nativas em exibição.


RESUMEN: En este estudio exploratorio con enfoque cualitativo, investigamos cómo las familias se involucran emocionalmente en la experiencia de visitar el Parque Zootópico Emílio Goeldi, en Belém. Las visitas fueron registradas y las interacciones y contenidos conversacionales codificados con descriptores de emociones. Posteriormente, con un análisis inductivo, identificamos cuatro temas de interés: 1) Construcción de significado y evidencia del aprendizaje en ciencias; 2) Papel de los adultos en la promoción del involucramiento; 3) Antropomorfismo y empatía por los animales y 4) Experiencias previas. Los resultados muestran que la experiencia de la visita generó emociones positivas para las familias, pero también negativas, ambas con potencial para potenciar la construcción de sentido y experiencias de aprendizaje. Además, los resultados sugieren que la conexión emocional de las familias favoreció el sentido de identidad, en el que los visitantes desarrollaron más confianza en el proceso de aprendizaje y en su relación con su mundo, a través del reconocimiento de las especies nativas en exhibición.

Introduction

It is recognized and accepted that emotions play an important role in human experiences. Investigating emotions from different perspectives, researchers such as Charles Darwin, Sigmund Freud, Henry Wallon, Lev Vygotsky, and Paulo Freire gave the topic a privileged place in the scientific discourse of recent centuries. More recently, studies in neuroscience have provided evidence that emotional responses affect learning processes and the consolidation of significant memories (PICARD et al., 2004). Damasio (1999), for example, demonstrates that emotion is an integral part of reasoning and decision-making processes. Aware of this, researchers who carry out studies in museums are increasingly concerned with understanding the role of emotion in the engagement of their visitors.

In this study, we are guided by the educational engagement approach (BELL et al., 2009; LEWENSTEIN, 2016, MCCALLIE et al., 2009) related to the participation, interaction, and learning experiences of visitors in non-formal education spaces. For McCallie et al. (2009, p. 20), engagement in non-formal education environments refers to “behaviors that demonstrate an interest in or interaction with a science-related activity or experience, or as a springboard for greater participation or learning”.

This conception of engagement shows potential for understanding visitors' experience with exhibitions and science, whether they occur individually, with a group or with mediators, as it incorporates different aspects, namely: (i) behavior (participation and investment of energy in the activity), (ii) epistemic (effort, motivation, and strategy necessary to understand and master knowledge and skills) and (iii) emotion (connection between the visitor and the activity or object) (ROWE et al., 2023). The latter is the focus of interest in this paper. We also understand that engagement makes up the learning process, which is continuous and built by experiences, in this case, family experiences. In this sense, we will use the expression “learning experiences” to name the experiences that can constitute learning.

In a recent publication, The Network of European Museum Organizations (NEMO, 2021) argues that museums need to engage their audiences emotionally, as emotion is a central condition in all phases of the museum experience and is associated with a practical and authentic museum experience learning. Other authors bring the idea of emotional engagement, that is, positive or negative emotional responses in the subject’s involvement with a certain activity, person, object, or experience, as a fundamental part of the learning process (BAMBERGER; TAL, 2008; SHABY; BEN-ZVI ASSARAF; TAL, 2019a; SHABY; BEN-ZVI ASSARAF; TAL, 2019b).
Shaby, Ben-Zvi Assaraf, and Tal (2019a), for example, examined over three years the interactions of students from the fifth to the seventh year of elementary school with the mediators and with the exhibition at the Carasso Science Park (Israel). The visits of 15 groups made up of 15 to 20 children were recorded and analyzed following an interaction protocol. As a result, the authors report that mediators facilitated student engagement through physical instruction and emotional involvement. Bamberger and Tal (2009) analyzed the perceptions of 500 elementary school students about school visits to four museum institutions in Israel, including a science museum, a natural history museum, a botanical garden, and a zoo. The results indicate that zoos had higher scores than other museum institutions regarding emotional and cognitive engagement. In the responses of students who visited the spaces, reports about what they learned and their feelings toward live animals stood out.

Animals trigger interest and curiosity in zoos and aquariums and are responsible for much of their visitors’ emotional responses. Therefore, it is necessary to consider that our ways of interpreting animals' characteristics can influence how we relate to them. Regarding this, previous studies have identified some points that can influence the perception and interpretation of animals.

For example, the taxonomic group (MOSS; ESSON, 2010); displayed behaviors and activities/movements of the animal (MYERS; SAUNDERS; BIRJULIN, 2004); the possibility of anthropomorphizing (RIGNEY; CALLANAN, 2011; ROOT-BERNSTEIN et al., 2013) and the presence of noticeable characteristics that “identify” them as an animal, such as a face with eyes, body, arms and legs (MYERS; SAUNDERS; BIRJULIN, 2004; RIGNEY; CALLANAN, 2011). Perceptions, emotions, and attitudes towards animals can also be influenced by the exhibition environment, such as the enclosure in which the species is located (MOSS; ESSON, 2010; SKIBINS; POWELL, 2013); the perception of animal welfare (HOWELL; MCLEOD; COLEMAN, 2019; PACKER, 2008); the proximity to the animal and the physical interactions provided – such as touch tanks in aquariums (BRISEÑO-GARZÓN; ANDERSON; ANDERSON, 2007; HOWELL; MCLEOD; COLEMAN, 2019; KISIEL et al., 2012; ROWE; KISIEL, 2012).

In general, studies that investigate the emotions provided by encounters with animals in environments such as zoos and aquariums have reported positive results in promoting an experience of empathy or emotional connection; stimulating cognitive processing or creation of meaning concerning species and, also, emotional responses with the potential to generate changes in the pro-environmental behavior of its visitors (BALLANTYNE; PACKER;
Sutherland, 2011; Clayton; Fraser; Saunders, 2009; Falk; Adelman, 2003).

However, as Witcomb (2013) notes, public responses to emotional engagements are highly unpredictable and depend largely on empathy or willingness to engage and be affected in some way. In the same vein, Falk (2021) argues that individuals’ emotional responses are unique and dependent on factors such as culture, education, history and previous experiences, immediate context, etc. Thus, the same experience can provide different emotional responses in its visitors. Based on the above, it is necessary to expand the understanding of the role of emotion in visitor engagement.

As professionals in non-formal education spaces strive to understand and personalize visitors’ experiences (Falk; Dierking, 2000), a greater understanding of how emotions impact learning, pleasure, and the construction of meaning is enhanced. With this, professionals in these spaces can leverage emotion to increase the value and impact of an exhibition for visitors. Therefore, this investigation aims to analyze the emotional engagement of families visiting a Zoobotanical Park.

Methodology

In this exploratory study with a qualitative approach (Minayo, 2001), we sought to analyze the emotional engagement of families in the experience of visiting a Zoobotanical Park. We understand the visiting experience as visitors’ perceptions regarding the animals in the exhibition, the enclosure, the interpretive signs on site, and the educational programs and activities available. In addition, interactions and conversations with your group, with mediators, and with other visitors are considered. To this end, we examined video and audio recordings to observe the types of interaction and conversational content (detailed in item 2.2), seeking to answer: how emotion, from the perspective of engagement, is present in the family visit experience process to non-formal education spaces?

This study was carried out within the scope of the National Institute of Public Communication of Science and Technology and is part of a larger project that aims to understand the experience of visitors to non-formal education spaces entitled “Visitor’s View” (Massarani et al., 2019a; Massarani et al., 2019b; Massarani et al., 2021a; Massarani et al., 2021b). In this case, the role of emotions in a family context supports expanding the growing literature on family interactions and conversations as evidence of
learning in science spaces, specifically a Zoobotanical Park in the Brazilian context. Below, we present details of the methodological procedures, as well as the justifications for our choices.

**Study location**

The data were collected at the Zoobotanical Park of the Goeldi Museum, which is in the urban center of Belém, Pará. Opened in 1895, the park occupies an area of 5.4 hectares and presents a rich diversity of Amazonian fauna and flora. In addition to the Emilio Goeldi Museum – one of the oldest natural history and ethnography museums in the country – part of the park’s landscape complex is a small, century-old aquarium, Jacques Huber, opened in 1911, which brings together around 40 species of fish and reptiles of great cultural and economic importance to the Amazon, administrative and research buildings, and historical monuments. The park has a paid entrance fee of R$3.00 and receives around 215 thousand visitors annually (PARÁ, 2017, 2021).

**Study design and participants**

Two researchers recruited families over three days in September 2018. A specific point in the park was defined, and the first group, made up of at least one adult and one child, was invited to participate in the research when passing through the area. The approach point was established because it is close to the Jacques Huber Aquarium and has a shaded bench that provides greater visitor comfort. For the groups that agreed to participate in the research, the age of each member and their family ties were verified. Those groups with at least one child between 6 and 12 years old and who considered themselves a family group participated in the research.

Families received information about the objectives and ethical issues of the research and were informed about the use of equipment to record the route. The qualitative data consisted of a combination of (1) video recordings using a subjective camera – which allows the participant to record the visit (GLÁVEANU; LAHLOU 2012; MASSARANI et al., 2021a), and provides a record of interactions and conversations between families among themselves and with the exhibition and (2) sociocultural questionnaire applied before the visit, to contextualize the participants’ profile concerning place of residence, age, gender, previous visit to museum institutions, family leisure habits and data for contact.
In this study, the Zoom HD Q2 audio and video equipment was used to record the visit, hanging from a cord around the neck of an adult and a child, due to the number of equipment available (n=2). The visitors themselves made the choice of the members who would carry the equipment. The families conducted the visit in their way, with free time and itinerary. In total, 12 groups (24 adults and 17 children) with different configurations (Table 1) agreed to participate and visited the Zoobotanical Park, including the Aquarium.

Table 1 – Information on visiting members of each family group and visiting time

<table>
<thead>
<tr>
<th>Groups</th>
<th>Location</th>
<th>Members</th>
<th>Adult/relationship</th>
<th>Child (number/sex)</th>
<th>Visit time</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>NI*</td>
<td>3</td>
<td>1 ♀</td>
<td>1 ♂ 1 ♀</td>
<td>9min39s</td>
</tr>
<tr>
<td>G2</td>
<td>Belém (PA)</td>
<td>3</td>
<td>1 ♂ 1 ♀</td>
<td>1 ♀</td>
<td>10min23s</td>
</tr>
<tr>
<td>G3</td>
<td>Oiapoque (AP)</td>
<td>4</td>
<td>1 ♂ 1 ♀</td>
<td>2 ♂</td>
<td>7min36s</td>
</tr>
<tr>
<td>G4</td>
<td>Bacarena (PA)</td>
<td>2</td>
<td>1 ♀</td>
<td>1 ♀</td>
<td>10min43s</td>
</tr>
<tr>
<td>G5</td>
<td>Altamira (PA)</td>
<td>3</td>
<td>2 ♂</td>
<td>1 ♀</td>
<td>6min03s</td>
</tr>
<tr>
<td>G6</td>
<td>Castanhal (PA)</td>
<td>3</td>
<td>1 ♂ 1 ♀</td>
<td>1 ♀</td>
<td>14min42s</td>
</tr>
<tr>
<td>G7</td>
<td>Belém (PA)</td>
<td>3</td>
<td>1 ♀</td>
<td>1 ♂</td>
<td>7min59s</td>
</tr>
<tr>
<td>G8</td>
<td>Belém (PA)</td>
<td>6</td>
<td>3 ♀</td>
<td>2 ♂ 1 ♀</td>
<td>10min05s</td>
</tr>
<tr>
<td>G9</td>
<td>NI*</td>
<td>3</td>
<td>1 ♂ 1 ♀</td>
<td>1 ♂</td>
<td>8min08s</td>
</tr>
<tr>
<td>G10</td>
<td>Belém (PA)</td>
<td>5</td>
<td>2 ♂ 1 ♀</td>
<td>1 ♂ 1 ♀</td>
<td>12min40s</td>
</tr>
<tr>
<td>G11</td>
<td>NI*</td>
<td>4</td>
<td>2 ♀</td>
<td>2 ♀</td>
<td>20min54s</td>
</tr>
<tr>
<td>G12</td>
<td>Ananindeua (PA)</td>
<td>2</td>
<td>1 ♂</td>
<td>1 ♂</td>
<td>12min24s</td>
</tr>
</tbody>
</table>

Source: The authors.
Analytical framework

The proposed analytical framework is based on a conception of emotional engagement in non-formal education spaces that includes expressions determined not only or mainly by internal individual characteristics (intrapersonal), but also by relationships - with other people and other elements (FREDRICKS; BLUMENFELD; PARIS, 2004; MASSARANI et al., 2022a; PEKRUN; LINNENBRINK-GARCIA, 2012; ROWE et al., 2023). In this sense, positive (pleasant) or negative (unpleasant) emotions are considered, concerning the epistemic aspects of learning, triggered by the content covered, a cognitive problem, or even the recombination of previous information with new information.

Therefore, emotions can potentially shape how visitors engage with and process the content displayed in the exhibition. Emotional engagement can also be associated with social relationships, that is, social involvement with peers. For example, on a family visit to a zoo, parents can influence children's emotions by how they conduct conversations and behave and whether they engage them in interactions. They can even trigger family memories that shape emotions. Emotions arising from interaction with the activity and exposure, such as pleasure or boredom during contemplation or interactivity, are also considered.

That said, our analytical focus proposes that emotional engagement is interrelated to learning experiences and behaviors (through gestures and conversations) expressed during interactions with other individuals, with exhibit elements, and with animals in the visiting experience.

Data analysis

Data analysis involved a sequence of steps established in previous research developed by this research group (MASSARANI et al., 2022b; SCALFI et al., 2022) based on studies on emotions and museum audiences. Audiovisual records were uploaded into Dedoose 8.0.23 software and viewed to gain an understanding of families' visiting experiences. Next, excerpts from significant conversations adapted from the analysis method proposed by Ash et al. (2007), Rowe and Kisiel (2012), and Rowe et al. (2023) characterized by: i) having a clear beginning, middle and end; ii) have discursive content related to the exhibition; iii) be an externalized conversation between participants, with themselves or with an imagined other and iv) have linguistic descriptors of emotion (spoken or gestural, the typologies of which are presented in Chart 1).
We gathered these excerpts to explore, develop, and refine analytical themes related to emotion among families, allowing us to describe and explore the nature of emotional experiences. To this end, we transcribed the excerpts applying descriptors of speech intonation, pauses, and voice volume, among others, which are specified in item 2.3.2. Then, we coded the emotions in the families' speeches using discursive emotion descriptors categorized by Emotion Annotation and Representation Language (EARL), Human-Machine Interaction Network on Emotion (HUMAINE) (HUMAINE ASSOCIATION, 2006), and Wheel of emotion (Plutchik, 2001).

The descriptors were grouped into categories, following the Core Affect Model (RUSSEL, 2003, RUSSEL; BARRETT, 1999). The model presents two dimensions with distinct and independent poles: arousal and valence. Valence corresponds to the analysis of pleasant (positive) or unpleasant (negative) sensations experienced and excitement to the fact of feeling active or calm/passive (RUSSEL, BARRETT, 1999; RUSSEL, 2003).

With the categorization and quantification of emotions, we carried out an exploratory and inductive analysis, which aims to understand the phenomenon without prior conceptions and predetermined analytical categories (MINAYO, 2001). Thus, we identified four themes of interest: 1) Construction of meaning and learning in science; 2) Role of adults in promoting engagement; 3) Anthropomorphism (projection of our own experience onto animals) and empathy for animals; and 4) Previous experiences (Chart 1). Each theme represents a personal connection made with the exhibit, another person, or oneself that resulted in emotional responses. It should be noted that themes may overlap in the same section of a significant event. The definition of each category is presented below.

**Chart 1 – Analysis themes for emotional engagement**

<table>
<thead>
<tr>
<th>1. Meaning construction and evidence of learning in science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refere-se às emoções que ocorrem quando as famílias (de maneira individual ou compartilhada) se esforçam para compreender novas informações veiculadas pela exposição. Esse processo é moldado pelas experiências culturais e sociais das famílias. As emoções também são identificadas no processo de aquisição, correção e construção do conteúdo científico específico da exibição.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Role of adults in promoting engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refers to the emotions expressed or felt when adults guide, encourage, comment, encourage children to reconnect with the environment, draw attention and/or redirect children's conversations and thoughts to the animals and/or exhibit.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Anthropomorphism and empathy for animals</th>
</tr>
</thead>
</table>

Revista @mbienteeducação, São Paulo, v. 16, n. 00, e023035, 2023.
e-ISSN: 1982-8632

DOI: 

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It refers to emotions expressed through conversations in which visitors anthropomorphize animals, comparing them to humans and/or attributing humanized intentions or psychological states. It also includes conversations that are imbued with empathy – in which visitors demonstrate that they feel the same emotions that the other is believed to be feeling, that is, an indirect experience of the emotions perceived by the animal.

4. Previous experiences

It refers to the emotions present in an episodic memory shared by families of their previous experiences. Includes references and/or connections to past experiences in other contexts.

Source: The authors.

Transcription code

The transcription code for this study (Chart 2) is adapted from Kasper and Wagner (2014) and Perakyla and Sorjonen (2012) and follows a multimodal analysis – speech, intonation, breathing, gestures, facial expressions, spatial positioning, etc. It is also used to identify the temporal and sequential relationships of dialogues. The adopted coding made it possible to give visibility to a range of verbal and non-verbal resources used by families.

Chart 2 – Transcription convention adopted


Source: The authors.

Results and Discussion

In 320 minutes of videos analyzed, 79 significant events were identified with the application of 19 emotion descriptors, corresponding to 32 minutes. Below, we'd like to highlight the occurrence of each one based on the model adapted from Russel (2003) by Rowe et al. (2023), who applied the descriptors in a museum context. Descriptors with positive valence (high activation) were counted 66 times, and those with positive valence (deactivation) were counted 7 times. The descriptors with negative valence (high activation) 30 times and those with negative valence (deactivation) 10 times, as shown in the following figure (Figure 1).
Figure 1 – Occurrence of the descriptors identified in this study

* Note: The size of the bubble reflects the sum of occurrences of the code in the analyzed dataset.
Source: The authors.

Negatively valenced emotions were counted 40 times in the analyzed conversation excerpts. Emotions with a positive valence were 82.5% more expressive, occurring in 73 excerpts of conversations. Among the most recurrent negative emotions were Doubt (10 times), Disagreement (8 times), and Strangeness and Irritation (5 times each). Among the positive emotion descriptors, the most counted were Surprise (12 times), Curiosity, Excitement, and Enthusiasm (11 times each), and Fun (10 times). The following examples illustrate how such descriptors occurred in family conversations. The title of each section reflects the recurring themes that emerged from the data.
Meaning construction and evidence of learning in science

The theme of Construction of meaning and evidence of learning in science was identified in 72 of the 79 significant events analyzed. The conversations show that positive and negative emotional responses were associated with the excerpts. Curiosity, for example, favored the naming of species (Ex. 1); Enthusiasm stimulated conversations so that characteristics and particularities of animals were discussed (Ex 2). Furthermore, Trust, especially in the adult-child direction, was evident during affirmation and explanation in information sharing (Ex. 3), as the following examples illustrate.

Table 4 – Examples of meaning-making and evidence of learning in science

<table>
<thead>
<tr>
<th>Ex: 1 - Reptile space (G12)</th>
<th>Ex: 3 - Acaris tank (G5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1: WHAT IS IT? [CURIOSITY]</td>
<td>A2: Look, it's this acari, the white one's acari</td>
</tr>
<tr>
<td>A1: It's a turtle (.) It's a:(.) this is a kind of turtle that eats all these things. she: she feeds on dead matter, its neck here is big, here like this</td>
<td>A1: He was in the sand; look how he has nothing but sand in him [ENTHUSIASM]</td>
</tr>
<tr>
<td>A2: Matamata, right? =</td>
<td>C1: Does it bury itself in the sand? [CURIOSITY]</td>
</tr>
<tr>
<td>A1: =matamata</td>
<td>A1: Yeah:: he buries himself [TRUST]</td>
</tr>
<tr>
<td>A2: She's horrible! Very prehistoric = [AVERSION]</td>
<td>A2: [inaudible]</td>
</tr>
<tr>
<td>A1: = Yeah? Here she is, oh how she is</td>
<td>A1: But the place he likes isn't sandy, he likes mud::, he likes places with mud [TRUST; ENTHUSIASM]</td>
</tr>
<tr>
<td>C1: Let me take a closer look dad. [see closer] = [Excitement]</td>
<td>Ex: 4 - Tank with pacu and piau (G5)</td>
</tr>
<tr>
<td>A1: =</td>
<td>A1: Oh, this one is the pacuzinho (.) and this one is the piau [TRUST]</td>
</tr>
<tr>
<td>Ugly! Horrible! look at her face! [aversion]</td>
<td>C1: I wanted to eat a piau:: [FRUSTRATION]</td>
</tr>
<tr>
<td>Ex: 2 - Reptile space (G4)</td>
<td>A1: [laughs] [fun]</td>
</tr>
<tr>
<td>A1: Did you like it?</td>
<td>Ex: 5 - Tank with pacu and piau (G1)</td>
</tr>
<tr>
<td>C1: huh?</td>
<td>C1: [It is very cool! (.) was the boa constrictor sleeping? [ENTHUSIASM; DOUBT; CURIOSITY]</td>
</tr>
<tr>
<td>A1: Did you like seeing the animals? I liked this one. I thought this one was pretty [ENTHUSIASM]</td>
<td>M: They stay like this (.) for most of the day (.) because they are nocturnal (.) then at night they move around more</td>
</tr>
<tr>
<td>C1: What is this one?</td>
<td></td>
</tr>
<tr>
<td>A1: This one is the boa constrictor. The boa constrictor is not poisonous, but it has teeth that bite and this one:: it is not poisonous, but it squeezes its prey, it wraps around the person (sic) until:: it breaks everything and then swallows it whole. She even swallows beef [TRUST; ENTHUSIASM]</td>
<td></td>
</tr>
</tbody>
</table>

Source: The authors.

Positive emotions are those experienced as pleasant (RUSSEL; BARRETT, 1999). Specifically, Excitement has been associated with increased attention, the desire to learn, and retention of facts (BUCHANAN; LOVALLO, 2001). Regarding this aspect, we found that the pleasure observed in moments of Enthusiasm and Excitement – emotions that increase physiological parameters and keep subjects active (RUSSEL; BARRETT 1999) – were
responsible for bringing families closer to animals and directing their attention to finding out more about them.

Curiosity, in turn, occurred in different analyzed excerpts associated mainly with questions. We observed that in most of the significant examples, it was children who initiated questions to adults, as seen in examples 1 and 2. Jirout and Klahr (2012), when discussing the origin of children's scientific curiosity, argue that this emotion is generated by the desire to give meaning to the environment. Furthermore, the authors reinforce that curiosity is motivated by information gaps and leads to exploratory behavior.

In line with these statements, the conversations analyzed in this study provide evidence that Curiosity in adults and children was a driving force for shared cognitive effort, which took place through spontaneous exploration in the face of some novelty or unknown animal. For Sadler (2013), confidence reflects a person’s perception of their ability to achieve a particular objective in a specific situation. In this study, Trust was observed considering how parents affirmed information to their children, as in the sentence A1 (2018): “But the place he likes isn't sandy like that, he likes muːd, he likes places with mud”: [CONFIDENCE; ENTHUSIASM], demonstrating a certain mastery of the topic (although whether the information was correct or not was assessed in this study) and, at the same time, helping to promote learning experiences. Sadler (2013), when analyzing the role of confidence in teaching, found that teachers were more confident when they mastered knowledge of a certain content. Although this study is focused on family relationships, we understand that parental confidence is a determining factor in the way that parents tend to teach their children.

Regarding negative emotional responses, few references in the literature investigated how these emotions are experienced in the museum experience and their impacts on learning. Among the existing studies, we highlight two investigations that specify negative emotional experiences regarding visitors’ perception of animals in aquariums and zoos. Santos et al. (2020) interviewed 103 participants in an educational program at the Georgia Aquarium (Georgia, United States).

As a result, the authors indicate that participants showed emotions of frustration, disappointment, and impatience when they sought to have a close interaction with the animals, but it was not possible. Myers, Saunders, and Birjulin (2004) observed the interaction of 279 visitors in front of the enclosure of three different species: a gorilla, an okapi, and a snake at the Brookfield Zoo (Chicago, United States). The results show that snakes had higher levels of negative emotions, such as fear and aversion, compared to okapi and orangutans.
In our study, as mentioned previously, negative emotions were observed in fewer numbers in family conversations compared to positive emotions. For example, Frustration was displayed only once, when C1 said he wanted to be able to eat a fish from the aquarium (E.g. 4). Strangeness (n = 5) was seen mainly in children, when they were suspicious of the pronunciation of a word or information mentioned by the adult, such as “A1 (2018): Look at the pirarucu baby, this one grows bi:g” [EXCITATION] / C2: “WINN:::OW?” [EXCITEMENT; STRANGEMENT] or A1 (2018): “Look at a stingray [SURPRISE] / C1: A stingray?” [STRANGEMENT; DOUBT].

In turn, the most expressive negative valence descriptors, such as Doubt (n = 10) and Disagreement (n = 8), were not associated with a negative visit experience concerning the animals. Both Doubt and Disagreement were seen as emotions associated with cognition, which favored subsequent discussion in family conversations for skills of comparison, correction, and construction of knowledge to give meaning to what they visualized.

In summary, conversations about Meaning Construction and Evidence of Learning in Science show that emotions and cognition contributed to conversations about science, by naming species and mentioning the physical and physiological characteristics, behaviors, and habits of the animals on display. Kisiel et al. (2012) demonstrated that interactions with live animals can stimulate and support scientific reasoning among family groups. Regarding this, in our study we found that families showed evidence of learning how to compare, discriminate, question, and qualify (ALLEN, 2002), thus showing a level of emotional engagement.

Role of Adults in promoting engagement

The theme of the Role of adults in promoting engagement occurred in 35 of the 79 significant events, with evidence of an active role for adults in the visit experience and family dynamics. Adults encouraged children's engagement with animals, demonstrating Enthusiasm and Excitement with the species viewed. Below are episodes that exemplify such occurrences.
Table 5 – Examples of adults’ role in promoting engagement

E.g. 6 - Bird space (G10)
A1: Flamingos (. ) Look up here, look up here (. )
Here [SURPRISE; EXCITEMENT]
A2: Look [.inaudible] [EXCITEMENT]
A1: Attacking in the carambola =
C1: =COO::L= EXCITEMENT]
A2: = That's why everything is dirty there (h)
C: I can hear its noise::: = EXCITEMENT]
A1: = It's on top, on top of you.

There's one eating up here
[EXCITEMENT]
A2: Look at one up here
[Look:::k] [EXCITEMENT]
A1: = I have a bird looking up at that one eating freely]
A2: There's one here, look. Another one right here,
very close (. ) Look here, look.

Look at that one over there
[EXCITEMENT]
A1: Look:::k what a beautiful little creature::: re
[ADMIRATION; ENCHANTMENT]
A4: Everyone takes a nap at some point =
C1: = The red macaw is so beautiful::! [ENCHANTMENT]

E.g. 7. Reptile space (G5)
A1: Look at the snakes there [EXCITEMENT]
A2: Green snake, huh? [inaudible] [CURIOSITY]
A1: = It's a kind of emerald tree boa.
A2: [It is?]

C1: [Where?]
A1: Some people call it a parrot snake. It is from the boa constrictor family, it [TRUST]
C1: Whe:::re [CURIOSITY; IRRITATION]
A2: Up there, that green thing, on that stick. =
C1: = O: h
A1: (. ) It has no poison

E.g. 8 - Alligator space (G7)
A2: Look on the other side at all the alligators =
[TENSION]
A1: = OHHHH [SURPRISE]
C1: Where? [CURIOSITY]
A1: Where [laughs]=
C1: = Oh, I've seen it here (. ) I've seen it
(. ) WHERE'S THE OTHER ALLIGATOR?

(. ) There was=[EXCITEMENT]
A1: = It's right there
A2: = It's over there=
C1: = No (. ) there are two
(. ) one here and one there =
A2: = They are together (. ) look here, come here
A1: = It's there! It's that big guy over there =
[EXCITEMENT]
A2: = Oh yes
A1: = Let's get out of here because I'm scared [laughs]
[FUN]

Source: The authors.

In common, the examples presented above indicate that adults not only demonstrated empathy and appreciation for wildlife but also engaged children in this feeling. The excerpts above reinforce that adults nurtured positive emotions among children, such as Excitement, Surprise, and Enchantment during the journey (E.g. 6, 7, and 8). The adults also engaged the children through gestures, pointing, and shared attention (POVIS; CROWLEY, 2015), which, in turn, increased the children's focus on the animal targeted by their observation and supported subsequent conversations. Similar results are reported by Zimmerman and McClain (2016), who explored family outdoor learning.

The authors described that adults' use of physical movements and body arrangements, such as physically adjusting children's positions and using other forms of physical touch and movement, are essential strategies for guiding children's participation and supporting learning. Wolf and Wood (2012) compare adults to scaffolding, as they provide conditions for children
to participate in the conversation and expand their knowledge and skills. In line with this statement, we found that conversations led by adults were important for learning experiences, using analogies, reading subtitles, and prior knowledge or previous experiences.

**Anthropomorphism and empathy for animals**

The visit to the Zoobotanical Park provided families with contact with different groups of animals, showcasing the biodiversity inherent to the Museum. During the route, visitors had very close contact with animals that roamed freely in the park, such as the agouti, the lowland paca, the iguana, the mangrove parrot, and the scarlet macaw. Furthermore, in the Aquarium, there were several aquatic animals of economic, scientific, and gastronomic importance in the Amazon region, such as arowana, red-bellied piranha, poraqué (electrophorus electricus), and pirarucu fish.

As the introduction mentions, animal characteristics are important in shaping visitors’ emotional responses (MOSS; ESSON, 2010; MYERS; SAUNDERS; BIRJULIN, 2004; RIGNEY; CALLANAN, 2011). In our study, in 18 of the 79 significant events analyzed, conversations were identified in which families used *Anthropomorphism and empathy for animals*. Episodes that illustrate this code are highlighted in the following examples.

**Table 6 – Examples of anthropomorphism and empathy for animals**

<table>
<thead>
<tr>
<th>E.g. 9 - Monkey enclosure (G10)</th>
<th>E.g. 12 - Watching the turtles (G7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1: Look guys [EXCITEMENT]</td>
<td>C1: Look at that one swimming</td>
</tr>
<tr>
<td>A1: Hi mister monkey</td>
<td>A1: And is?</td>
</tr>
<tr>
<td>C1: He said hi to me Hi, pet [ENTHUSIASM]</td>
<td>C1: It can’t even climb up, poor turtle [WORRY]</td>
</tr>
<tr>
<td>C1: Who said hi to me?</td>
<td>C1: But it’s a good thing a turtle is a water turtle (.)</td>
</tr>
<tr>
<td>A2: Look, it went to hide</td>
<td>Otherwise, it would never be able to get out of the water.</td>
</tr>
<tr>
<td>C1: Hi little monkey [ENTHUSIASM]</td>
<td></td>
</tr>
<tr>
<td>A1: Today they are so quiet. Some days they are so hectic (sic)</td>
<td></td>
</tr>
<tr>
<td>C1: I don’t think [he’ll do ih-ih-a-a]</td>
<td></td>
</tr>
<tr>
<td>A2: [Look at that face. Very suspicious]</td>
<td>E.g. 13 - Reptile space (G6)</td>
</tr>
<tr>
<td>E.g. 10 - Aquarius - Pisces (G11)</td>
<td>C1: Dad, what is the name of this snake?</td>
</tr>
<tr>
<td>C1: What's it doing here? = [CURIOUSITY]</td>
<td>[CURIOUSITY]</td>
</tr>
<tr>
<td>A1: = It’s::</td>
<td></td>
</tr>
<tr>
<td>[camouflaged]</td>
<td></td>
</tr>
<tr>
<td>C2: [Hungry]</td>
<td></td>
</tr>
<tr>
<td>C1: It’s hungry =</td>
<td></td>
</tr>
<tr>
<td>A1: = That's right, it’s hungry</td>
<td></td>
</tr>
<tr>
<td>C1: It has nothing to ea::t [SADNESS]</td>
<td></td>
</tr>
<tr>
<td>C2: That’s why it’s hungry</td>
<td></td>
</tr>
<tr>
<td>C1: I’m going to give a little “yum yum”</td>
<td></td>
</tr>
<tr>
<td>E.g. 11 - Aquarius - piranutabas (G10)</td>
<td></td>
</tr>
<tr>
<td>C1: Look there, up there, there. “Periquitambói”</td>
<td></td>
</tr>
<tr>
<td>C1: Come on::: get out of there, come here! come here [irritation]</td>
<td></td>
</tr>
<tr>
<td>A1: Look, another snake here, look</td>
<td></td>
</tr>
<tr>
<td>C1: What is the name of this snake? = [CURIOUSITY]</td>
<td></td>
</tr>
</tbody>
</table>
A2: Look at the angry face
A1: This one is cross-eyed [laughs] [FUN] (.) Which one is this?
[CURIOUSITY] :::::h piramuta::ba
C1: Dad, what's his name? See it on the sign =
[CURIOUSITY]
A2: PIRA:MUtaba its name
A1: = This one is::: this one I think is the surucucu, let me see here [DOUBT]
(.)Periquitambói is this one: (0.10) This one is ano:ther, one minute: (0.2) This here is the anaconda
It's the sucuri, anaconda look.
C1: Is it the sucuri? It lives in the water, right?
[DOUBT; curiosity]
A1: Yeah::: it lives in the water and the tree, look how it is curled up in the tree.

Source: The authors.

In family conversations, it is possible to observe that visitors anthropomorphized the animals, by attributing human characteristics to the animals on display, such as A2 (2018): “Look at the angry face” (E.g. 11) and A2 (2018): “Look at that face. Very suspicious” (E.g. 9). Still concerning anthropomorphism, our results are like those found by Rigney and Callanan (2011), who investigated family conversations while interacting at the Rocky Reef exhibition at the Seymour Discovery Center (California, United States). The authors found that family speech frequently uses language that tends to anthropomorphize animals, giving them psychological characteristics, such as wanting, thinking, liking, hiding, and resting. Root-Bernstein et al. (2013) argue that the projection of anthropomorphism can bring visitors closer to animals – when true similarities are found –, but it can also distance when people, instead of trying to understand animals and learn more about them, continue to project their experiences, leading to incorrect empathy.

Concerning empathy (the ability to perceive, understand, and care about the animal’s experiences or perspectives), we found that the families’ conversations showed a certain empathic concern, linked to action to alleviate the animals’ suffering, as seen in example 10 “He has nothing to ea::t” [SADNESS] (G13, 2018), and they placed themselves in the animal’s place, almost as if they were experiencing the same situation, as explained in example 12 “It can’t even climb, poor turtle” [WORRY].

In this regard, we share the arguments of Root-Bernstein et al. (2013) that, unless one is an expert in animal behavior, it is unlikely that a person will know what that animal is feeling, which, in turn, can lead to an inaccurate conclusion about the animals’ experiences. Studies investigating perception and empathy towards animals argue that species perceived as familiar – with characteristics and behaviors closer to humans – and aesthetically attractive species tend to provoke a more positive response among visitors (MYERS; SAUNDERS; BIRJULIN, 2004; SERPELL, 2004). Looking at our data, we found that, in the conversations analyzed, this trend
is repeated for mammal species, which in general presented more emotional responses with a positive valence.

Specifically, in the monkey enclosure (E.g. 9) conversations suggest that “being noticed” by the animal was an important aspect and that it aroused positive emotions in the family, such as Enthusiasm and Enchantment. Regarding this, Myers, Saunders, and Birjulin (2004) reinforce that zoo visitors experience more positive emotions when they believe that the animals are paying attention to them or even to other people around them, which, in turn, favors the sense of visitor-animal connection.

Unlike their charismatic counterparts, animals such as insects, fish, invertebrates, and reptiles, whose behaviors may not be easily understood, face cultural barriers to human empathy. For Myers, Saunders, and Birjulin (2004), cultural stigmas, knowledge about the species, and the narrative framework used (language and history used to talk about an animal) favor such an understanding. Hyenas and snakes, for example, arouse more negative emotions in visitors, such as fear or repulsion (HOWELL; MCLEOD; COLEMAN, 2019; MYERS; SAUNDERS; BIRJULIN, 2004). However, contrary to these results, we found that the dialogical interaction of families that took place in front of the serpentarium showed that conversations with positive emotional responses, such as Excitement, Surprise, and Curiosity, were more identified compared to negative emotional responses, as highlighted in example 13.

In the study conducted by Myers, Saunders, and Birjulin (2004), which shows that visitors have more negative emotions about snakes, it is also pointed out that Surprise was one of the feelings that did not change significantly among the animals analyzed: snakes, okapi, and orangutan. This result is an indication that positive emotions such as Surprise, Curiosity, and Excitement are input emotions, that is, those that trigger and direct conversations in an experience with animals. In this way, the input emotions guide families to establish their conversations, trigger their memories, and interpret the information. Consequently, other emotions are constructed individually and in a shared way.

Few studies have examined human perception and empathy toward fish. We highlight the study by Cracknell et al. (2017), who used self-report and physiological measures on visitors after interacting with fish in public aquarium exhibits. The authors provide evidence that the participants’ affective state improved significantly, with reported levels of pleasurable arousal (CRACKNELL et al., 2017). In part, our data also contains several excerpts from conversations in which visitors display the emotion of Excitement toward fish. However, families’ emotional responses fluctuated greatly on the continuum of positive and negative valence. The poraqué,
for example, sparked conversations in family 5, with more negative comments from Tension, such as “I’m afraid of that one, even to look at it [TENSION]” ... “It’s a poraqué, it shocks” and from family 6 with a lot of Excitement and Enthusiasm (E.g. 14, below). We suggest that this result may be associated with the nature of emotions, which are idiosyncratic, reflecting personal interests and motivations, as argued by Falk (2021) and Witcomb (2013).

### Previous experiences

The theme of Previous experiences was identified in 17 of the 79 significant events. Our results suggest that encounters with animals awakened memories and triggered emotions that stimulated conversations about previous experiences. Such conversations also provided ways to promote a more meaningful dialogue between families, as shown in the following examples.

#### Table 7 – Examples of previous experiences

| E.g. 14 - Poraqué tank (G4) | Look, daughter! This fish grows a lot in the stream, there in the river in the sweet water there (.) THERE at the uncle where we take a bath, one of these has already appeared to give it to your uncle there (.) who gets shocked [DISCORDANCE; ENTHUSIASM] |
| C1: Ohh=[EXCITAÇÃO] | |
| A1: Ohh this is poraqué::! Do you know the electric fish I'm talking about? That's that fish! [EXCITEMENT] | |
| C1: Ohh=[SURPRISE] | |
| A1: = It passes [electrical discharge that can even kill a person!] [ENTHUSIASM] | |
| C1: [ohhh] [SURPRISE] | |
| A1: Come here! come see more! (.) [It passes electrical discharge (.)] | |
| C1: [ohhh HAVE ONE MORE!]= [EXCITEMENT; SURPRISE] | |
| A1: [that has power to light up a city] = [ENTHUSIASM] | |
| C1: look! Have one more! = Mom | |
| A1: Oh, my go::! [EXCITEMENT] | |
| A1: Have one more? (.) No, it's the same one that's reflecting up there (.) | |

Source: The authors.

Analyzing the examples, we noticed two main trends in the families’ statements about their previous experiences. The first concerns associating fish with food. Fish are part of the food culture of Pará, and this was reflected in the statements regarding fish, such as mandique, piramutaba, tambaqui, and piau. In example 15, A1 comments that “in Maranhão, we eat a lot”. Other phrases reinforce this occurrence: “Tambaqui, right. I understand more about...”
eating it” [laughs] [FUN] (G1) and “and this one is the piau [CONFIDENCE] / C1: “I wanted to eat a piau::” [FRUSTRATION] / A1: [laughs] [fun] (G5). The second refers to the animal’s contact or prior knowledge of its natural environment, as seen in example 14, in which A1 tells the child that this fish is common in the Igarapé. Or even, in example 3, in which A1 confidently states that the acari “like mːd, he likes places that have mud” [CONFIDANCE; ENTHUSIASM]”. Such conversations may have been employed, perhaps, as a means of enhancing the development of a shared identity among family members and/or continuing a conversation started in the aquarium environment.

In general, these events also proved to be important for the construction of meanings – the process by which people give meaning to a new experience (ZIMMERMAN; MCCLAIN, 2016). Each family had a particular interpretation of their experiences, which varied according to their beliefs, knowledge of science, and cultural context. These are important aspects that led families to form connections with personal meaning.

We suggest that the fact that the Emílio Goeldi Zoobotanical Park presents fauna and flora representative of the Amazon contributed to conversations in which families demonstrate confidence when talking about species, increasing the sense of identity and motivating visitors to discuss topics that are part of their local reality. When visitors are involved in personally relevant themes that involve emotions, there is a greater chance that museum experiences will allow them to consolidate memories that will be remembered later (FALK; DIERKING, 1992).

Final considerations

In this paper, we analyze the emotional engagement of families in the experience of visiting the Emílio Goeldi Zoobotanical Park. The conversations and interactions observed in the 12 groups studied provide evidence that the animals on display evoked positive emotions such as Surprise, Enthusiasm, Excitement, and Curiosity. Furthermore, there are indications that the visiting experience positively impacted families. Our study highlights a smaller number of negative emotions towards zoo animals, such as Tension and Aversion, and emotions, such as Doubt, Disagreement, and Strangeness.

This last group of emotions (Doubt, Disagreement, and Strangeness), in turn, was not associated with an unpleasant experience but rather with statements in which information about animals was discussed, such as the identification or correction of a specific species. From our data, we understand that emotions analyzed as unpleasant (negative) do not necessarily harm
the actions conducted by families during visits. As such, our data shows that emotions – positive and negative – allowed us to stimulate the construction of meaning and learning experiences.

During the visit, the adults demonstrated enthusiasm, motivation, and engagement with the children emotionally and cognitively. To achieve this, adults used strategies such as directing attention and referring to previous knowledge, cultural aspects, and everyday activities to contextualize and facilitate children’s understanding of the more complex topics covered, aiming to give meaning to the exposition. Another factor that influenced visitors’ emotions was related to how families perceived and interpreted the behaviors of the animals on display. In this regard, our data indicate that families tend to anthropomorphize animals as a way of getting closer to them, which favors positive emotions.

Empathy was more associated with a concern for the welfare of animals, which, in turn, evoked negative emotional responses. But, in general, the theme of Anthropomorphism and empathy for animals had a positive impact on the emotional experience of families. Evidence of this is the fact that even animals commonly associated with negative emotional experiences in other studies, such as snakes, or less empathetic, such as fish, had a positive impact on the family’s experience in our investigation. We consider that this result may be directly related to the species on display that are native to the Amazon region and provided families with a sense of identity and emotional connection through (re)cognition of the species on display.

Although additional research is needed to understand emotional engagement in non-formal education environments, our results support studies that show that the emotions present in families’ experiences are associated with cultural, personal, and cognitive aspects and are fundamental to the meaning-making process and learning. However, it is important to remember that this study was conducted with 12 families and, as such, the results cannot be generalized to the entire Brazilian population or even in Belém – nor was our intention. Still, we hope that this study contributes to the understanding of emotions in non-formal education environments and encourages new investigations to expand and deepen the literature on emotions in museums in the Brazilian context.
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**CRedit Author Statement**

**Acknowledgements:** This study was carried out within the scope of the National Institute of Public Communication of Science and Technology, with financial support from the funding agencies National Council for Scientific and Technological Development (CNPq) and Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ). The study is also part of the Biota/Fapesp project (2016/05836-8 – Main researcher Alessandra Bizerra) and the CNPq Universal Notice 2018 (led by Luisa Massarani). The author, Luisa Massarani, thanks the CNPq Productivity 1B Grant and Faperj for the Cientista do Nosso Estado grant. The author, Alessandra Bizerra, thanks the CNPq Productivity Level 2 Grant. The author, Waneicy Gonçalves, thanks FAPERJ for the TCT5 grant. Author Grazielle Scalfi thanks CNPq for her EXP-B grant. We thank Aquário Jacques Huber for allowing data collection and the families who accepted our invitation, enabling the development of this study.

**Funding:** Not applicable.

National Council for Scientific and Technological Development (CNPq) and Carlos Chagas Filho Research Support Foundation of the State of Rio de Janeiro (FAPERJ).

**Conflicts of interest:** There are no conflicts of interest.

**Ethical approval:** The study was approved by the Ethics Committee of the Biosciences Institute of the University of São Paulo (CAAE 72217717.6.0000.5464).

**Data and material availability:** For access, contact the main author of the paper: luisa.massarani@fiocruz.br.

**Authors’ contributions:** We consider that divisions of labor are important for the development and quality of work, but, in this paper, all authors were involved in carrying out the research, in its various processes. Author **Luisa Massarani** coordinated the research from its conception to the writing of the paper, in its various stages. Authors **Alessandra Bizerra** and **Tatiane Venancio** collected the data on-site organized the audiovisual material and participated in reviewing the paper. Author **Waneicy Gonçalves** coded the data in the Dedoose software and subsequently produced the research report under the supervision of Luisa Massarani and Grazielle Scalfi. The author Grazielle Scalfi participated in validating the data and writing the paper, associated with the development of the theoretical framework.

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**Processing and editing:** Editora Ibero-Americana de Educação.

Proofreading, formatting, normalization and translation.