Creating an Interactive QR Code Scavenger Hunt for the Eilat Bird Sanctuary

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Abstract

Rapidly declining bird populations in Eilat, Israel are caused by climate change and human infringement on birds' habitats. The Eilat Bird Sanctuary brings awareness to this issue by hosting community outreach and educational programs. To further promote the sanctuary’s mission, we created educational material for children, ages 6-12, designed to evoke emotions and engage different learning modalities. The educational content was presented in an interactive QR code scavenger hunt that teaches visitors of the sanctuary about birds and nature conservation.

Executive Summary

There is low public awareness of how human activity threatens birds and nature in Israel. Eilat, Israel serves as a stopover point during bird migration, essential for the survival of millions of birds. However, there has been a steady decrease in the number of bird populations passing through Eilat each year. Recent data collected by the Eilat Bird Sanctuary, the sponsor of this project, shows a rapidly declining number of migratory birds in Eilat. Because of the sheer number of bird populations that fly through Eilat every year, this data can be extrapolated to show the global severity of the problem. The decrease in bird populations is attributed to the effects of climate change and the development of birds' habitats for human use. Birds play an integral part in the ecosystem, acting as pollinators as well as controlling insect populations. Thus, creating advocates for bird conservation is critical in protecting biodiversity. The Eilat Bird Sanctuary does this through hosting public outreach and educational programs that promote their message of bird conservation.

Project Goal and Objectives

The goal of this project was to enhance the emotional connection between birds and visitors of the Eilat Bird Sanctuary, creating advocates for conservation within Eilat's local community.

To accomplish our goal, we designed engaging educational material for families that was implemented online; the material was created to cater to different learning modalities and evoke an emotional response in visitors. We created a scavenger hunt that consists of different stations at points of interest around the sanctuary. Each station has a QR code that leads to a web page with part of a story, information about the station, and a different learning activity about the birds that inhabit the surrounding area. All of the educational content on the website was provided by our sponsor. The QR codes cover a range of important topics related to conservation and bird migration as well as topics specific to the Eilat Bird Sanctuary.

Listed below are the objectives we followed to achieve the project goal:

1. Created interactive activities that were accessible for children from ages 6-12 with different learning modalities.
2. Engaged visitors by creating an emotional connection to birds through stories.
3. Implemented learning activities that are accessible online by visitors in the Eilat Bird Sanctuary

Research

We interviewed staff members of two museums in Venice, Italy: the Peggy Guggenheim Collection and the Olivetti Showroom. We also participated in workshops that they created for children. The interviews and activities allowed us to observe and learn about the tactics they employed to make engaging and entertaining learning activities. We spoke with a child psychologist and a professional who works in human-centered product design. From these

interviews, we learned how children of different ages respond to the presentation of learning materials, as well as how to design a professional website geared towards children.

We also researched the four learning modes of Kolb's Learning Theory: Concrete Experience, Active Experimentation, Abstract Conceptualization, and Reflective Observation. In addition, we also studied Renzulli's Teaching Methods: projects, discussions, and games. We researched the three main learning modalities, tactile, auditory, and visual, and how to include them in our interactive activities and the story.

Through research conducted on our own as well as interviews and observations, we understood that introducing material through interactive activities is far more beneficial for children aged 6-12 than simply reading or hearing the material. Engaging children with interactive activities allows them to associate a positive memory with the information they obtained at the sanctuary, connecting them to the material.

Story and Activity Design

A key aspect of the project was to engage visitors, specifically children ages 6-12, by invoking an emotional response. Stories are a proven way to create emotional engagement in children (Nikolajeva, 2013). Thus, we developed a story that takes the visitor on a journey of the sanctuary. The objective of the story was to create feelings of fear, safety, comfort, and adventure, and leave the visitor with a sense of connection to migratory birds, and thus, conservation as a whole. The creation of the story was influenced by the main elements of story writing: characters, plot, language, and tone.

We designed drawings of several different birds seen throughout the sanctuary to lead the visitor through the story. Anthropomorphism directed our character design process of the different birds in the story because that is what appeals to young children. We designed a main character, an Arabian bee-eater named Ozzie, who takes the visitor on a tour of the bird sanctuary. Ozzie uses friendly language to approach the visitor, and then presents information about birds as well as certain challenges birds may face at the sanctuary. Overcoming obstacles with Ozzie, a character that visitors can relate to, engages them by helping them empathize with the struggles of birds. The obstacles in the story were based on natural and human-made obstacles that birds face in the sanctuary and during migration. We designed stations that relate to children's experiences, so that they could form a connection with the material. This was accomplished by including analogies that related bird migration to experiences in daily human life. Characters spoke to each other in a friendly manner and information was delivered in a lighthearted tone to appeal to children. Despite discussing serious topics, we focused on tones of marvel, adventure, and inspiration.

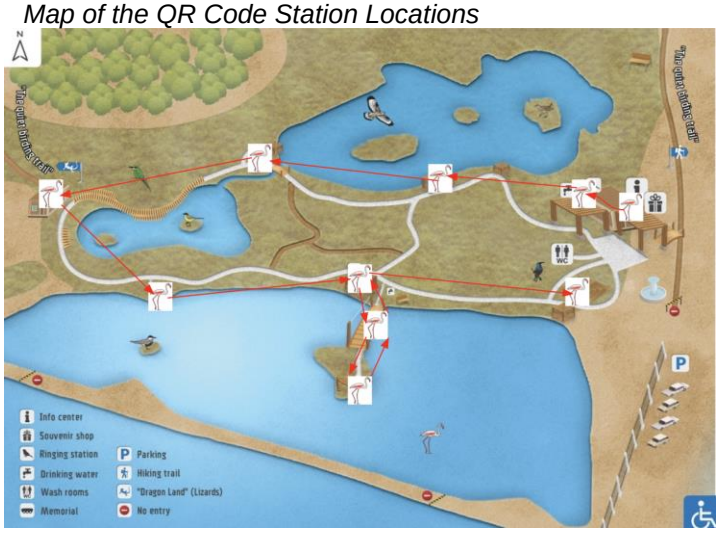
We applied three different learning modalities (tactile, auditory, and visual) in the design of each station. The scavenger hunt was designed to engage at least one of each learning modality, tactile, auditory, and visual, as recommended by the staff at the Peggy Guggenheim Collection. We achieved this through a combination of games, pictures, illustrations, and audio files.

We created a QR code scavenger hunt hosted on a Google website that has educational content regarding important information on birds, migration, and conservation. A map of the QR code locations, each marked by a greater flamingo placeholder, is shown in Figure E.1. The map is located on the front page of the website and can be accessed by scanning the first QR code or clicking the home button.

Each QR code links to a different webpage. Figure E.2 displays the QR code that links to the home page, where the map is displayed. Each QR code was placed by our sponsor at its respective physical location. The webpages were designed with the same template, listed below:

- Story
- Educational content
- Interactive activity
- Preview of the next station

Figure E.1
Map of the QR Code Station Locations



We chose this order so that the visitors are engaged by the story first. After learning new information, visitors solidify what they learned through an interactive activity and then are introduced to the next station. The preview of the next station builds the visitor's excitement as they continue the journey.

Figure E.2
QR Code to Website Home Page

Recommendations

Creating more activities will increase visitor engagement, especially tactile activities that cater to children. Children can also provide valuable end user feedback on the designs of characters and activities, which will help produce a refined deliverable that is more culturally relevant and interesting to them, our target audience.
Our recommendations include:

- Design more tactile activities:
    - Bird identification where visitors can narrow down a list of birds by specifying colors, size, and actions.
    - Identify the differences between two drawings of birds.
    - Add bird tracks on walking paths around the sanctuary.
- Involve children in the design process:
    - Obtain feedback on character design and interactive activities.
- Create a digital photo collage activity where visitors can combine pictures they took with official bird sanctuary pictures, creating a memorable souvenir.
- Translate the website into Hebrew and get feedback from visitors. The font style should be similar to the English version.

The feedback form should be open at all times, so that the product can be improved to better meet the visitors' needs. The new activities should be engaging, but not too complicated or technical for children to learn. If children are unable to understand the activity or if the activity does not load on the visitors' phones, then the activity loses its purpose.

Conclusion

The completion of this project aids in creating community support for the Eilat Bird Sanctuary and their mission. This will create advocates for nature conservation in Eilat, placing pressure on lawmakers and decision makers to protect birds and their habitats. The issues of declining migratory bird populations and nature conservation are global. If this project is proven to be successful, it can be adopted by other sanctuaries and nature reserves to achieve a similar effect.

Our product is designed to invoke a powerful connection to birds by sharing their stories and to educate children on topics related to birds and migration. This inspires people to get involved in their community and promote change. In this way, it fosters a mutual relationship between birds and humans; one that protects the birds, while also solidifying a strong community network.

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1.0 Introduction

Every year, the red-backed shrike, as well as hundreds of other migratory bird species, make a tireless journey, thousands of miles long, between Europe and Africa. During their migration, they face many geographical obstacles, such as the Alps, the Mediterranean Sea, and the Sahara Desert (Tattoni & Ciolli, 2019). For many birds, Israel serves as an oasis, providing a resting and refueling station before resuming the rest of their journey. The Eilat Bird Sanctuary, located on the southern tip of Israel, safeguards these birds. The sanctuary prioritizes the welfare of the birds, while also conducting research on the patterns of migratory birds and local birds in the Southern Arava region.

Increasing human infringement on Israel's land and ecosystems are threatening the welfare of these birds. In Eilat, new construction of hotels to support their tourist industry has decreased the available habitats for birds, contributing to dwindling populations and loss of biodiversity. Support from lawmakers and decision makers is needed to protect bird habitats. The Eilat Bird Sanctuary hopes to accomplish this difficult feat by recruiting local communities to implement change in the environment. Noam Weiss, the director of the Eilat Bird Sanctuary says, "Public opinion, data and knowledge have an impact on decision makers. Their decisions change reality" (Weiss, 2023).

The Eilat Bird Sanctuary aims to increase community support by hosting public education and outreach programs that promote their mission of protecting birds and their habitats. The goal of this project is to spread the Eilat Bird Sanctuary's message to visitors of the sanctuary by creating a QR code scavenger hunt for families. To achieve this goal, we created a scavenger hunt in the sanctuary that achieved the following objectives:

1. Created interactive activities that were accessible for children from ages 6-12 with different learning modalities.
2. Engaged visitors by creating an emotional connection to birds through stories.
3. Implemented learning activities that are accessible online by visitors in the Eilat Bird Sanctuary.

2.0 Background

2.1 Birds

2.1.1 Birds & Migration

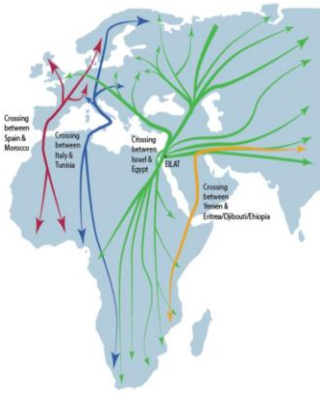
Birds play an essential role in global ecosystems by feeding on pests, spreading seeds, and pollinating plants essential to humans, for both food and medicine. Over 4,000 species of birds migrate, or 40% of all birds in the world (9 Awesome Facts about Bird Migration, 2012). Birds migrate thousands of kilometers across the Earth, in a long and treacherous journey. During migration, billions of birds travel to and from their breeding areas, in intercontinental routes known as flyways (BirdLife International, 2022). During seasonal changes, birds migrate to habitats with a greater availability of food. Changes in the amount of natural sunlight trigger a hormonal response in birds to prepare for their journey (BirdLife International, 2022). Throughout their migratory route, birds face geographic barriers such as mountain ranges, seas, and deserts. Thus, birds must stop at intermediate sites, which act as refueling stations for birds to rest and regain energy for the rest of their journey (BirdLife International, 2022, Tattoni & Ciolli, 2019).

Figure 1
Eilat, Israel
https://earth.google.com

2.1.2 Eilat's Importance to Bird Migration

Eilat, Israel, a city in southern Israel (Figure 1), is a valuable stopping point for birds traveling in the African-Eurasian flyway (shown in green in Figure 2). Stretching from Eurasia to eastern and southern Africa, this journey covers thousands of miles and can take several weeks. Unable to cross over large bodies of water, such as the Mediterranean and Red Seas, birds must travel through Israel, the only land bridge connecting Africa, Asia, and Europe. (Tattoni & Ciolli, 2019). Eilat's salt marshes provide ample vegetation and water for birds in a desert environment. For birds flying south in autumn, Eilat is the last stopping point before a grueling, 3,000 km (1,864 mi) journey across the African desert. For birds flying north in spring, Eilat is the first resting point after the desert (Weiss, personal communication, 2024).

Figure 2
Eilat flyway in green
https://wysinfo.com/migratory-birds-without-boundaries/



2.1.3 Threats to Bird Populations

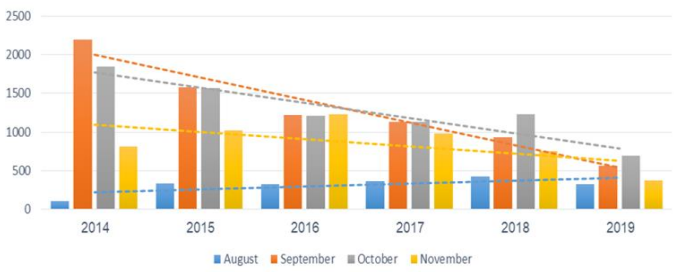
The potential of a mass extinction caused almost entirely by humans will affect global biodiversity, and birds are no exception. According to BirdLife International, one in eight species of birds face the threat of extinction. Habitat degradation, illegal hunting, and collisions with energy infrastructure all pose major threats to birds (BirdLife International, 2022). In 2015, only 9% of over 1,450 migratory bird species in the world had an adequate amount of

protected area throughout their migration journey (Khan, 2015). The effects of climate change will only exacerbate the threats that migratory birds face. Climate change affects seasonal patterns such as migration and breeding (Kirby, et al., 2008) and contributes to desertification, or loss of vegetation in dry climates. Desertification expands the desert, which lengthens the birds' journey and shrinks the available habitat and resources for birds. If left unchanged, both habitat loss and climate change will result in the extinction of numerous bird species (Sternberg et al., 2014).

In Israel, open areas are constantly under threat of being developed (The Society for the Protection of Nature in Israel | IUCN, n.d.). New development causes habitat loss, environmental degradation, and habitat fragmentation, all of which pose immediate threats to over 500 species of birds that live in Israel. Examples of new development in Eilat include hotels and wind turbines. Hotel construction destroys bird habitats and also places birds at risk. In November 2021, Eilat had the highest occupancy in hotels in Israel (72%) to support its booming domestic tourism industry. Discussions to begin construction of 8,000 new hotel rooms started in 2022 ("Hotel Construction in Israel Booming," 2022). In addition, plans to build wind turbines threaten raptors, waterfowl, and sea birds that pass through Eilat because collisions with wind turbines are fatal for birds. Almost 30% of Israel's land is used for agriculture (Agriculture in Israel, 2022). Due to the dry climate, farmers use irrigation to supply enough water for their crops, creating lush, green fields. Although birds will sometimes inhabit these fields, the monoculture fields primarily encourage the abundance of generalist or omnipresent species that compete with specialized migratory bird species for food. All of these factors have an effect on bird populations in Eilat. As seen in Figure 4, there has been a steady decline in the bird populations passing through Eilat during autumn migration since 2014.

Figure 3
Green Fields in Israel
https://www.historycentral.com/Israel/Agriculture.html

Figure 4
Abundance of Migratory Birds Ringed in Eilat by Month and Year
The Eilat Bird Sanctuary, 2023



2.1.4 The Eilat Bird Sanctuary

In the 1950s and 1960s, Eilat experienced a rapid development of land, expanding onto the saltmarshes. As a result, the salt marsh habitats were destroyed. In an effort to restore the natural habitat for birds and so many other species, Eilat underwent a rehabilitation project to recreate salt ponds and expand the salt marsh. In 1993, the Eilat Bird Sanctuary opened on the land that was once home to these salt ponds. It has since become a safeguard to birds by protecting their habitat and promoting nature conservation (Birding, n.d.). The sanctuary conducts key research through their ringing station, where researchers record and monitor the biometrics of migratory birds, checking if they are healthy enough to complete the long migration ahead.

Figure 5
Batumi Birdwatching Festival
https://www.birds.org.il/en/blog/id/9

The Eilat Bird Sanctuary engages surrounding communities in conservation by connecting people to the stories of birds, evoking emotion, and inspiring people to take action. Noam Weiss, the director of the Eilat Bird Sanctuary and the sponsor of this project, states that visitors would assimilate to the sanctuary's mission better if they could form an emotional connection to it (Weiss, personal communication, 2023). He states that, "People say that money and political power drive the world, but emotions are stronger than money" (Israel Science Info, 2023). Conservation efforts to protect flyways and stopover sites for migratory birds, "pass through recruiting [Eilat's] communities and decision makers" (Israel Science Info, 2023). To increase public interest and knowledge, the bird sanctuary has several outreach programs including bird watching, hiking, and observing bird ringing (Birding, n.d.).

Community engagement contributes to the success of the conservation efforts for birds and nature in Israel. Educational environmental programs, such as the ones hosted by the Eilat Bird Sanctuary, increase public awareness and connect people to the critical issues of bird and nature conservation. In the end, the public's connection to birds and nature as a whole influences local decisions and laws that protect the environment.

2.2 Learning & Education

The Eilat Bird Sanctuary envisions creating engaging learning material that promotes their message. They have defined the target audience to be Israeli families with children from ages 6-12. According to the Eilat Bird Sanctuary, visitors either have minimal or basic knowledge of nature and bird conservation (Noam Weiss, personal communication, 2023). This information informs the design and presentation of our material to the sanctuary's visitors.

2.2.1 Environmental Education

Environmental education aids in creating socially and environmentally responsible citizens. It does this by giving the opportunity for students to develop skills and attributes that make them more ethically and environmentally conscious (Krzesni, 2015). The goal of environmental education is to improve attitudes towards the environment and ultimately, foster environmentally friendly behavior. First-hand experiences in nature settings both increase knowledge about nature and create a connection with nature. By forming this connection from an early age, children gain enhanced concern for nature (Oh, et al., 2021, Sellmann & Bogner, 2013). In 2013, students at a German high school participated in a one day environmental education outreach program. Their attitudes on the environment were compared with the attitudes of students from the same school that didn't participate in the program. Results from the study showed that there was a positive correlation between positive environmental attitudes and the environmental education program, suggesting that environmental education programs have an influence on environmental attitudes (Sellmann & Bogner, 2013).

Environmental education programs teach communities about problems in the environment and give opportunities to address the issues. In two case studies conducted in New Zealand, results showed that environmental education had a positive impact on the community's involvement in the environment. Participants were empowered to think critically about environmental issues and thus were more committed to improving the surrounding environment (Blair, 2008).

The Eilat Bird Sanctuary's programs and content are examples of environmental education programs. The sanctuary provides an opportunity for visitors to learn about the local environment, bringing public awareness to the environmental issues that are surrounding them and encourages visitors to get involved in the issue to implement change.

2.2.2 Emotional Engagement

A key goal of the content that we designed was to evoke feelings of empathy and create emotional engagement with the public. Pathos, an argumentative strategy that appeals to emotions, is a way to emotionally connect with the audience (Higgins & Walker, 2012). The goal of pathos is to evoke feelings of pity and empathy.

Empathy, or one's capacity to understand how others feel, emerges in children as young as age four and continues to develop into adolescence. Fiction books can foster feelings of empathy in children through engagement with the emotions of characters. Picturebooks can create emotional engagement through emotionally charged images and words. In addition, it has been found that anthropomorphism, or attributing human qualities to nonhuman characters, can create emotional engagement with nonhuman characters or inanimate objects (Nikolajeva, 2013). The use of metaphors, imagery, and artwork can also be used to appeal to emotions (Higgins & Walker, 2012). Specific to nature, photos of rare animal species can create an intimate connection between the viewer and wildlife, thus stimulating emotions. This method connects people with nature by allowing people to relate to wildlife. By fostering a connection to

nature, people are more likely to support conservation (Molek-Kozakowska & Szymańska-Czaplak, 2022).

2.2.3 Learning Modalities

There are three widely accepted learning modalities: auditory, tactile, and visual. People may associate with one or multiple modalities. Auditory learners are engaged by discussion and listening to information. Tactile learners learn best with hands-on activities and by interacting with materials. Visual learners retain the most information with pictures and diagrams (Three Basic Types of Learning Styles, n.d.). Information that addresses each of these learning modalities will maximize engagement and interest.

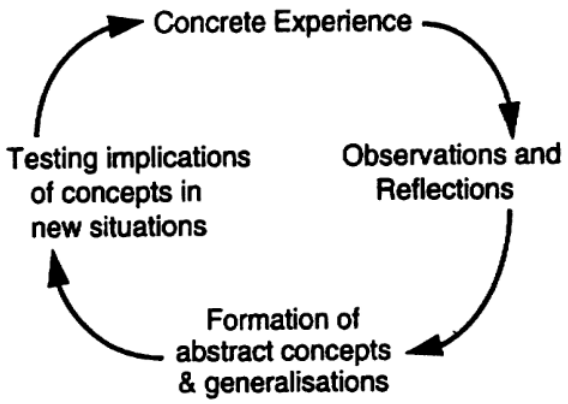
Researchers at the Hebrew University of Jerusalem gave statistical learning tasks to children in Jerusalem aged 5-12. Both sets of tasks involved statistical learning, and the results were compared between ages. Unsurprisingly, age and performance were positively correlated for both sets of activities. However, the visual learners showed a far greater increase in performance than the auditory learners. Therefore, it can be deduced that visual tasks become more suitable for learning as children grow older (Raviv & Arnon, 2018). A similar study conducted by researchers in China found that visual statistical learning improved for children ages 9 to 13, and auditory statistical learning only improved for children from ages 11 to 13 (Ren & Wang, 2022). The results from both studies suggest that visual tasks may be better received by older children.

2.2.4 Learning Styles Research

To foster learning, the Eilat Bird Sanctuary needs to create an experience that resonates with the public. David A. Kolb, an educational theorist, says that “learning is a process whereby knowledge is created through the transformation of experience” (Vince, 1998).

Kolb explains that learning has two dimensions: perceiving information and processing information. Figure 6 shows Kolb's four learning modes that are associated with either of the two aforementioned dimensions. Concrete Experience and Abstract Conceptualization are related to perceiving information. Active Experimentation and Reflective Observation are associated with processing information. People can associate with multiple learning modes. The alternating structure of processing and perceiving information suggests that learning is a continuous and evolving process (Vince, 1998). People who are Concrete Experience oriented prefer discussion with peers. Abstract Conceptualization learners prefer authority-directed learning, with an emphasis on theory and systemic analysis. Active Experimentation learners benefit from engaging and experimental projects. Finally, Reflective Observation learners are more inclined to observation and judgment (Lu et al., 2007).

Figure 6
Kolb's Learning Cycle
https://journals.sagepub.com/doi/abs/10.1177/10525629980220030 4



According to Kolb, learning is facilitated through experience and interaction with their environment. By designing material that addresses Kolb's Learning Methods, visitors will be more engaged, creating a positive and memorable learning experience.

Joseph Renzulli is an American psychologist who created a list of instructional methods that educators can use to increase student engagement. Three methods include projects, games, and discussion (Renzulli, J. S., & Sullivan, E. E., 2009). The project teaching method requires specific learning objectives and scaffolding to steer students in the right direction and support them, respectively. If projects are catered to the audience's interest, they can result in a profound and memorable learning experience. Another learning method is using games, which are inherently alluring to children. Educational games can teach children about various topics, as long as learning objectives are defined. Discussions allow children to hear ideas different from their own, which can give them new perspectives and insights. (Renzulli, J. S., & Sullivan, E. E., 2009).

Kolb and Renzulli have different classifications of learning styles and therefore different opinions on how to create the best learning experience for students. Kolb's research focuses on creating a cycle of learning and applying knowledge. Renzulli provides specific activities that can be used to engage learners with different styles. However, both Kolb and Renzulli both emphasize that a wide variety of learning styles comprise any given audience. Thus, learning about Kolb and Renzulli's classifications provides insight on how to engage learners and create a meaningful learning experience.

2.3 Technical Development

2.3.1 Creating Interactive Activities

Four impactful factors to consider when designing interactive activities are curiosity, challenges, narratives, and visitor participation (Skydsgaard, et. al., 2016). Arguably, the most

vital factor is curiosity because it entices visitors to engage with the activities. Once the exhibit has captured the visitor's curiosity, all the other factors come into focus (Skydsgaard, et. al., 2016). Creating a physical or intellectual challenge pushes the visitor to create a meaningful memory connected to the exhibit. Creating a narrative around the exhibit allows them to build an emotional stake in the issue. Visitors should be allowed to discuss their own thoughts and opinions about the exhibit and create a discussion around the activity. Beyond this, creating a narrative makes an issue or an exhibit more personal for the visitor. Participation can include either physical or dialogic interaction with the activity (Skydsgaard, et. al., 2016). Both types of interactions are valuable for a visitor to create an emotional connection to the exhibit.

Sanctuaries are generally self-guided experiences, and without anyone to direct the activities it is very easy to become overstimulated. Sue Allen, the former Director of Visitor Research & Evaluation at the Exploratorium in San Francisco, suggests creating activities that are understood within a few moments, rather than having complex rules and instructions (Allen, 2004).

2.3.2 Website Design

The intended purpose and audience of a website influences its design. An educational website for children will use different language and information than a news website for adults. The presentability of the website affects the response it will get from its audience. A website with a simple background and warm colors may be more appealing to readers. Font choice is also an important aspect of website design and can be used to increase the charm of the website (Prihatiningsih, et al., 2021).

Websites communicate information in both visual and auditory ways. A study conducted in 2019 found that news websites with multimedia-rich, interactive, and consistent designs had the highest information retention (Al Said, N., & Al-Said, K. M., 2022). One of the components of this project is to communicate educational information about birds, so content delivery methods between this project and news websites are similar. The study found that including pictures and videos helps to break up blocks of text, which makes the content easier to follow. Pictures can also be comprehended faster than text, especially for complex concepts. Websites can be structured as nonlinear or linear, meaning clicking links or scrolling, respectively. Nonlinear website structures are interactive and were better received in this study because they allow the reader more freedom over what they see (Al Said, N., & Al-Said, K. M., 2022). Including a balance of text, audio, and visuals is essential to creating an engaging and interactive website, which will maintain the reader’s interest in the content.

3.0 Observational Research

While in Venice, Italy, our team visited four different museums and participated in learning activities for children. Our observations and experiences at the museums provided the background information to create engaging content for children with diverse learning modalities.

3.1 Museum Visits

After visiting each museum, we responded to a series of questions based on our experiences. The questions aimed to assess how engaging the content was and how well it appealed to the different learning modalities. Next, we synthesized the results to understand which exhibits were most engaging, and why. The questions are below:

- How often did we engage with our team members during the learning activity (on a scale of 1 to 5)?
- How much did the learning activity evoke collaboration amongst peers (on a scale of 1 to 5)?
- Did we observe other visitors collaborating with each other in the learning activities?
- Was there anything in the learning activities that specifically fostered collaboration?
- Was there anything that you found engaging? What modality was it and why was it interesting/engaging for you?

We used collaboration as a measure of engagement because it was easily observable. Other forms of engagement, such as emotional, are difficult to assess in other people without asking them questions about the material. There is a difference (one that we can't measure by observation alone) between scanning content and creating a response to it. While this method may not be the most accurate, we felt that it was a good compromise given our project schedule and intended purpose of the museum visits.

Collaboration, in the form of a discussion, inherently involves engagement with the content because visitors must obtain the information before they can form opinions on it. Collaborative interactive activities also require teammates to communicate with each other to achieve a certain goal, therefore all members must be engaged in the activity.

Our important findings guided the factors we considered while designing content for the Eilat Bird Sanctuary. Beyond this, we observed how people interacted with features at the museums and compared notes to see if we had any similar findings. Our individual notes and survey responses are included in Appendices A through D which include a description of engaging exhibits or activities and our opinions and feedback on them. Below are descriptions of each museum visit and activity and the team's overall findings.

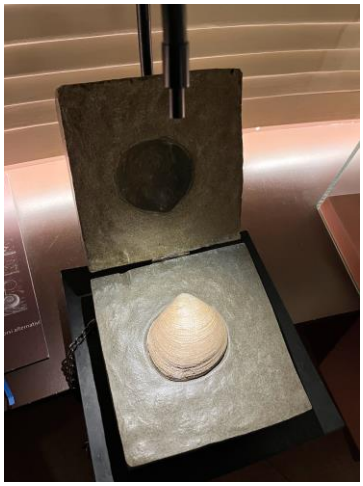
3.1.1 Natural History Museum

We visited the Museum of Natural History and experienced their interactive learning exhibits.

Figure 7
Dinosaur exhibit at the Natural History Museum

The team concluded that the content was presented in an engaging way. As shown in Figure 7, content was placed at different heights: dinosaur footprints on the ground, text and models at acceptable heights for children, and screens hanging from the ceiling. In addition, music and animal noises were played in rooms to engage auditory learners. It gave the different rooms their own character and created an immersive experience. The shell shown in Figure 8 can be taken apart and reassembled, a very clever way to display the entirety of the shell and engage tactile learners. While the museum exhibits had a lot of visuals, there was a lack of informative auditory materials, such as videos.

Figure 8
Tactile exhibit at the Natural History Museum



The team's average score for visitor engagement was 3.75/5. Our score for collaboration averaged to 1.75/5. We agreed that there weren't many collaborative aspects besides discussing exhibits. We observed other visitors discussing the exhibits with each other, however, nothing at the museum explicitly fostered collaboration. Visitors had to take initiative to create discussions based on what they saw as there were only independent activities.

We all enjoyed an interactive table where visitors could choose what they wanted to learn about. At first, we didn't understand how it worked, so we worked together to figure it out. The information about that topic was displayed on a 360-degree screen around the table, engaging all three modalities.

3.1.2 The Human Safety Net

We visited the "A World of Potential" interactive exhibit, hosted by The Human Safety Net. The organization's mission is to help refugees and families in need. The exhibit focused on learning about one's potential by analyzing their personal strengths. While there were clear learning objectives for each activity, the connection wasn't clear between the exhibits and the central mission of the organization.

Figure 9 shows an interactive, technological activity where we wrote what we were

grateful for on a screen, and then printed it onto a ribbon. There were a lot of screens throughout the exhibit, and they had videos or interactive tasks. The various activities addressed the three major learning modalities. Figure 10 shows a technical activity. The activity fostered collaboration by having all four participants work together and communicate with each other to achieve a common goal: move different wheels at the same speed. After participating in the activity together, we agreed that it fostered communication and collaboration. In general, the screens were used effectively to create engaging activities

Figure 9
Ribbons, printing what you are grateful for today

The average score for teammate collaboration at The Human Safety Net exhibit was 4/5. It was more interactive than the Natural History Museum, both in terms of discussing exhibits and having dedicated collaborative activities. The activities fostered collaboration; we gave it an average score of 4.75/5. We observed and participated in two activities that required collaboration. We all observed children and families working together (adults helping children). The exhibit fostered collaboration by creating an interconnectedness between visitors. In addition, it also included various independent activities, where we discussed our experiences with each other. There was at least one activity that engaged each modality: Tactile was most common, followed by visual, then auditory. Team members felt the most engaged with the tactile activities, for example the activity shown in Figure 10: writing what we were grateful for on ribbons. Overall, the collaborative activities were fun and engaging for the whole team.

Figure 10
Collaborative Activity at the Human Safety Net

3.1.3 Peggy Guggenheim Collection

We observed a workshop for fourth graders hosted by the Peggy Guggenheim Collection. It included a guided tour of various paintings in the collection followed by an interactive laboratory. The tour of the Guggenheim Collection engaged children in all three modalities by visually looking at paintings, listening to the descriptions of the art and artist, and touching 3D renderings of the artwork. In the laboratory experience, the children created artwork based on a given theme. Although this was an independent task, they were all seated around one large table, which invited collaboration and idea sharing. Throughout both activities, the children were engaged in discussions, and could share their thoughts and ideas on their artwork and the museum's artwork. As the tour continued, children became less attentive. However,

once the activities switched to tactile learning in the workshop, the children were able to regain focus.

The tour catered to the children's interests and background knowledge. We noticed that the tour guide talked to the children at eye level and allowed them to sit comfortably on the floor of the gallery (Figure 11). The experience presented a plethora of methods that engaged learning modalities and introduced unfamiliar topics, which we applied to our project.

Figure 11
Schoolchildren Participating in a Tour of the Guggenheim Collection

Because we did not participate in the workshop, we did not have a score for teammate engagement. The average score for visitor collaboration was 4/5. As stated above, all of the children shared ideas and artwork throughout the activity. The tour guide asked questions and was actively trying to create an interactive experience for the children. We all agreed that the activity and tour was a strong example of an engaging experience and had many qualities we wanted to emulate in our project.

3.1.4 The Olivetti Showroom

The Olivetti Showroom (Negozio Olivetti) showcases the famous Olivetti typewriters. They have a series of scavenger hunt activities for different ages that teaches children about the history of letters and fonts in Venice and St. Mark's Square. We participated in this activity to learn more about scavenger hunt design geared towards children. We participated in a scavenger hunt designed for sixth grade children.

The activity is designed to be done collaboratively; we had to search for certain inscriptions around St. Mark's Square by solving riddles, so we were sharing our ideas and figuring out where to go. Thus, the average score for teammate engagement was 4.75/5 and the average score for collaboration was 5/5. We did not observe other groups participating in the scavenger hunt, but it was designed for groups of families or students, so we assumed they would have had a similar experience. We thought that Negozio Olivetti did a good job creating an activity using the existing features of St. Mark's Square. This is similar to our project, where we can't build physical structures and instead need to use our creativity to create engaging activities in the sanctuary. The scavenger hunt engages all three learning modalities through different activities. There is another activity inside the showroom, in which students create a newspaper article and type it out on a typewriter, satisfying both tactile and visual learners.

3.2 Conducting Interviews

We interviewed staff members at the Guggenheim collection and Negozio Olivetti as well as a child psychologist to learn how to design engaging activities for our scavenger hunt targeted for children.

The interviews gave us a deeper understanding of the content creation process. Rather than simply mimicking the methods of engagement seen at the Guggenheim and Negozio Olivetti, we learned the reasoning behind the activities and applied those principles to our own project. All of the interviews gave us further insight on how to implement content that is engaging and accessible to a wide audience.

After receiving IRB approval for our various interviews, we began each interview with the following statement:

We are a student team from Worcester Polytechnic Institute (WPI) in Massachusetts, United States. Our project is to create an engaging and accessible learning experience at the Eilat Bird Sanctuary in Israel. This interview will help us design engaging content for our project. Your participation in this interview is voluntary. You may choose to stop participating at any time or skip questions. There are no risks foreseen with this interview. With your verbal consent, information or quotes from this interview may be included in our final report, with credits to you. Thank you for your participation!

The information below represents the most important information gathered from our interviews. An in depth summary of the three interviews can be found in Appendices E, F, and G.

3.2.1 Peggy Guggenheim Collection Staff

We interviewed the staff at the Peggy Guggenheim collection to learn about how they curate different learning activities aimed towards children of different ages. The interview questions focused on the teaching methods used to promote the activity's message and create engagement. The script of questions is as follows:

- Is there a different way that activities are planned or created for adults, compared to children?
- How do you build knowledge on visitors' previous knowledge from what they already know?
- How do you portray a central message/theme through your activities and exhibits?
- How do you engage different learning modalities?

The interview with the staff at Guggenheim gave us insight on how to design learning materials for children as well as how to build upon participants' pre-existing knowledge. They

advised us to first listen to what they know, and then slowly provide more information about the topics that they are interested in. As such, it is beneficial to have the children lead the discussion. Additional information on the topics should be accessible to the children, in order to encourage their curiosity. They explained that it is important to allow for creative expression in the activity because it builds confidence in their learning. Furthermore, it is important to incorporate multiple learning modalities so that no child feels left behind, which the Guggenheim collection achieved through their guided tour and workshop. The staff also advised us to connect the content to their daily lives, so that they could relate more to the material.

3.2.2 The Olivetti Showroom Staff

The questions asked are as follows:

- How did you make the scavenger hunt interesting and engaging?
- How did you convey the message of Olivetti Showroom in the scavenger hunt?
- Did you consider the wide range of ages and learning styles of visitors when creating the scavenger hunt? How were the differences addressed in the scavenger hunt?

The Negozio Olivetti scavenger hunt maintains engagement by placing stations on a less traveled path, inviting the participant to search for meaning in “mundane” locations. The staff member stated that writing down observations associated with each station helps the children remember what they saw and learned during the scavenger hunt. The activities were designed differently based on age groups and audience (student groups or families). The activity for sixth grade children required writing about the things they saw and mostly catered to visual learners. The activity for kindergarteners was drawing the shapes they saw around St. Mark’s Square or finding the bell tower and canals based on their sounds, engaging both the visual and auditory learning modalities.

3.2.3 Child Psychologist

We interviewed a child psychologist to learn about the development of children and their learning needs. Furthermore, we wanted to know differences in the learning styles of younger and older children. The script of questions is as follows:

- How can we make the content engaging for a wide range of children? Wide range of learning modalities?
- What would children find distracting on a website that would disengage them from the environment around them?
- How can we create an emotional response to the content?
- What is the difference between learning in younger children and older children?
- Do children respond better to structured or free-form learning?

Our interview with the child psychologist gave us insight on child development from ages 6-12. We learned that children start to develop a theory of mind as early as six years old, which means they are learning to be empathetic and realizing that other people may not have the

same experiences, thoughts, and beliefs as they do. She also affirmed previous research of ours that children are engaged by different things at different ages.

Younger children often use animals to express their feelings and are engaged by fun graphics and interacting with the activity. Older children are interested in role-playing, games, challenges, and rewards, and are more likely to engage in an activity if their intellectual interest is stimulated immediately. If pre-teenagers and teenagers are not immediately interested in an activity, they will not participate in it.

She advised us to take advantage of our informal learning setting by keeping the focus of the scavenger hunt on the environment. She told us that we should engage the children in a structured activity, then leave room for them to independently explore their surroundings.

4.0 Goal

The goal of this project was to spread the Eilat Bird Sanctuary's message to visitors of the sanctuary by creating a QR code scavenger hunt for families. To achieve this goal, we created a scavenger hunt in the sanctuary that achieved the following objectives:

4. Created interactive activities that were accessible for children from ages 6-12 with different learning modalities.
5. Engaged visitors by creating an emotional connection to birds through stories.
6. Implemented learning activities that are accessible online by visitors in the Eilat Bird Sanctuary

We created a scavenger hunt that consists of different stations at points of interest around the sanctuary. Each station has a QR code that leads to a web page with information about the station, and a different learning activity about the birds that inhabit the surrounding area. All of the educational content on the website was provided by our sponsor. The QR codes were placed in their specific locations by our sponsor. The QR codes covered a range of important topics related to conservation and migration as well as topics specific to the Eilat Bird Sanctuary.

5.0 Methods

5.1 Learning Modalities - Stations

The three different learning modalities (tactile, auditory, and visual), Kolb's Learning Theory, and Renzulli's teaching methods were applied in the design of each station.

Visual, Auditory, and Tactile Learning Modalities

We designed the activities to engage a combination of the tactile, auditory, and visual learning modalities, as recommended by the staff at the Peggy Guggenheim Collection. This was achieved through the combination of games, pictures, illustrations, and audio files. Each station engages a different learning modality which includes an activity that participants complete before moving onto the next station. Our observations at the Peggy Guggenheim Collection also indicated that children retained the most focus and attention during the beginning of the presentation (when visual and auditory learning was engaged). However, once they reached the end of the presentation, they were less attentive and became restless, so the tour guide switched to tactile activities. We considered this information when determining the order of stations, by including more tactile activities towards the end of the scavenger hunt.

Kolb's Learning Theory

We designed stations that engaged the four learning modes of Kolb's Learning Theory. For those who associated with Concrete Experience, we asked questions to prompt topics for discussion. They were used to relate content to the visitors' personal experiences. Projects/Active Experimentation was invoked through hands-on activities that could be done at home. These projects were intended to be done by the whole family and a way for them to remember their experience at the bird sanctuary. We addressed Abstract Conceptualization through authority-directed learning with an emphasis on theory. Reflective Observation was engaged through several activities prompting visitors to look at their surroundings.

Renzulli's Teaching Methods

We included games in stations, such as matching games and a maze that challenged the visitors and reinforced their knowledge relating to birds and conservation. The other two methods -- projects and discussions -- are included in the previous section.

5.2 Emotional Engagement - Story Development

As communicated by our sponsor, evoking emotion was the most important aspect of the project. Stories are a proven way to create emotional engagement in children (Nikolajeva, 2013). Thus, we developed a story that takes the visitor on a journey of the sanctuary. The

creation of the story was influenced by the main elements of story writing: characters, plot, language, and tone. The objective of the story was to create feelings of fear, safety, comfort, and adventure, and leave the visitor with a sense of connection to migratory birds, and thus, conservation as a whole. Ultimately, the goal of the project was to create feelings of empathy and inspire visitors to help the birds.

Characters

The development of characters was used as a way to foster a connection between children and the birds of the sanctuary. After talking with the child psychologist, we learned that young children resonate with anthropomorphism, which directed our character design process of the different birds in the sanctuary.

We chose the Arabian bee eater as our main character because of its appearance and significance. The bird features bright shades of blue and green on its body, which appeals to the younger audience. The Arabian bee eater is significant because it is present at the sanctuary for the entirety of the year. The main character, Oswald (Ozzie), was given human qualities, such as the ability to speak, and helped progress the story, as well as move visitors throughout the sanctuary. We also created side characters, which were other birds that inhabit or migrate to the sanctuary. These birds taught the visitors that the sanctuary is important for many species of birds.

Plot

Overcoming obstacles engages learners by helping them empathize with the struggles of birds. In the story, Ozzie overcame various obstacles as the story progressed. The obstacles in the story were based on natural and human-made obstacles that birds face in the sanctuary and during migration.

Language & Tone

Both the child psychologist and the staff at the Peggy Guggenheim Collection advised us to design stations that relate to children’s experiences, so that they could form a connection with the material. We accomplished this by including analogies that connected bird migration to experiences in daily human life. In addition, characters spoke in a friendly manner to each other. Information was delivered in a lighthearted tone to appeal to children. Despite discussing serious topics, we focused on tones of marvel, adventure, and inspiration.

5.3 Website Development

Figure 12
Oswald the Arabian bee-eater (First Edition)

We had multiple meetings with a professional website designer who works in human-centered product design. She provided us with insight on the fonts and colors for the website, as well as how to make the website engaging for families with children. In addition, she helped us refine our station ideas so they could be implemented on a website. She also advised us on how to approach communications with our sponsor, regarding the design of the main character of the scavenger hunt. After receiving feedback from our sponsor on the design of the bird in Figure 12, we revised the design to include the bee eater's unique long beak and overall body shape. Figure 13 depicts the final design of the bird, which is a more accurate representation of an Arabian bee-eater.

Figure 13
Oswald the Arabian bee-eater (Final edition)

5.4 Limitations

Through communication with our sponsor, we learned that there is no public Wi-Fi at the sanctuary. However, visitors can access the website with cellular data through their phones. Because of this, we decided against using content with large file sizes (such as long videos or high resolution images), so that people can access it wherever they are in the sanctuary.

There are cultural and educational differences between Venice and Eilat. We used the same principles and ideas seen in Venice to design our interactive activities. To minimize the impact of cultural differences, we asked the sponsor for his feedback on our ideas throughout the design process, and revised our content as needed. We had weekly meetings with our sponsor to update him on decisions and to discuss our ideas.

6.0 Results

The results section provides an overview of each station of the scavenger hunt, including the story, information, activity, and emotions.

We created a QR code scavenger hunt hosted on a Google website (Appendix H) that has important information on birds, migration, and conservation. Each QR code links to a different webpage, and each page was designed with the same template, listed below:

1. Story
2. Educational content
3. Interactive activity
4. Preview of the next station

We chose this order so that the visitors would be engaged through the story first. After learning new information, visitors solidified what they learned through an interactive activity, and then were introduced to the next station. The preview of the next station built the visitor's excitement as they continued the journey. Using the same template for each web page gives visitors a sense of familiarity and improves navigability during their experience.

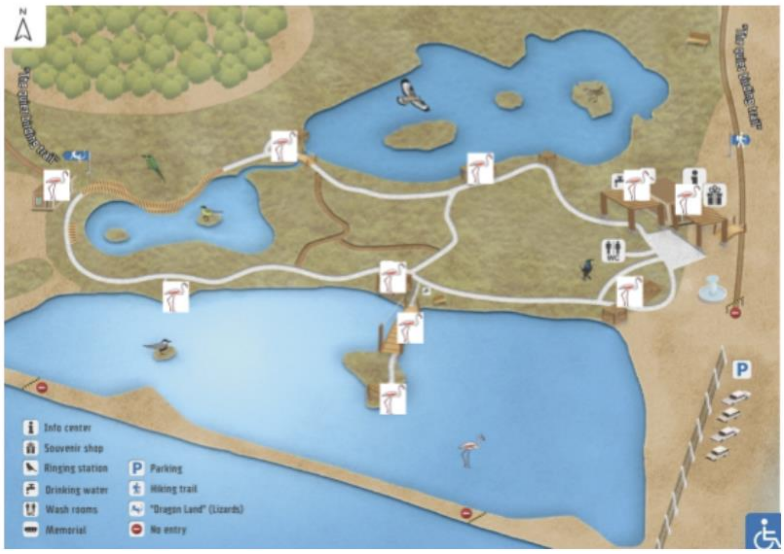
6.1 The QR Code Scavenger Hunt

Below are the stations in the QR scavenger hunt, including their activities, associated learning modality, and story.

6.1.1 Welcome to the Eilat Bird Sanctuary

The first station is the introduction to both the story and the scavenger hunt. The main character, Ozzie, is introduced. Ozzie serves as the sanctuary's tour guide, directing visitors to each station.

Figure 14
Map of Station Locations



An overview of the station locations is shown in Figure 14. Each station is marked by a picture of a greater flamingo, a migratory species that inhabits the sanctuary. A fun fact is given about Arabian bee-eaters, and Ozzie asks the visitor the preliminary question of “What is your favorite bird?”, engaging in concrete experience with Kolb’s Learning Theory. The visitor is then encouraged to share their answer with their friends or family, beginning the engagement and collaboration that the product emphasizes.

6.1.2 Preparation for our Journey

The second station moves the visitor to the ringing station at the bird sanctuary to introduce the concept of migration and migratory birds. Visitors can watch staff conduct the ringing process, engaging visual learning. On the website, the visitor learns about migration. There is no interactive activity at this station; it just introduces the visitor to the journey they will be embarking on with the rest of the QR codes.

6.1.3 Lake Anita

At Lake Anita, the visitor encounters two other birds with Ozzie. The two birds, a little grebe named Caleb and a night heron named Abel (Figure 15), are stopping to rest at the lake before continuing their migration journey. The visitor is then engaged with a visual learning activity, where they have to spot a little grebe swimming in a picture of the lake (Figure 16). After finding it on the website, they are encouraged to look at the lake in real life and see if they can spot a little grebe and time how long the grebe dives for.

Figure 15
Caleb the little grebe (left) and Abel the night heron (right)

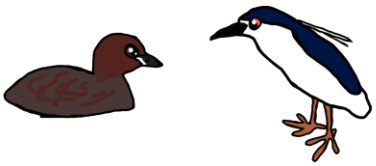


Figure 16
Where's Waldo activity for the "Lake Anita" station

6.1.4 Salt Marsh

At the next station, Ozzie introduces a rest spot, the former location of the salt marshes. The rufous-tailed bush robin Dalia, shown in Figure 17, is introduced in the story. Information and fun facts are given about both the graceful prinia and rufous-tailed bush robin, two bird species that are commonly found in the area. Additional information about the salt marsh and its importance is displayed to highlight the sanctuary's mission of restoring habitats for birds. This transitions into the activity of the station, the QR code food hunt, engaging tactile learning.

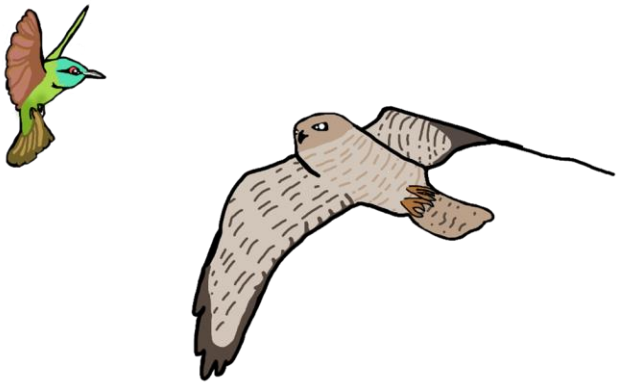
The visitor is tasked to search for additional QR codes as they walk to the next station, keeping them engaged during the long walk. The food hunt features two QR codes: one about the insects at the Eilat Bird Sanctuary and one about nectar. The first QR code leads to a web page that describes the bird and insect relationships in the sanctuary. The web page also highlights how birds help the sanctuary stay healthy by feeding on pests. Then, it asks the visitor to continue looking for the second code.

Figure 17
Oswald the Arabian bee-eater (left) and Dalia the rufous-tailed bush robin (right)

The second QR code contains information about nectar. The importance of birds being long range pollinators is highlighted in this station, and at the end of the station, the visitor is asked what they learned. The station concludes with a short preview of the next station: Predator and Prey.

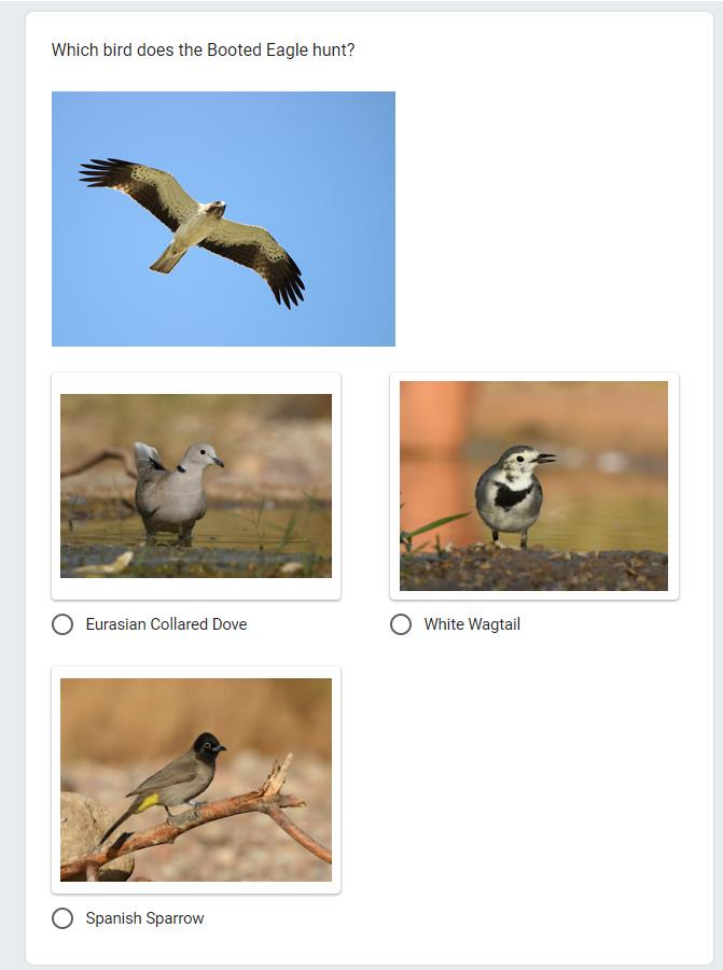
6.1.5 Predator and Prey

Figure 18
Oswald the Arabian bee-eater (left) and Daniel the levant sparrowhawk (right)



At the Predator and Prey station, which is located at the hut, the visitor is introduced to the relationship between predators and prey. Ozzie and the visitor meet Daniel, a levant sparrowhawk (Figure 18). Daniel chases Ozzie, evoking a feeling of fear. The visitor is advised not to villainize the predator, and that predator/prey relationships are simply part of the circle of life. After the short informational section, the visitor is presented with six birds (three predators and three prey) and they are encouraged to guess which predator eats which prey, as pictured in Figure 19.

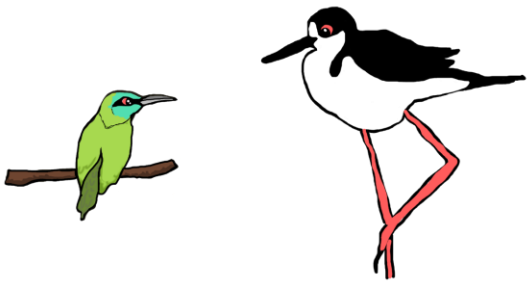
Figure 19
Predator and Prey matching activity



6.1.6 Safety from Predators

After Predator and Prey, the visitor is led to the breeding island, where prey birds feel a sense of safety away from predators. Here, Ozzie and the visitor meet a black-winged stilt, Asher (Figure 20). Since the nature of the breeding island is to find a mate, the visitor is encouraged to participate in an auditory activity that relates to communication. The visitor plays an audio file that contains a bird call, and they have to choose, from an answer bank, which bird makes that call. This activity engages auditory learners.

Figure 20
Oswald the Arabian bee-eater (left) and Asher the black-winged stilt (right)



6.1.7 Migration

At the beginning of the migration station, the visitor is given information about the migration of birds that pass through Eilat from all over the world. An impressive figure is given for the length of the migration, and the visitor is asked to compare it to their own long journeys. The activity for this station is a quiz, similar to the previous two stations. For each question, the visitor is shown a picture of a shorebird and has to guess which species it is. Throughout the three questions, the difficulty increases to challenge the visitor. The station ends with Ozzie telling the visitor that the journey over the bridge will be similar to that of a bird's migration over the land bridge that is Eilat.

6.1.8 Resting on the Land Bridge

Ozzie then moves to the bridge, which symbolizes Israel as the land bridge between Europe and Africa. He sees Asher again, who tells the visitor about the land bridge and its importance in migration.

Figure 21
Tamar the greater flamingo

The information relates to why migratory birds have to utilize the land bridge during their journey. Below the information are pictures of bird tracks, and visitors can click on them to visit a separate webpage with information on the birds that created those prints. This part of the story evokes feelings of exhaustion as well as marvel and wonder.

The two pages contain information on the greater flamingo Tamar (Figure 21) and the little stint Yael (Figure 22). The two birds both share fun facts about their species and why the sanctuary is a good resting point for them, relating back to the overall importance of the sanctuary. After the visitor returns to the main page, Ozzie is ready to continue the tour, and introduces the island.

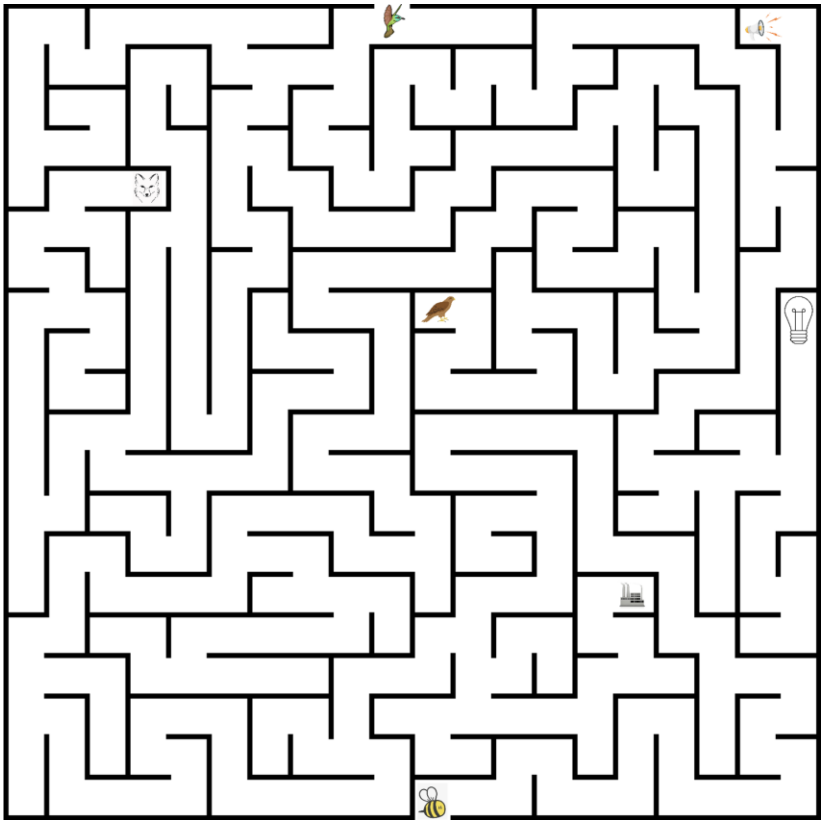
Figure 22
Yael the little stint

6.1.9 Effects of Pollution

In the pollution station at the island after the bridge, Tamar returns because greater flamingos are near the island. The view from the island includes the city of Eilat and a salt factory. The content of the station revolves around pollution and how it affects birds. The topics of light and noise pollution are both discussed because visitors are familiar with them and interact with the sources of these pollutants in their daily life. The activity for this station is a maze where the visitor has to help Ozzie get through it without

running into obstacles such as predators and pollution (Figure 23). This activity engages tactile learners.

Figure 23
Maze activity for the "Effects of Pollution" station



6.1.10 Continue Conservation at Home!

At the conclusion of the scavenger hunt, Ozzie thanks the visitor for going along with him on a tour of the sanctuary. The visitor is then encouraged to support the sanctuary, through donating or buying something at the gift shop, or support bird conservation by setting up a simple bird feeder at home. There is a link to a blog that discusses creating a paper plate bird feeder with common household materials. At the bottom of the page, the visitor can see all of the birds that they met on the journey, wishing them goodbye and thanking them for coming along on the tour, as seen in Figure 24.

Figure 24
The entire cast of the Eilat Bird Sanctuary story

7.0 Discussion and Recommendations

7.1 Learning Modalities

Through interviews with museum staff, we saw firsthand how learning modalities factor into designing activities for children. When creating activities, we considered how to address all learning modalities to increase the effectiveness of the activities. There is something for everyone; a tactile activity for those who learn better through engaging with their environment, an auditory activity for those who learn better through listening, and a visual activity for those who learn best through observing. We used multiple learning theories from Kolb and Renzulli to design activities. Below are some ideas to further address different learning modalities.

A future team could incorporate a bird identification activity, which would allow visitors to enter information about the physical characteristics and behaviors of birds they see, and then get a list of birds that match the criteria. This activity takes inspiration from an activity at the Human Safety Net. At the Human Safety Net, questions are given where the visitor is asked to rank themselves based on a human quality. At the end of the activity, the visitor is presented with the quality that most represents them, similar to how this activity would return a bird that best fits the description given. This would look like a questionnaire asking the user the following questions, with selectable answers:

Q: What color is the bird? Select up to 3 colors.
    A: red, orange, yellow, green, blue, black, gray, white, pink
Q: What size was the bird?
    A: several clickable image sizes
Q: What was the bird doing?
    A: swimming, flying, feeding, diving, pecking at the grass
Q: What was the bird eating?
    Fish, nectar, insects, N/A, other

With each answer, the list of birds will become smaller, until a short list of birds is returned to the user. All of the information needed to create this activity is available at the bird sanctuary. This is a simple coding problem that can be implemented by a future IQP group or website developer.

Similarly, an activity that could be implemented in the future is asking visitors to identify differences between two pictures of the same bird with minute differences. During the scavenger hunt at Negozio Olivetti, the group was asked to find differences between a unique clock tower and a typical one, utilizing the same thought process that would be involved with this activity. The visual activity from Lake Anita is similar to the scavenger hunt that we participated in at Negozio Olivetti. Both activities invite participants to look around their surroundings for existing features of the location.

We suggest that the Eilat Bird Sanctuary create tactile activities by adding more to the immediate environment around the walking path. For example, they could add bird tracks made out of stone onto the walking path and an activity for children to identify which species of bird the footprint belongs to. The Natural History Museum did this by having content surrounding every room, engaging the visitor at all times. For example, the exhibit had fossilized dinosaur footprints embedded in the ground, other fossils and bones at both waist and eye level, and plastic iterations of animals hanging from the ceiling.

7.2 Emotional Engagement

In the future, children should be more involved during the creation process of the activities. We suggest conducting research and interviews with children that match the demographic of the target audience. While we were able to observe children participating in activities and speak with those who designed the activity, we were unable to hear the children's opinion on their favorite and most engaging activities. In addition, we were unable to talk with Israeli children, our target audience.

A photo collage where visitors can use pictures from the sanctuary's database and pictures from their visit can be implemented in a future project. This activity is both collaborative and creative, which will appeal to visitors of all ages. The photo collage idea would align with Renzulli's teaching method of projects and mimic the Guggenheim Collection's activity of creating something that can be taken home. Posting the collage on social media would promote the sanctuary, increasing awareness about bird conservation and nature conservation. Allowing visitors to create personalized souvenirs will help maintain the emotional connection they made to nature and birds.

7.3 Website Development

Migrating our entire Google Site onto the bird sanctuary website will make it easier to manage and update. The bird sanctuary's website will also have more functionality and capability to include additional interactive activities.

In the future, a series of feedback forms that ask about the engagement of the story and activities should be implemented. The visitors' feedback will help with future design and edits. It will be useful to have access to website metrics to view which pages are frequently visited and revise the website accordingly.

All written components of the project will need to be translated into Hebrew, and for future projects, ample time should be given to translate into Hebrew if testing is to occur during the project term. Most visitors are from Israel and speak Hebrew as a first language. Therefore, they would be more likely to relate to and understand the website if it were in Hebrew. The font in the Hebrew version must be chosen carefully, as fonts are another aspect of website design that affects engagement and retention. The original website font was carefully chosen to appeal to children, and the chosen Hebrew font should have a similar effect.

8.0 Conclusion

Many people are unaware of the challenges that birds face. The Eilat Bird Sanctuary strives to combat this issue by gaining community support through outreach and educational programs. By gaining support for the issue, they can influence the decision of law and decision makers on policies that will help birds.

The team created a paperless, interactive learning experience that educates visitors on the sanctuary's purpose to further increase community engagement of the Eilat Bird Sanctuary. The deliverable included activities that engaged different learning modalities and a story that created an emotional response. When visitors create an emotional connection to nature conservation, they are compelled to support the cause.

Creating educational material that evokes emotion and addresses a variety of learning modalities and styles can result in a memorable and engaging learning experience. The completion of this project aids in creating community support for the Eilat Bird Sanctuary and their mission. This will place pressure on lawmakers and decision makers to protect birds and their habitats, synergizing with the mission of the sanctuary. Endangered species and nature conservation are global issues. If this project proves to be successful, it can be adopted by other sanctuaries and nature reserves to promote nature conservation.

References

9 Awesome Facts About Bird Migration. (2012, October 11). Audubon. https://www.audubon.org/news/9-awesome-facts-about-bird-migration

Agriculture in Israel. (2022). History Central. https://www.historycentral.com/Israel/Agriculture.html#google_vignette

Allen, S. (2004). Designs for learning: Studying science museum exhibits that do more than entertain. Science education, 88(S1), S17-S33.

Al Said, N., & Al-Said, K. M. (2022). The effect of visual and informational complexity of news website designs on comprehension and memorization among undergraduate students.

BirdLife International. (2022, January 1). Who We Are - BirdLife International. Retrieved from https://www.birdlife.org/about/who-we-are

Blair, M. (2008). Community Environmental Education as a Model for Effective Environmental Programmes. Australian Journal of Environmental Education, 24, 45–53. https://www.jstor.org/stable/44656500

Birding. (n.d.). Eilatbirds.com. Retrieved November 27, 2023, from https://eilatbirds.com/en/birding.aspx

Higgins, C., & Walker, R. (2012). Ethos, logos, pathos: Strategies of persuasion in social/environmental reports. Accounting Forum, 36(3), 194–208. https://doi.org/10.1016/j.accfor.2012.02.003

Hotel construction in Israel booming. (2022, September 1). Globes. https://en.globes.co.il/en/article-hotel-construction-in-israel-booming-1001397875

Khan, A. (2015). Threats to migratory birds is an issue without borders. Los Angeles Times https://www.proquest.com/newspapers/threats-migratory-birds-is-issue-without-borders/docview/1739350934/se-2

Kirby, J. S., Stattersfield, A. J., Butchart, S. H. M., Evans, M. I., Grimmett, R. F. A., Jones, V. R., O'Sullivan, J., Tucker, G. M., & Newton, I. (2008). Key conservation issues for migratory land- and waterbird species on the world's major flyways. Bird Conservation International, 18(S1), S49–S73. https://doi.org/10.1017/s0959270908000439

Lu, H., Jia, L., Gong, S., & Clark, B. (2007). The Relationship of Kolb Learning Styles, Online Learning Behaviors and Learning Outcomes. Journal of Educational Technology & Society, 10(4), 187–196. https://www.jstor.org/stable/jeductechsoci.10.4.187

Israel Science Info. (2023). Retrieved from https://www.israelscienceinfo.com/en/environnement/cop-15-biodiversite-lobservatoire-de-migration-des-oiseaux-deilat-israel-est-lun-des-plus-importants-au-monde/

Krzesni, D. (2015). ENVIRONMENTAL EDUCATION. Counterpoints, 503, 9–18. https://www.jstor.org/stable/45136517

Molek-Kozakowska, K. & Szymańska-Czaplak, E. (2022). "Nature needs you": discursive constructions of legitimacy and identification in environmental charity appeals. Text & Talk, 42(4), 499-523. https://doi.org/10.1515/text-2020-0075

Nikolajeva, M. (2013). Picturebooks and Emotional Literacy. The Reading Teacher, 67(4), 249–254. https://www.jstor.org/stable/24573569
Oh, R. R. Y., Fielding, K. S., Nghiem, L. T. P., Chang, C. C., Carrasco, L. R., & Fuller, R. A. (2021). Connection to nature is predicted by family values, social norms and personal experiences of nature. *Global Ecology and Conservation*, *28*, e01632. https://doi.org/10.1016/j.gecco.2021.e01632
Prihatiningsih, W., Damayani, N. A., Suryana, A., & Perbawasari, S. (2021). Website Creation as a Means of Fulfilling Muslim Funeral Information Needs Amid Covid-19 Pandemic. Library Philosophy and Practice, 1–7.
Raviv, L., & Arnon, I. (2018). The developmental trajectory of children's auditory and visual statistical learning abilities: modality-based differences in the effect of age. *Developmental Science*, *21*(4), e12593-n/a. https://doi.org/10.1111/desc.12593
Ren, J., & Wang, M. (2023). Development of statistical learning ability across modalities, domains, and languages. Journal of Experimental Child Psychology, 226. https://doi.org/https://doi.org/10.1016/j.jecp.2022.105570
Renzulli, J. S., & Sullivan, E. E. (2009). Learning styles applied: Harnessing students' instructional style preferences. In L. Zhang & R. J. Sternberg (Eds.), Perspectives on the nature of intellectual styles (pp. 209–232). New York: Springer Publishing.
Sellmann, D., & Bogner, F. X. (2013). Effects of a 1-day environmental education intervention on environmental attitudes and connectedness with nature. European Journal of Psychology of Education, 28(3), 1077–1086. https://www.jstor.org/stable/23581537
Skydsgaard, M. A., Møller Andersen, H., & King, H. (2016). Designing museum exhibits that facilitate visitor reflection and discussion. Museum Management and Curatorship, 31(1), 48-68.
Sternberg, M., Gabay, O., Angel, D., Barneah, O., Gafny, S., Gasith, A., Grünzweig, J. M., Hershkovitz, Y., Israel, A., Milstein, D., Rilov, G., Steinberger, Y., & Zohary, T. (2014). Impacts of climate change on biodiversity in Israel: an expert assessment approach. Regional Environmental Change, 15(5), 895–906. https://doi.org/10.1007/s10113-014-0675-z
Tattoni, C., & Ciolli, M. (2019). Analysis of Bird Flyways in 3D. ISPRS International Journal of Geo-Information, 8(12), 535. https://doi.org/10.3390/ijgi8120535
The Society for the Protection of Nature in Israel | IUCN. (n.d.). Iucn.org. Retrieved November 19, 2023, from https://iucn.org/our-union/members/iucn-members/society-protection-nature-israel
Three Basic Types of Learning Styles. (n.d.). Retrieved December 13, 2023, from https://www.online-distance-learning-education.com/learning.html
Vince, R. (1998). Behind and beyond Kolb's Learning Cycle. Journal of Management Education, 22(3), 304–319. https://journals.sagepub.com/doi/abs/10.1177/105256299802200304
Weiss, N. (2023, June 2). ציפורים, פורטל צפרות - אתר הצפרות הישראלי. https://www.birds.org.il/en/article/Noam-Weiss-Accomplishments-of-2022-and-challenges-for-2023-June-2023

Appendices

Appendix A: Natural History Museum Responses and Observations

	Jesse	Sarah	Michael	Tyler
How often did we engage with others (our team members) throughout participating in the learning activity (on a scale of 1 to 5)? 1: least, 5: most	4/5; A lot of the museum was a quiet activity, however, whenever there was an interactive activity, we engaged with the activity and with each other to figure out how it worked.	4/5; Throughout the exhibit, I interacted with my fellow teammates talking about our opinions and interests and what we liked about the exhibit.	4/5; Many of the items in the museum were left by themselves with little to no explanation. This sparked curiosity in me and led to me seeking my teammates' opinions of the pieces to see if they differed from mine.	3/5; I talked to my team members about observations in each exhibit,
How much did the learning activity evoke collaboration amongst peers (on a scale of 1 to 5)?	1/5. Not a lot of collaboration besides on the interactive exhibits	2/5. There were no exhibits/activities that invited collaboration and cooperation with each other. Mostly all activities were independent activities.	2/5. Conversely, many parts of the museum did not involve any sort of collaboration. Collaborating and engaging are two different things, and I think that collaboration did not happen often during the visit.	2/5, but there weren’t many activities that we could do together

Did we observe other visitors collaborating with each other, when also participating in learning activities?	Yes, those who were interested in the material engaged in discussion with each other about what they were seeing	There was nothing in particular that fostered collaboration.	There was a guided tour with children and they were talking amongst themselves as well with the person that was guiding them. Additionally, there were a few couples who were talking to each other while exploring the exhibit.	I didn't see people working together
Was there anything specifically that the learning activities included that fostered collaboration?	Not specifically	There was not anything that I found that fostered collaboration. Most exhibits were about retaining information and not an activity that had a clear objective to achieve.	No, nothing fostered collaboration.	There were a lot of things to see, which promoted discussion
Was there anything that you found engaging? What modality was it and why was it interesting/engaging for you?	The interactive projector table was the most engaging museum exhibit, and I think it was because it employed all learning modalities rather than just visual or visual and auditory, as all	I found many of the tactile exhibits engaging. Their exhibit included many things that you could touch and break apart. In addition, I liked how there was a diverse range of learning modalities that	The table where you were able to select different types of animals based on a feature was a brilliant example of tactile learning. It allowed the visitor to select what they wanted to learn	I found the table with the projector engaging because we could choose what we wanted to see. It was also a new presentation method for me. It was mostly visual.

	the other exhibits only had 1-2 learning modalities. But with the projector table, there were sounds, a visual representation, and you got to actually learn through touching.	were included. In exhibits they played music/animal noises which added to the experience. There was also an abundance of visual things to look at. In addition, there was also an interactive exhibit that projected stuff onto a wall where you could touch the table and categorize animals/organisms into different sections.	about and display it, all while doing so in an engaging way.	
Observations	Every room had a different feel to it, and the way material was presented was especially exciting. I liked that there were dinosaur footprints when we were in the fossil rooms, and I also liked when we could touch the fossils, as shown in Figure 8.	There were many layers included in the exhibit; Dinosaur footprints on the ground, material at eye-level and hanging above (as can be seen in Figure 7). I was engaged with the environment, as I felt like I was truly immersed in the environment.	Content presentation was great. Different layers, height, lighting. For example, in Figure 7, the exhibit features content on different levels such as the floor, knee height, waist height, eye height, and above eye height. Made all the different rooms have	Lots of visuals (videos, models, text) I would have liked to see more auditory information like explaining a concept or artifact. I was engaged, even without understanding the text. Mostly visual, had some sounds/music playing, but were more for immersion than learning, most

		Overall it was a good exhibit that I would recommend. Most times, I felt engaged with the exhibit and I did not notice my mind wandering.	character and seem exciting. Use of models was very clever and accurate. The shell shown in Figure 8 can be taken apart and reassembled, a very clever way to display the entirety of the shell.	rooms had something to touch, and could feel different textures. I think the translation online is a good idea, but not sure how useful it is, because you'd have to search for each exhibit and its translation, which breaks immersion.

Appendix B: The Human Safety Net Responses and Observations

	Jesse	Sarah	Michael	Tyler
How often did we engage with others (our team members) throughout participating in the learning activity (on a scale of 1 to 5)? 1: least, 5: most	4/5; There was one activity where Sarah and I worked together, and there was also an activity specifically designed for the team to do together; you couldn't play with only one person.	5/5; There were many times where I engaged with other team members. Both when interacting in activities or simply discussing the activities.	3/5; The activities were all interesting and created some sort of engagement. I felt myself wanting to talk to my teammates about what was going on around me, but not to the extent of the National History Museum.	4/5; I worked with my group for 2 activities, but there were many more independent activities.
How much did the learning activity evoke collaboration amongst peers (on a scale of 1 to 5)?	5/5; The activity Sarah and I did together required collaboration and teamwork	5/5; There were many activities that fostered collaboration. There was one activity that was a four player game in which all four of our team members had to work together to win. In addition, there was one other 2 player game in which I played with Jesse.	5/5; There were two activities that involved collaboration, and they both created a feeling of codependency as well as accomplishment after being completed. You had to collaborate in order to complete the activities.	4/5; It is possible to collaborate on activities or do the experiences with people
Did we observe other visitors	I saw other families and a	Yes, there were other visitors	A family was collaborating	I saw people working together

collaborating with each other, when also participating in learning activities?	group of school children that were all participating in the activities together, even when they were independent.	interacting with each other and participating in learning activities.	and engaging with each other for every activity present. Many of the activities required some sort of adult assistance for the young child which is one way to foster engagement and collaboration.	on the collaborative activities
Was there anything specifically that the learning activities included that fostered collaboration?	Yes, a lot of activities were designed specifically with collaboration in mind.	Yes, the learning activities made it so that you had to work with each other in order to meet a certain objective of the game. Additionally, games which were considered “solo” games also fostered collaboration. After doing the activity, my fellow teammates asked what my results were which led to a discussion about the activity.	Creating codependency with an activity was the main way the museum fostered collaboration. Some of the activities absolutely needed collaboration to be completed.	There was one game that required multiple people to be in sync with each other. There was another activity where one person gave instructions to build something with shapes to another person.
Was there anything that you found engaging? What modality was it and why	The most engaging things were things I could touch/play with. For example, I really	I found tactile learning modalities engaging. Mostly all activities included in the	Practically all the activities were engaging for all types of modalities. Auditory was	I found the initial online survey about personal strengths interesting because I was

was it interesting/engaging for you?	liked the activity when the 4 of us had to work together because it required turning a wheel. I also liked printing why I was grateful because I got to write it in my own handwriting.	exhibit were tactile. There were very few if not any auditory activities and only some visual activities to do.	demonstrated by an audio message from people around the world. Visual was represented by a room where you had to look inside different boxes to see an image. Tactile was the most represented, being involved with all of the collaborative experiences.	learning about myself and the surveys were short.
Observations	Although I enjoyed my time at The Human Safety Net, I found that I walked out of the exhibition without understanding the mission of their organization, what they were trying to achieve. They mentioned their mission statement briefly in the beginning however, there was not any connection to their organization mentioned in any of the	The exhibit was engaging but I don't really know what I was engaged with. Some parts of the exhibit I really liked can be seen in Figures 9 and 10; in Figure 9, we were able to write what we were grateful for that day on a screen, and then print it onto a ribbon. In Figure 10, we were all able to participate in an activity together. Their mission was unclear, and I was left with a	The content presentation was extremely fun and engaging, however it is most likely out of our scope due to the technology being used. In Figure 10, a technological marvel is shown. The activity fosters collaboration by having all four participants work together and communicate with each other to achieve a common goal. This is achieved by moving different wheels	Screens were engaging (some had tasks, others had videos), different learning modalities were addressed throughout. I was engaged during the whole visit and interested in learning more about myself through the activities. It was interesting how they used your ticket as a means of personalizing the visit. I enjoyed the initial video that gave an

	activities.	sense of confusion on what I was supposed to take away from the exhibit.	at similar speeds, something which we will not be able to achieve in our product.	overview of The Human Safety Net. I liked taking the initial survey about personal strengths, but wished they were used more in the exhibits. It wasn't clear what the connection between personal strengths and the rest of the exhibits were.

Appendix C: Peggy Guggenheim Collection Responses and Observations

	Jesse	Sarah	Michael	Tyler
How often did we engage with others (our team members) throughout participating in the learning activity (on a scale of 1 to 5)? 1: least, 5: most	N/A to this activity, but we did observe kids interacting with each other and having discussions around the content	N/A; Since we were not participating in this activity, we only observed the children. I did observe a lot of interactions between the children. More specifically, there was engagement for the whole class/group. The instructor was asking many questions that kept the children engaged with the activity.	N/A, because of the nature of observing the children complete the activity, we did not speak amongst ourselves but rather watched and took notes	N/A, but our objective was just to observe the kids
How much did the learning activity evoke collaboration amongst peers (on a scale of 1 to 5)?	4/5; the children talked to each other and also actively asked questions to the presenter, who engaged them with active learning, as opposed to just lecturing to them	3/5; The presented asked questions to engage kids. But beyond that there was nothing in particular that evoked collaboration amongst peers.	5/5; Throughout the activity, the room was filled with the noise of the children talking to each other, and they were talking about the activity. The children shared with the class after completing their activities, creating even	5/5; All of the kids were talking with each other when doing the activity; sharing ideas and creations, as well as helping each other

			more collaboration	
Did we observe other visitors collaborating with each other, when also participating in learning activities?	Yes, the children collaborated when they created their works of art, but also in discussion with each other	Yes, the environment was interactive and stimulating that was conducive to learning. The learning activity was independent work, however, I noticed many children showing their peers as well as the adults in the room their work.	Yes, the children were working together to complete the activity as stated above	Yes, we observed children working collaboratively
Was there anything specifically that the learning activities included that fostered collaboration?	The presenter was actively trying to get students to participate/talk to each other	From my observations there was nothing specifically that fostered collaboration. However, the activities allowed for an environment in which the children were free to express themselves (in both their artwork as well as verbally). The environment was stimulating, allowing the children to have a fun experience doing the activity with their peers.	Not particularly, because the majority of the collaboration came from the creativity of the children as well as the advisors asking them questions	Kind of, all the children were seated at a big table, so they were able to see what everyone was doing and easily talk about it

Was there anything that you found engaging? What modality was it and why was it interesting/engaging for you?	I really liked the paintings that had braille inscriptions so everyone could get a chance to experience the art, even if they were blind. I also really liked that the kids were able to engage with a lecture type experience, and then get to apply that in a workshop setting	From my observations, the children seemed to enjoy the tactile activity located in the laboratory. I noticed that especially at the end of the tour, their attention and focus seemed to dwindle. Having the tactile activity was an opportunity for them to apply what they learned from the tour and exhibit into a project that they could use their hand. Furthermore, I noticed a great deal of engagement with the activity.	The artwork in the exhibit aided visual learning, the advisors speaking to the kids leaned toward auditory learning, and the drawing activity was geared toward tactile learners. Because I only participated in the visual activity, I only got that experience. However, I did find it engaging, and I found my thoughts wandering as I looked at the different pieces of art, trying to understand them	The artwork was visual, the activity was tactile, there were a few videos in the Marcel Duchamp exhibition and an interactive 3D viewer of his Box in a Valise (I didn't interact with those, but they seemed interesting). I think I would have been engaged with them because they are different modalities (getting to hear something or touch something to learn about different things). There were also some paintings that had a tactile aspect: braille description and portrayed the painting in a 3D way
Observations	The tour plus the activity in the laboratory included all three learning modalities. The tour mostly	I really enjoyed that all of the learning modalities were considered when creating the tour (as seen in	Children fold a piece of paper into 4 quadrants. Write words that come to mind and share amongst each	All of the kids seemed engaged with the activity and the tour (no one was visibly bored or acted

	focused on visual and auditory learning modalities while the laboratory was a tactile learning activity.	Figure 11) and the workshop in the library. The curators were willing to be flexible with the kids, and first understand what knowledge they came into the tour with, and then adapt accordingly. I also appreciated that the presenter would get on eye level with the kids, and allow them to get comfortable by sitting on the floor of the galley (Figure 11).	other what they wrote. Activity based on teamwork. Children were engaged throughout. Guided tour through a variety of selected artwork. After each piece of artwork, let them roam free for a couple minutes.	out). They were well planned out and well executed. I appreciated the braille and tactile representations of the art.

Appendix D: Olivetti Showroom Responses and Observations

	Jesse	Sarah	Michael	Tyler
How often did we engage with others (our team members) throughout participating in the learning activity (on a scale of 1 to 5)? 1: least, 5: most	4/5; the scavenger hunt we mostly completed by listening to the tour guide, but the second part of the activity was collaborative.	5/5; The activity was completed collectively.	5/5; Every part of the scavenger hunt required the team to work together to complete it.	5/5; We completed the entire activity together
How much did the learning activity evoke collaboration amongst peers (on a scale of 1 to 5)?	5/5; the scavenger hunt did not allow us to collaborate much, but we had to collaborate significantly for the second activity with typewriters	5/5; The learning material sparked discussion and conversation amongst peers.	5/5; The final activity of using a typewriter encouraged two peers to work in tandem to create a product. Additionally, the staff member encouraged collaboration throughout the entire scavenger hunt.	5/5; It was designed for groups of schoolchildren or families
Did we observe other visitors collaborating with each other, when also participating in learning activities?	No, nobody else was there when we did the scavenger hunt and following activity.	N/A; did not apply since we were the only group participating in the activity.	No, our scavenger hunt was a private one with just us participating.	No, we had a private session, but the staff member said that groups of children collaborate to complete the scavenger hunt.

Was there anything specifically that the learning activities included that fostered collaboration?	For the typewriter activity, we were encouraged to break into groups and come up with a way to solve the task at hand together.	The activities were designed so that we discussed the problem/question together to find the solution.	All of the scavenger hunt activities were challenging enough for us to collaborate amongst each other and try to solve them. Additionally, like I stated earlier, the typewriter activity required collaboration to be completed.	We had to solve riddles and look for signs around St. Mark's Square. The design invites the participants to share ideas and figure out where to go and what to look for.
Was there anything that you found engaging? What modality was it and why was it interesting/engaging for you?	I liked the typewriter activity. It was fun to write a story that we made up, as well as collaborate with my team members.	I found the typewriter activity engaging. This was a tactile activity where we had a task to complete a newspaper article on a typewriter. Allowed for creative freedom and expression.	I enjoyed the typewriter activity which was a tactile learning activity. It was interesting because it forced me to think creatively and come up with my own solution to the activity.	I found the scavenger hunt engaging because there was a mission I had to complete. The scavenger hunt we participated in only had visual tasks, but the other versions for different ages have different tasks and modalities.
Observations	The scavenger hunt was cool but there was not much else to do in the showroom besides doing the activity; I felt like they could	Overall, I thought the scavenger hunt was well designed and engaging for the group. The activities fostered	Overall, Negozio Olivetti's scavenger hunt did a great job being both engaging and collaborative. Some of their activities could	I thought that Negozio Olivetti did a good job creating an activity using the existing features of St. Mark's Square. They were limited in

	involve visitors with the showroom much more.	collaboration and had a mix of learning modalities (although they did not include an auditory learning modality).	definitely be applicable to our project.	what they could include, but still managed to make it engaging and interactive.

Appendix E: Guggenheim Interview

Q: Can you explain the workshop?
A: The workshop is sponsored by the Veneto region and is created in collaboration with schools and teachers. The content is based on what the children are learning in school.
Q: What was your thought process behind creating the workshop this way?
A: An informal setting allows the students to embrace their creativity. It also allows for the tour to have a free-flowing schedule and cater to the students' curiosities and interests.
Q: Did you consider learning modalities and age of visitors when creating the workshop?
A: Yes, different ages have different capacities for information and attention span. For younger kids, it should have a playful mood

- **Q: If so, what did you do to make sure the content was accessible for diverse groups?**
- A: With different ages, you need to present the content in different ways. You have to change the complexity and depth of the content. Children of different ages also have different learning styles and attention spans, so the content and activities need to account for that.
- **Were there any exhibits created mainly for kids? How did you have to change the content to reach that audience?**
- A: There are tours for children, high school students, and adults. The high schoolers and adults don't participate in the activity. The register you use when giving the tour changes. Also, the expected background knowledge changes, so the new information you present should also change.

Q: Primary objective of exhibit (educate, engage, etc.)
A: Inspire creativity outside of school and show new methods to accomplish something
Q: How do you incorporate background knowledge of visitors when creating exhibits?
A: The activities are created with the teachers and are based on the school curriculum, so it is designed to relate to knowledge that the students already have. On the tour, the tour guides allow the children to lead the discussion. This includes asking questions about what the children see and allowing them to make connections to their knowledge.

Appendix F: Olivetti Showroom Interview

Q: How did you make the scavenger hunt interesting and engaging?
A: The tasks are based on age and there are different types of missions for each place you find. Also, make the path interesting and go to non-touristy or less crowded places.

Q: How did you convey the message of Olivetti Showroom in the scavenger hunt?
A: The logo with the gold and overlapping squares. Also, by including the history of letters and fonts and shapes of letters in Venice throughout the scavenger hunt.

Q: Did you consider the wide range of ages and learning styles of visitors when creating the scavenger hunt? How were the differences addressed in the scavenger hunt?
The activities for each group are based on age and if it is a school group or family
There is a different way of preparing material and different difficulties of challenges. We work with teachers to determine this
The scavenger hunt for older kids had geography and writing, but younger kids probably wouldn't have the required knowledge to do this. The purpose of the writing activity is to elaborate and record the ideas that you see onto the paper (keeps it in memory)
The activities need to be age appropriate, for example, drawing activities for 6 year olds and younger; for 4 year olds: use sound as the clues: listen to bells and find the bell tower, or listen to the water and find a canal.
Somewhat difficult to engage different learning modalities because they have to use existing architecture, but different ages have different tasks that account for each modality
Have tasks for touching the things they need to find (sometimes Negozio Olivetti needs to design new things to make the activities accessible. This is done with the help of experts that know how to create accessible activities.

Appendix G: Child Psychologist Interview

Q: How can we make the content engaging for a wide range of children? Wide range of learning modalities?
A: Consider how different ages learn best. Try to include different learning modalities at different stations, so you are not just focusing on one modality and only engaging one type of learner.

Q: What would children find distracting on a website that would disengage them from the environment around them?
A: Think about how to limit screen time so that kids are engaged with environment

- Give instructions in the activities to encourage kids to look at other things
- Find things, pick up leaves or feathers

Q: How can we create an emotional response to the content?
A: From age 6, kids have a sense of empathy and begin to develop a “theory of mind”.
They begin to understand different points of view and realize that not everyone has the same thoughts, beliefs, and experiences as they do.

Q: What is the difference between learning in younger children and older children?
A: Children from ages 6-9 use animals to represent their feelings. You can use pictures to describe bird migration and their preparation for migration. Make the images clickable and interactive, or change pictures with each tap
Children from ages 10-12 require more to get them interested. They are interested in video games and role-playing, try to think of a way to game-ify the activity
You can’t make the content too basic, you need to challenge them to get their interest or attention. You can present information at a higher academic level and add a reward or some incentive to participate, like a sticker or bookmark at the end

Q: Do children respond better to structured or free-form learning?
A: They benefit from a combination of both. Start with structure, then give the children freedom to figure the rest of it out. This engages their creativity and imagination.

Appendix H: Website Link

https://sites.google.com/view/eilat-bird-sanctuary/welcome-to-the-eilat-bird-sanctuary