# **Empathy in Action: Research Study on Emotional Response in Game Design**

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#### **ABSTRACT**

In this research we explore the efficacy of gamification for the study of the psychological concept of emotion in children. Our intent is to elicit and record the emotional responses of our players in order to study how they think about and project an empathic response on the world around them. We designed a series of games which draw on the empathy of our participants (children aged 5-11) and incorporated these game designs into a survey utilizing StudyCrafter. In this way, we introduce players to the visual context of endangered species, allowing them to share in the experience of the animals through our games, and then record their feelings and interpretations of these experiences throughout their gameplay. Initial testing of this gamified research suggests that the educational format of our prototype, as well as the empathetic reaction children have toward animals provides a successful combination of game design with the psychological concept of emotion.

#### **KEYWORDS**

Emotion, Children, Animals, Climate change, Visual context, Context integration, Video games, Development

#### **INTRODUCTION**

While the psychological concept of emotion is nebulous and far reaching, empathy is a core pillar of the human experience. It is for this reason that we have focused on it as a path toward designing a game prototype that is fundamentally about emotion. In the initial planning stages for our research, we came to the conclusion that designing this project for children would generate the most effective responses, as their capacity for caring for others is unimpeded by the responsibilities that come with adulthood. We also focused early on making the theme of the project focused on endangered species, in hopes of increasing the awareness of our participants to the damages caused by human pollution, traffic, and indifference to the environments of aquatic species. Our problem therefore was to design a prototype that effectively created an empathetic emotional response in our playtesters, and be able to track those responses in a format of data that could be used for study. Our solution was to create 3 mini games, each focused on a different endangered species overcoming the obstacles presented by climate change and human interference, and link them back to a main survey hub where players could record their emotional responses. The first (Save the Seals) is about seals getting caught in discarded nets left by humans, where players would assume the role of the hero who could free them. The second (Voyage Home) was about orcas navigating through the hazards of human traffic and pollution on their endless voyages home, where the player would be the orca and feel the strain of never ending struggle. The final game (Beyer's Bears) was about polar bears, and the hazards climate change represents to their environment and way of life.

At the end of each experience, players would be given the opportunity to answer a short survey about how they felt using StudyCrafter. Our research would then be done using interview protocol with our participants, in order to further understand their emotional reaction to the games they played. Through our study, we were able to recruit several playtesters who all had unique experiences with our game. The emotional response of each was incredibly interesting, while also displaying the need for further research on how to design a game with the goal of eliciting empathy through mechanics. Furthermore, it is obvious that our participants all had a great deal of empathy for the endangered species featured in our prototype, and further emphasis must be placed on awareness and educating children on what they can do to combat climate change.

#### PSYCHOLOGICAL CONCEPT AND RELATED WORK

Empathy, as defined by Merriam Webster is, "the action of understanding, being aware of, being sensitive to, and vicariously experiencing the feelings, thoughts, and experience of another of either the past or present without having the feelings, thoughts, and experience fully communicated in an objectively explicit manner." Przybylski et al. showed that for adult players "the experience of autonomy needs satisfaction during play related positively to change in affect and enjoyment of the game." The approach of Przybylski is based on the well known concept of self-determination theory which describes how social environments can aptly satisfy human needs, specifically the needs for competence, autonomy and relatedness (Przybylski, 2010). This work informed our game design as we considered the story, mechanics and difficulty level of our games in the context of our age demographic so that the needs for competence, autonomy and relatedness might be satisfied and players might experience self-determination. For children specifically, the satisfaction of autonomy, competence and relatedness needs is an essential piece of socialemotional development. Despite being dependent on others, children possess a high capacity for autonomy and have an innate interest in developing self-determination. Mullin (2014) asserts that because children often lack a stable sense of self-concept and higher level cognitive processing skills, "emotions can be more reliable guides to what we care stably about than our self image" (Mullin, 2014). Our game design and development was informed by this research as we relied on the emotion of empathy to drive our players' motivation. This reliance on a participant's empathy for the game character is a form of relatedness satisfaction as in order to form empathy, as opposed to just sympathy, the child must to some degree relate personally to the character. An additional component of autonomy development in children is a sense of self-efficacy, or the ability to execute the tasks required to achieve the desired outcome. This can be seen in self-determination theory as competency and is exhibited in our game through the use of simple and intuitive game mechanics. Interestingly, Mullin (2014) points out that for children specifically a strong command of self-control may be required if the steps to achieve the goal are not intrinsically motivating as children are still developing their understanding of planning and processing of delaying

gratification. Our games were designed with the intention to be intrinsically motivated however this need for self-control would apply if that is not the case.

Our game design and development was also informed by the concept of the Four Fun Keys researched by Nicole Lazzaro (2008). Lazzaro posits that there are four keys to accessing player emotions in games which include, hard fun, easy fun, serious fun and people fun. Her research continues to suggest that "players preferred three out of the four different types of fun and that the best selling games offered three out of the four" (Lazzaro, 2008). We sought to meet this standard with our game design and included hard fun, easy fun and serious fun as the three fun keys included in our game. Hard fun, defined as challenge and mastery by Lazzaro, was seen in the difficulty level of the game which was designed specifically for the ability of our target age group of children. Easy fun, defined as creativity and imagination by Lazzaro, is seen in the engaging and vibrant visual aesthetic of our game. Finally, serious fun, defined by Lazzaro as acquiring real knowledge, is seen in the educational component of our game which informs participants about environmental degradation. Social fun is not a component of our game as it only features a single-player option and there are no characters with which players can interact socially. In this way we used the Fun Keys researched by Lazzaro in the context of our specific target audience to create a more engaging player experience.

#### **GAME DESIGN**

This experimental study investigates how game design can evoke a player's feeling of empathy via raising awareness about environmental issues. We developed three online games for young children aged 5-11 (elementary-school-aged students) via GameSalad<sup>1</sup> and unified them into StudyCrafter<sup>2</sup> to test the players' responses at the beginning and ending of each game. Design process of each game is described below.

### **Save The Seals**

The first game, *Save The Seals*<sup>3</sup>, focuses on the issue of seal entanglement. Seals are curious animals, and they sometimes end up playing with the trash being released to the ocean by humans. When it comes to the seals playing with fishing nets and plastic bags, they might get trapped and when that happens, they are not likely able to free themselves. As a trapped seal grows, the entanglement gradually becomes tighter around their body and causes them injuries, which can eventually lead to death. A number of non-Profit organizations such as Ocean Conservation Namibia help the entangled seals by catching, unbinding, and releasing the seals to rescue them.

<sup>&</sup>lt;sup>1</sup> a game development platform; https://gamesalad.com/

<sup>&</sup>lt;sup>2</sup> a gamify research platform; https://studycrafter.com/

<sup>&</sup>lt;sup>3</sup> http://arcade.gamesalad.com/games/158825

*Save The Seals* was inspired by this issue, in which the player would collect the trash on the beach and rescue the trapped seals.

The game starts with a short narrative explaining the problem (Figure 1), then the player learns the game objectives and how to use controls through simple tutorials (Figure 2).

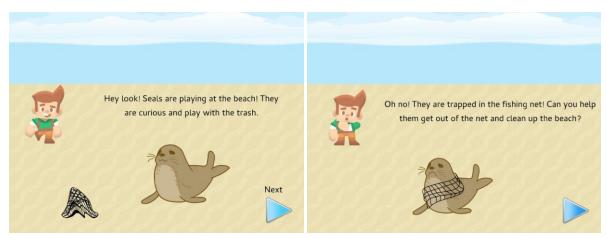


Figure 1 – Save The Seals Narrative Scenes



Figure 2 – Save The Seals Tutorial and Instructions Scenes

After that, the game enters the main scene, where the player can move around on the beach and collect the plastic nets. If a seal gets trapped, the player can catch the seal and enter another scene where they can cut the plastic net to set the seals free and go back to rescue the others. Players can keep track of their progress by looking at their score at the top of the screen every time that they collect the nets and a seal safely enters the ocean (Figure 3).

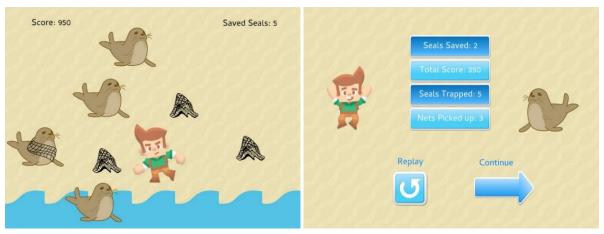


Figure 3 – Save The Seals Main Scene

Figure 4 – Save The Seals Score Scene

At the end, the game shows the record of rescued seals, trapped seals, player score, and number of plastic nets collected (Figure 4). Since the main objective of the game is to rescue the seals, the records are ordered in a way the number of seals being saved is displayed at first.

# **Voyage Home**

The second game, *Voyage Home*<sup>4</sup>, aims to increase ecological awareness about orcas being endangered. The primary factors that have led orcas to become endangered species are lack of prey, toxic pollution, and disturbance from the vessels. The game is designed in a way that the young children would play the role of an orcas who must avoid pollution and vessels to navigate through the ocean. The activity loop would create emotions of empathy in the player such as the feeling of what it would be like to be a whale, especially orcas who migrate over 5800 miles per year and have to deal with human footprint in order to survive.

<sup>&</sup>lt;sup>4</sup> http://arcade.gamesalad.com/games/158771



Figure 5 – Voyage Home Objectives, Controls, and Story

The game starts with an intro scene which describes the objectives, controls, and the story of the game (Figure 5). In the main scene, the player takes the role of an orca and navigates through the obstacles such as the vessels and the ocean pollution. Player's progress is shown on the screen by a scoring system, and they receive positive sound feedback as they safely navigate around the obstacles (Figure 6). When the orca collides with the obstacles, the game gives a negative feedback by the sound of vessel horn and it ends by displaying the score (Figure 7). Players can easily continue playing over, which keeps them in flow and resembles the whale's persistence.

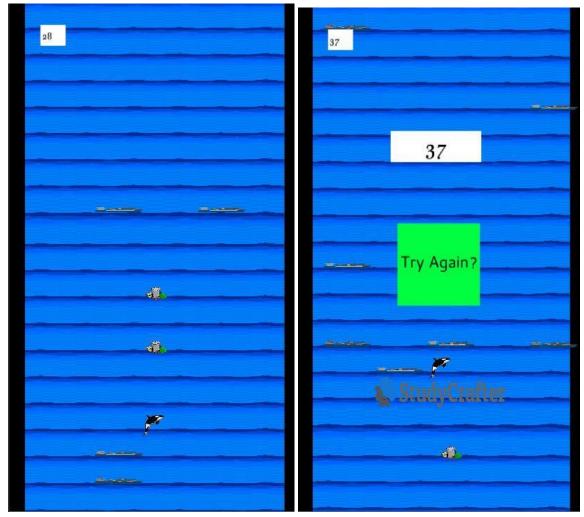


Figure 6 – Voyage Home Main Scene

Figure 7 – Voyage Home Score Scene

# Beyer's Bears

The core idea of the third game, *Beyer's Bears*<sup>5</sup>, is to depict the problem of melting ice caps as a result of global warming, and how it affects polar bears lives and their habitat. Although the concept of global warming can be complicated for the young children to comprehend, they can relate to the fact that polar bears are losing their homes. The game also focuses on the importance of parental attachment for the children and triggers emotions, primarily the fear of being separated from family by creating empathy between the children and the baby polar bear. Children can identify with this fear and some may even have experienced the feeling of being lost, or becoming separated from their parents.

The game starts with a narrative that the baby bear has lost his parent in a storm and needs to find his way back to his family through ice caps, but the ice is melting quickly (Figure 8). Then, the

<sup>&</sup>lt;sup>5</sup> https://arcade.gamesalad.com/games/158856

game's main activity, jumping, and the instruction on how to control the character are displayed on the screen (Figure 9).



Figure 8 – Beyer's Bears Narrative Scene

Figure 9 – Beyer's Bears Instruction Scene

The player interacts with the game by jumping over the icebergs and as soon as they land on the ice, it starts melting (Figure 10). The melting ice conveys the sense that the bear is in danger and also illustrates the effects of global warming and the animal losing its habitat. To balance the game's difficulty for the young children, the ice does not fully shrink, and it only loses its opacity and gives enough time to the player to react. If the player falls from the iceberg, they will receive a feedback that invites them to start over (Figure 11). At the end when the player jumps through all the icebergs, the baby polar bear reunites with his parent and the player receives positive feedback (Figure 12).



Figure 10 – Beyer's Bears Main Scene

Figure 11 – Beyer's Bears Replay Scene



Figure 12 – Beyer's Bears Final Scene

Considering the audience that are young children, all three games' aesthetics, narrative, and user interface are designed in a way that captures their attention and suits their language and understanding. The games have a balanced pace to manage the difficulty, gives appropriate feedback, and teaches through tutorials and simple narratives. The attempts of the player as a hero to help the animals resonates with the player's feeling of empathy.

At the end of playing the games, the players are being led to StudyCrafter and are being asked to express their emotions via emojis about how they feel, and how they think the animals feel. The whole experience will teach them the concept of empathy in a simplified form.

#### **METHODS**

We envision this project contextualized online for children as part of an educational outreach for organizations such as NASA Climate Kids, PBSkids or the World Wildlife Fund. Our game prototype explores this direction using the built-in research mechanics of Studycrafter which could be expanded and refined towards this end. Embedded and unified within a website our games would become part of a storytelling and teaching framework for children to explore issues as well as formulate and express their thoughts about them. Our prototype suggests many opportunities for engaging children with this format, to teach and to learn from them new ways of thinking about and seeing the world.

Using an interview protocol \* during playtesting we queried participants in order to study their emotional experiences throughout their game play. We utilize a semi-structured format to accommodate the needs of our target demographic, children ages 5-11, collecting a mix of gameplay data, think-aloud feedback and responses to interview questions. Our game, *Planet Patrol*, hybridizes the StudyCrafter and Gamesalad platforms in order to present a narrative framework for a series of mini-games in a study based design format. We include a simplified interview protocol within the Studycrafter component of our design, using emoji icons as clickable buttons for the players to select. In our playtesting, however we relied more heavily on our semi-structured interview method. The participants were all known to the researchers and obtained permission from their parents to participate.

The project opens in Studycrafter with an introduction to the issue of human actions impacting the wellbeing of other species in simple terms, for example: "Human actions can harm animals in many ways." And, "With lots of big ships on the ocean animals can get hurt." We follow this general introduction with a specific introduction of the first mini-game, *Save the Seals*, which ends by allowing the player to select an emoji, and then continue on to play the particular game. By using a similar method for the other two games, *A Voyage Home* and *Beyer's Bears*, we alternate between a brief introduction contextualizing the animal's situation as well as providing space in the game play to querying the players in regards to how they are feeling and how they think the

animal feels. We check in with players at the start of each game and as they progress through the tutorial stages. While they are becoming acquainted with the particulars of each game's mechanics and the situation of the animals, we ask them repeatedly to share how they are feeling and how they think the animals in the game are feeling. We ask them again at the end of each game. After playing all three of our games players return to Studycrafter where the experience is summarized in terms of our game concept and the term "empathy" is introduced and defined. The series ends with players making a final selection of an emoji as we inquire one last time how they are feeling. The final screen explains the opportunity to contribute their play data to the study.

#### **RESULTS**

This interview protocol was followed with one team member orienting the participants toward the games and asking the questions while an assistant observed and took note of their responses. Our interview method improved throughout the study, without modification to the structure of the protocol. Responses from our first participant, P1, age 6, were instructive in how to make these modifications, but their results are incomplete for want of these changes and also revealing of the myriad of challenges around designing a gamified research study targeting this demographic, as well as playtesting it with them out of doors on a cold weekend during a pandemic. Comprehensive reporting of participants' responses in full are included as a separate spreadsheet. Responses for our oldest participants, P3, P6 and P7, age 11, is revealing of the complexities in the emotional intelligence of people and especially children. A natural and deep intellectual engagement with empathy towards animals generally, and the ease with which they will transpose their own feelings on characters in their imaginations and storied depictions of the world around them was evident in our study. Our oldest participants especially were highly capable of identifying emotions held by not just themselves, but also by others, as an avenue for establishing empathy for the characters in our story. An example of this is seen in P7 who empathized with the parent figure in *Beyer's Bears*: "the dad bear would feel... depressed because I know that parents love their kids a lot and I know that if I had a kid I probably wouldn't want to let them go." We found the participants readily projected their feelings on the characters of our games, even after playtesting, as with P5. Age 6, they had clearly and even forcefully explained their perspective that animals do not have feelings similar to their own: 'because they aren't people, they don't have feelings like people.'

In general players showed empathy for the game characters reporting that they felt sad or scared for the animals and were sympathetic towards the hardships depicted in the narratives of the games. They also expressed feeling happy and relieved for the animals they helped in the games. P2. demonstrated their empathic understanding with additional feedback on our queries, stating for example that not only did she think the seal would feel 'sad' to be trapped in the nets but also 'stressed.' When asked in question 9. How do you think the whale feels? P2. noted they felt the whale would be 'scared', but that it might also feel 'betrayed by the sailors.' In the end of this game and despite achieving a level of competence in the game, p2. reported feeling 'sad, stressed

and depressed' at its conclusion. Humorously when asked how the bear might feel after falling into the ocean from the melting ice this participant said 'so sad... like eating ice cream for a week, sad.' Their further interpretation of the bear's experience went beyond the emotional experience to consider the physical trauma resulting from the cold of the water. Other older participants extended the character's experience to apply to real animals noting as P7 did: "I kind of just felt sad and disappointed because it made me feel like things like that actually happen"

Herba et al. in The development of emotion-processing in children: effects of age emotion and intensity found that "in children, age, facial expression intensity and emotion category are important for predicting accuracy on emotion-processing tasks" (Herba, et al., 2006). These results informed the current work as across our participant age range we saw clear variation in the level of detail associated with emotional identification and understanding. While results from older participants brought additional color to their expressions of empathic relations to the fictitious animals in our stories, all but one of our participants expressed confidence in the idea that animals have feelings similar to their own. The youngest participants easily identified the situations that created additional hardships for the animals which resulted in their feeling sad and scared on behalf of the animals. For one of these two participants the emotions remained expressed in simple terms, and the emojis seemed sufficient for their sense of the situations: they mostly identified as sad or happy (p1). But, even with this polarity p1. explained that while they felt happy about their own accomplishment getting the whale to go far, they felt sad that the whale got hit by a boat. Our youngest participants' display of accurate emotional identification via emojis, which depict emotions intensely, aligns with the results of Herba et al. which showed that emotional intensity is a predictor for accurate emotional identification. Thus the use of emojis, which remove the subtleties of emotional facial expressions in favor of more intense expressions, may have contributed to our participants' ability to identify emotions and empathize with characters. Participants in the mid range of our age demographic added additional descriptions such as 'really really happy' regarding the seal's liberation, and 'pretty happy' regarding their own sense of joy in relation to aiding the seal in this way. Participants on the older end of our age range extended their responses to include more descriptive language relating specific human experience to that of the animals as with P2 who described sadness as "eating ice cream for a week" and P7 who described the animal's plight as similar to "those books about the apocalypse with zombies. I think that's how the animals feel but we are the zombies."

Many participants across age ranges felt inclined to explain their understanding of animals' situation, giving further insight into how they were reasoning about the experiences shown in the games. Such as with P1 who added they 'liked animals' so they feel sad if the animal feels sad. One participant, P6 age 11, provided intricate explanations for why they believed the animals clearly shown in distress to be feeling happy. These answers, though provided in a tone of jest, did indicate an association between the child's feelings and the animal's feelings. However the association was reversed so that the child described the animal's adoption of their human feelings

and experiences as opposed to vice versa which we saw with other participants. For example P6 notes that after reuniting with his family, the baby polar bear in *Beyer's Bears* would be "very upset because he knew he was back to eating broccoli and screen time restrictions," two challenges that we can assume this participant faces in daily human life.

Theurel et al. in *The integration of visual context information in facial emotion recognition in 5-to 15-year-olds* points out that in our daily lives emotional expressions are experienced mainly in contextualized situations. Their work informs the current study how, and how differently for different age demographics, visual context information begins to play a role in the visual recognition of basic emotions (Theurel et al., 2016). In our *Save the Seals* game the tutorial provided a unique opportunity distinct from the other games that allowed us to explore how players' experience of positive feedback from their actions might distort their perception of the animal's emotions as well. In these cases we observed players' who reacted positively to their sense of success maneuvering their character to collect a net, tended to transfer this positive emotion to the animal's experience despite the fact that the action they had taken had not yet altered the animal's condition. We observe that the perception of a positive effect for the seal is also presented by the removal of the trash from the scene, but found this note worthy since the seal was still looking just as sad and as trapped as before during this scene. This possibly suggests that the child's sense of positive effect comes as much from their agency and personal feeling of helpfulness as it does from the visible impact they make on their environment.

#### **DISCUSSION**

On further dissection of the results certain emergent themes were notable. For example, p6. started our study by stating they did not believe animals had emotions similar to people. We did not anticipate this and in the absence of an option to select no emotion for the animals in our games - which would imply empathy had not successfully been evoked by the game - we did not sufficiently account for this possibility. This inherent limitation in the design exposes the possibility of biasing participants with a narrowed spectrum of options which presumed that the criteria for success has already been met.

This leads to a second similar theme where multiple participants found inadequate freedom of expression in terms of selection of the options provided by the limited emotions portrayed by the Emojis. Matsumoto et. al, point out in their work that the recognition of basic facial expressions of emotion (e.g., joy, sadness, anger, fear) are integral to the development of emotional understanding and successful social interaction. This brings to light to a dichotomous relationship between the positives and negatives of using emojis as a method of emotional feedback: while being easier to recognize the intended emotion portrayed, by leveraging pre-existing mental models and thereby being efficient for visual feedback; they also serve to restrict

the availability of sufficient feedback options in terms of emotional reactions experienced by the participants to the game scenarios.

Emojis as a research instrument used to gather data are inadequate to exact the kinds of nuanced responses from participants regarding their emotional experience during playtest that we would like to see from this research. Due to the nature of the age group, participants require high levels of engagement with the researchers and contextual prompts to effectively communicate the complexities of their emotional experiences. This suggests to us that a story-completion method may prove more instrumental in future work. The MacArthur Story Stem Battery (MSSB), has been shown to elicit aspects of our demographic's inner worlds vividly with story-completion methods.

In terms of game design, a clearly resonant theme across all the games and overarching the game narrative was the use of anthropomorphisation (i.e., treating non-humans as they were real persons) of animals with an intent to create empathy toward them based on the belief that humans relate more readily with emotions of other humans. Notably, on closer observation of multiple participants during playtests, empathy seemed to manifest in the form of projections of their own emotions on to the animals by transplanting themselves into the game scenarios.

An aesthetic design choice enabling this level of immersion, which is sufficient to demand an empathetic emotional response by the player, was the usage of cartoons as opposed to real animals as protagonists, as they allowed for suspension of disbelief and disarmament of logic enabling freedom for emotional investment.

In terms of human motivational theory, the desire to play the games are driven primarily by two types of motivational drives: The intrinsic motivation to feel a sense of competence while playing the game, combined with a degree of autonomy in dictating the results of the game and a sense of relatedness to the humanised animal protagonist :based on SDT; And the extrinsic motivation for pain avoidance, driven by a desire to avoid the negative emotions projected by the animals trapped in problematic situations when failing to save the them, combined with a drive to get implicit rewards by successfully saving the animals in the respective games and experiencing the satisfaction of doing an altruistic deed.

Notably, participants in some cases found the absence of these motivational drives, primarily that of autonomy, more conspicuous than the presence of other explicit motivational factors, leading to a sense of frustration stemming from an inability to act as desired in-game.

#### **CONCLUSION**

As evidenced by feedback from the playtests and survey results: participants were successfully able to feel a sense of empathy towards the animals. They were also motivated by a desire to help the animals and sought to avoid feeling the negative emotions they associated with the animal's depicted suffering.

The game narrative was also successfully able to create awareness about the consequences of human actions on animals, while implicitly suggesting that there are things the players can do to help them. The game therefore shows potential to be a powerful education tool to create awareness about environmental issues concerning animals amongst young children through an interactive and engaging experience.

Further developing the game model as a WebGL using an HTML based game development platform would allow for a much more cohesive experience while also providing accessibility by enabling embedding the game directly into web pages with direct links that children can access with single clicks.

The use of a more powerful platform will also allow for creation of more advanced and engaging game mechanics as issues created by multi-platform development and platform limitations would be resolved and a user-friendly interface and ubiquitous control system can be established. A professional development platform will further allow for improved game aesthetics by providing access to an expansive array of visual game assets while also enabling the development of a comprehensive visual feedback system to measure the game's emotional impact more accurately.

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#### **APPENDIX**

## \*Interview Protocol - Responses available from this Link:

# At the beginning of the game, before players start we asked:

- 1. Can you give an example of an emotion?
- 2. How are you feeling right now?
- 3. Do you think animals have feelings like yours?

## After the introduction to Save the Seals we asked:

4. How do you think the seal feels?

# After players had picked up the net during the tutorial we asked:

- 5. How do you feel?
- 6. How do you think the seal feels?

## After they freed the seal in the tutorial we asked:

- 7. How do you feel?
- 8. How do you think the seal feels?

# After the intro to A Voyage Home we asked:

9. How do you think the whale feels?

# At the end of A Voyage Home we asked:

- 10. How do you feel?
- 11. How do you think the whale feels?

#### After the intro to Beyer's Bears we asked:

12. How do you think the bear feels?

#### After falling in the ocean we asked:

- 13. How do you feel?
- 14. How do you think the bear feels?

## At the end of the game we asked:

- 15. How do you feel?
- 16. How do you think the bear feels?

## In closing we asked again:

17. How do you feel?

## Additionally we asked participants to share which game was their favorite?