The Design of Marine Animal Protection Game Based on Emotional Design

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ABSTRACT

In recent years, ocean pollution is becoming more and more serious, and plastic waste is entering the ocean and damaging the environment while causing the death of a large number of marine animals. Under the theme of marine animal protection, the game named “New Life Out of Plastic” is designed from the three levels of emotional design theory. In which the visual style is designed at the instinctive level, the interaction and logic of the game is designed at the behavioral level, and the metaphorical approach leads people to reflect on the harm caused by plastic waste to marine animals at the reflective level. In the end, the final implementation is by computer language. The author hopes to promote the concept of marine animal protection and raise people's awareness of protecting marine animals by designing games.

Keywords: marine protection; game design; emotional design

1. BACKGROUND

1.1. Current status of marine pollution

Marine pollution refers to the phenomenon of harmful substances entering the marine environment and destroying biological resources and damaging the quality of seawater and the quality of the environment. According to “The 2021 World Ocean Assessment (WOA II)”, the global surface pH of the oceans has decreased by an average of about 0.1 and acidity has increased by about 30%. Marine pollution is a global environmental problem.

Plastic accounts for 85% of marine litter. The United Nations Environment Program projects that the amount of plastic waste flowing into marine areas will nearly triple by 2040, adding 23-37 million tons of plastic waste to the oceans each year. Plastic waste in the ocean has severely crowded the living space of marine life, threatening their lives. Helmholtz Centre for Polar and Marine Research of Germany has found that even deep-sea biodiversity in the Kuril-Kamchatka Trench is being threatened by plastic pollution. More than 800 marine species worldwide are affected by plastic pollution, and plastic trash can clog the stomachs and digestive systems of marine animals or entangle their bodies. Approximately millions of marine animals die painful deaths each year due to plastic litter.

1.2. Status of protection promotion

Marine plastic litter management cannot only rely on the government's unilateral power to implement, but also needs to strengthen public awareness of marine ecological environmental protection through publicity and education, and promote active public participation in marine plastic litter management[1]. Marine plastic litter management cannot only rely on the government's unilateral power to implement, but also needs to strengthen public awareness of marine ecological environmental protection through publicity and education, and promote active public participation in marine plastic litter management.With the continuous promotion of marine environmental protection over the years, the public's awareness of marine conservation has gradually increased and more and more people have become involved in the promotion. In recent years, with the rapid development of information technology, publicity design has also broken through the limits of technological development, which is no longer limited to simple graphic ideas, as diversified, interactive, entertaining information is more easily accepted by the public. For example, the cultural and scientific educational board game "Fun with the Ocean" introduces the local characteristic marine ecological environment through three different game modules, and players can learn about marine life and marine ecological protection while interacting. And the book drama game

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"Flewn", which takes a whale through the desert to find a new home for the adventure as the story line, standing in the perspective of marine creatures to describe the dangers of the marine environment and their survival is not easy. Nowadays, gamification is a popular form of propaganda. Games can bring players an impressive experience, and players can reflect on the game content after the experience.

The idea of gamification refers to a way of thinking that uses game elements and game design methods to redesign non-game things. As a partial use of certain game elements with a clear purpose, gamification intends to help the game object achieve a certain goal through an interesting process experience[2]. Fields include environmental protection, public welfare, education and so on are more and more widely used to gamification publicity methods, such as the Ant Forest, the WeChat mini-game Waste Sorting, Gaode Xiaoqiao and other public welfare games. Focusing on the positive meaning and public welfare value of the game to the society in the background of the Internet era can meet the needs of people's spiritual experience to a greater extent and realize technology for good.

However, most of the current publicity on marine protection is still based on documentaries, animated short films, posters and other traditional methods, which makes it difficult to innovate the content. Limitations exist in the choice of themes and expressions, and there is an obvious convergence, mostly through short animated films describing the increasingly decaying marine ecological environment.

2. THE PRINCIPLES OF EMOTIONAL DESIGN

The three-level theory of emotion was proposed by Donald Arthur Norman, a cognitive psychologist, in his book Emotional Design, according to which, the three levels of emotion include the instinctive level, the behavioral level and the reflective level. Once modern technology satisfies the user's need on basic function level, the user’s experience begins to gradually take over. At present, as the user's psychological demands and emotional attachment are receiving more and more attention, fully considering the "human" part is the key to human-computer interaction today[3]. The main purpose of the designer's emotional design of the product is to focus the user's attention and make his or her emotions explode, thus improving the ability to perform[4]. In game design, the entertainment nature makes its interaction emphasize the player's experience and emotional resonance in the game process more than general digital products. Excellent game interaction design corresponds to three levels of emotionality, which are the emotional design of interaction interface, interaction mode and interaction experience[5].

2.1. Instinctive level - aesthetic principle

At the instinctive level, human physiological senses play a dominant role, and good design at the instinctive level can appropriately stimulate human senses, allowing people to obtain physiological pleasure, acting on their immediate emotions and feelings[6]. The instinctive level of response is the innate spontaneous feedback behavior that a person makes in response to the external environment[5]. People instinctively gravitate toward content that is physiologically appealing to them and can bring about positive emotional experiences. According to the psychological experiments of experimental psychologist Akritra, 83% of the external information a person obtains comes from vision. In game design, it is necessary to make full use of the important position of visual feedback in the sensory feedback. The interactive interface and graphic elements are designed in a visual style that meets the user's perception of the ocean, so the the purpose of quickly attracting users could be achieved.

2.2. Behavioral level - light operational principles

At the behavioral level, whether the interaction logic is rational or not directly affects the user's experience, and a smooth and concise behavioral level design can make the user gain psychological comfort. The design of the behavior level is closely related to the user's operation behavior. A good design on behavioral level usually consists of four elements: functionality, ease of understanding, ease of use, and feeling[5]. The human-computer interaction will directly affect the user's game experience. The Good game interaction design can enhance the comprehension and ease of use, and achieve the purpose of efficient human-computer communication. The interaction design of the game with public welfare propaganda as the main task should follow the principle of light operation interaction design, simple and easy to understand the game language prompts can let players quickly understand the game content and game play, simple interaction behavior can let players directly start to quickly experience the game, and get the fun of the game[7].

2.3. Reflective level - educational principles

The reflective level design is the design of consciousness and higher feelings, emotions and intuition. The emotional design

at the instinctive and behavioral levels only contains feelings and does not have the effect of interpretation and understanding. Only through further reflection and analysis at the reflective level can the user truly achieve a complete interplay of meaning, thought, emotion and mood[8]. Reflection is a conscious act of indirect awareness, where users actively associate, transform, and relate to their life experiences through the potential information and characteristics contained in things, so the reflective level of design involves a higher, deeper level of psychological feeling, building up an experience full of empathy for the user. The metaphorical messages conveyed by the game's content and plot will stimulate players' memories and reflections. By creating an immersive experience, the game guide players to integrate their out-of-game experience with their in-game feelings. The promotional content resonates through the reflective level, which is deeper and more sustainable than the intuitive experience in the instinctive and behavioral levels. Therefore, gamification promotion method can achieve the purpose of warning more effectively than the traditional promotion form.

3. THE DESIGN STRATEGY OF THE GAME “NEW LIFE OUT OF PLASTIC”

3.1. Types of games and the characteristics of elimination games

3.1.1. Types of games

The types of games include role-playing games, sports games, shooting games, puzzle games, action games and a dozen other types, among which puzzle games have better adaptability with promotion. Puzzle games require players to observe, think, judge and solve problems with the content of the game, which can make players highly concentrated. The puzzle game itself is not complicated in the way it is made and played, but it is extremely playable. Combined with puzzle games to promote marine animal protection, it enables players to understand the game while receiving the environmental protection concept conveyed by the game theme.

Elimination games are a kind of puzzle games, sometimes called "triple elimination games".Players need to move, transpose or pair the game elements that originally seemed chaotic and randomly arranged to adjust them, so that three or more identical game elements are arranged according to a certain pattern and finally achieve the effect of elimination[9].

3.1.2. Characteristics of elimination games

The visual effect of the elements of the elimination game is striking. It generally chooses relatively simple shapes and abstract generalization with geometric techniques, uses bright colors with high saturation, and large bright colors can effectively stimulate users' vision and help players understand the game theme. The elements need to be cartoonish while retaining a sense of three-dimensionality and texture, which need to be drawn with a uniform style and an equal degree of detailing.

Elimination games are fast-paced and have low cognitive cost, so players can quickly understand the game and get started with it. Elimination games are generally divided into two modes: countdown and endless, which create a more tense atmosphere for players through countdown, timing, and dynamic effects to push players to enhance the speed of the experience. Fast-paced game promotion can prevent users from getting tired and bored due to excessive time during the experience.

Elimination games are suitable for people to experience in their free time. As people's leisure time in the intelligent era is more fragmented, the game rules, logic and operation of elimination games are relatively simple and do not change in real time, so it is convenient for people to experience or pause at any time. The nature of elimination games makes them suitable as a way to promote marine animal protection.

3.2. Design process

The process of the design can be divided into four stages: theme positioning, game rules design, visual aspect design and writing code, while the whole design process is practiced under the guidance of the theory of emotional design. The instinctive level corresponds to the visual aspect design stage, designing graphics and interactive interface according to players' cognitive and gaming habits. The behavior level corresponds to the game rules design stage, referring to the elimination game play, retaining the "triple elimination" operation logic, and innovating the specific game play operation design. And the reflective level corresponds to the theme positioning stage. The gamification design promotion is realized starting from the current situation of marine plastic waste, focusing on the plight of marine animals are facing, and with the theme of marine animal protection. It draws attention to the severe problems caused by pollution, such as the threat to the lives of marine animals and the irreversible damage to the marine environment, and thus invites people to reflect on them. Finally, in the writing code stage, the design output was completed. The whole design is introduced by the reflection

level and output from the instinct level, so as to complete the game design in a deep and easy way.

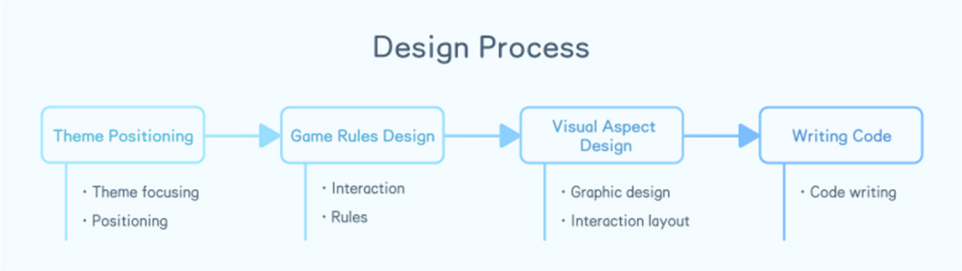

Figure 1. Design process

4. THE DESIGN OF THE GAME

4.1. Instinctive level - visual

4.1.1. Color design

According to the theme of marine animal protection, the blue color is chosen as the background of the game, in line with the public perception of the ocean. The high purity blue gradient makes the overall color tone of the game brighter and can bring users a relaxing gaming experience. Affected by the light of the sea floor and the colorful plants in the growing environment, marine animals will evolve bright colors to protect themselves mainly with pink, orange, yellow, purple and other colors, while mostly green and blue in the shallower waters. Therefore, six colors of pink, orange, yellow, green, blue and purple are chosen in the bubble design of the elements. In order to highlight the bubbles in the background and eliminate the difficulty of distinguishing between colors, six colors of peach pink, light orange, medium yellow, soft green, sky blue and violet with high brightness and purity are chosen for bubble drawing on the basis of the overall color, which makes it easy to distinguish from the background. Meanwhile, the bubbles bring a unified visual experience to the player when they are arranged together.

4.1.2. Graphics design

The design of the bubble mainly lies in the expression of the plastic shape and texture. Plastic waste in the ocean includes plastic bags, water pipes, bags, water bottles, disposable tableware and hundreds of other types of plastic waste, of which plastic bags, water bottles and disposable tableware are the types of plastic often used in life. Therefore, these three plastics are selected for drawing. The designer extracted three plastic shape features and simplified them respectively, such as retaining the carrying handle and smiley face pattern of plastic bags and plastic bottles deformed from the middle. The design uses a light anthropomorphic drawing style to highlight the transparent and easily deformable textural characteristics of plastic.

Figure 2. The plastic bubbles in the game

The marine animal pattern is designed to reflect the current situation of plastic pollution. Marine plastic pollution is becoming more and more serious, and all kinds of plastics are entangled in marine animals like parasites. The design is inspired by the mutant fish fused with marine garbage in the animated short film "HYBRIDS", choosing jellyfish, seahorse,

tropical fish, sea turtles, dolphins, starfish, six representative and distinctive marine animals, extracting and retaining the most characteristic shapes of the animals, and integrating the material and shape characteristics of plastic for graphic creative drawing. The umbrella part of the jellyfish is replaced by a flat and fat transparent plastic bottle, the internal stomach cavity is composed of plastic fragments, and the tentacles and mouth wrists are replaced by strips of plastic. The most characteristic abdominal form of the seahorse is extracted, and a similarly shaped toothbrush is chosen to replace the body part, and the fan-shaped dorsal fin is represented by a jagged plastic bag, which simulates a light and flexible tail. The body of the sea turtle is represented by a transparent plastic bottle, with the mouth and body of the bottle representing the head and shell of the turtle respectively, and the forelimbs and hindlimbs represented by plastic bags.

Figure 3. The plastic animals in the game

4.2. behavioral level – game rules

The rule of the game refers to the game Puzzle Bobble. The traditional Puzzle Bobble game requires the player to control the angle of the bubble launch, while this game simplifies and innovates in the way of interaction. The shells act as "cannonballs" to launch different colored plastic bubbles, abandoning the rule of adding a new line of bubbles every few seconds at the top. All bubbles are launched by the user, the shells swing left and right autonomously, and the user only needs to tap the external button to send the shells, making the game more rhythmic.

The game interface is divided into a start page, a game page and an end page. The start page of the game has an exaggerated bubble font showing the name of the game “New Life Out of Plastic”. The screen has the words and pattern "tap the button to start the game" to prompt the user to operate, and the player confirms the start and enters the game. In the game, plastic bubbles are launched from the bottom shells to the top, when three or more bubbles of the same color are collected, the plastic marine animals in same color could be integrated. The screen is divided as upper and lower part by a dotted line, the marine animals are integrated in the lower part of the screen floating. When plastic bubbles fill the upper part of the screen, the game ends, at which, the plastic bubbles recede and the waves wash the "plastic creatures" onto the beach, showing the text part.

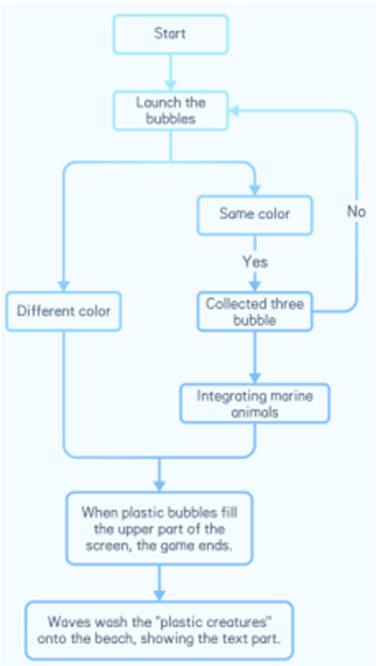

Figure 4. Game interaction logic

Figure 5. Integration formula

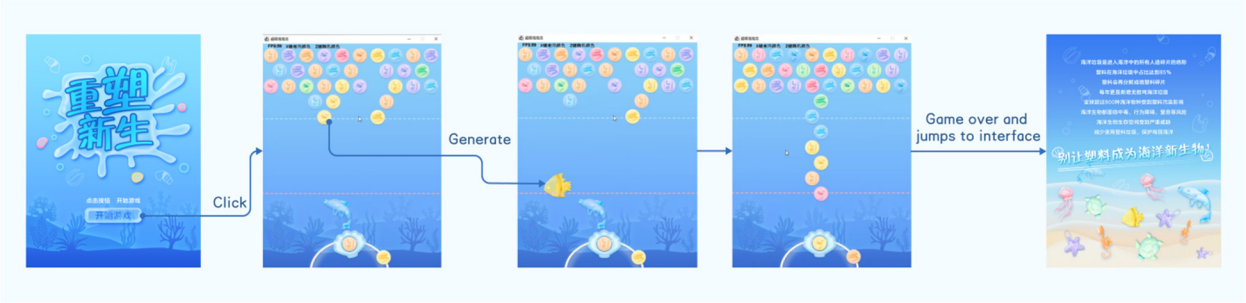

Figure 6. Game interaction flow chart

4.3. Reflective level - design implications

Before the game starts, the background is painted with light bubbles and a small amount of plastic, representing the gradual invasion of plastic waste into the ocean. Players enter the game and keep launching plastic, implying the bad behavior of people putting plastic garbage into the ocean. As the game progresses, the picture has more and more plastic bubbles and plastic fish, the background becomes monochrome and loses its original vitality. At the end of the game, the ocean has been filled with all kinds of plastic, in contrast to the beginning page with less plastic, representing the current situation that the living space of marine animals has been encroached by plastic. Om the game end page , the "plastic creatures" washed up on the beach indicate that plastic waste is affecting both the ocean and the land, representing that the plastic waste put into the ocean by humans will eventually harm humans themselves. The last text introduces the current situation of waste in the ocean, as a warning to players to pay attention to the harm caused by plastic waste to the ocean, and calls on players to establish awareness of protecting the marine environment and reducing the use of plastic products.

5. THE DESIGN OF THE GAME

```
public class BubbleFlags {
    private static final int LINE_COUNT = BubbleHashMap.LINE_COUNT;
    private static final int BIG_BUBBLE_COUNT = BubbleHashMap.BIG_BUBBLE_COUNT;
    private static final int SMALL_BUBBLE_COUNT = BubbleHashMap.SMALL_BUBBLE_COUNT;
    private int[][] flags = new int[LINE_COUNT][BIG_BUBBLE_COUNT];

    public BubbleFlags() {
        for (int i = 0; i < LINE_COUNT; i++) {
            for (int j = 0; j < BIG_BUBBLE_COUNT; j++) {
                flags[i][j] = 0;
```

```
            }
        }
    }

    public boolean isRight(Point p) {
        if (p.x == -1 || p.y == -1) {
            return false;
        } else if ((p.x % 2 == 0 && p.y == BIG_BUBBLE_COUNT) || (p.x % 2 != 0 && p.y ==
SMALL_BUBBLE_COUNT)) {
            return false;
        }
        return true;
    }

    public void add(Point p) {
        flags[p.x][p.y] = 1;
    }

    public void preRemove(Point p) {
        flags[p.x][p.y] = -1;
    }

    public void remove(Point p) {
        flags[p.x][p.y] = 0;
    }

    public int get(Point p) {
        if (!isRight(p)) {
            return 0;
        }
        return flags[p.x][p.y];
    }
}
```

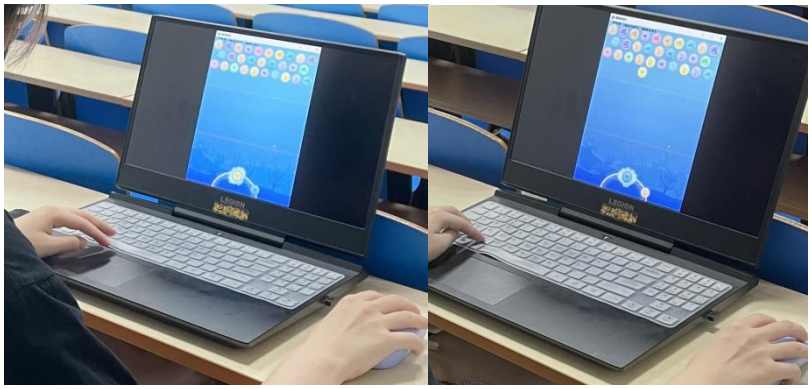

Figure 7 Operation test

6. FUTURE DEVELOPMENTS

There is still room for improvement in terms of dynamic rhythm, game play and scene drawing of the game. The game supports its dissemination in multiple scenarios, and the game can be disseminated as a lightweight mobile game, which allows players to experience and share via cell phones and tablets anytime, anywhere. The game has strong adaptability with the current new media communication methods, and users can open it by link jumping in WeChat H5, Tik Tok and other publicity channels. In the context of diversification and technology, interactive design provides more design techniques and technical means for the design of exhibition halls[10]. The application of the game is not limited to online communication, but can also be placed in offline exhibitions such as museums, by connecting external devices to create interactive operating platforms for players, so as to enrich the visitors' experience and deepen their memory of marine environmental protection promotion.

7.CONCLUSION

The prevention and control of marine plastic waste is urgent, while the awareness of marine protection needs to be deeply rooted. With the rapid development of digital technology nowadays, gamification is more and more commonly used in the field of publicity. The game “New Life Out of Plastic” combines the game playing with public welfare promotion. It creates value recognition, in-depth content and visually eye-catching experience for players under the guidance of emotional design theory, which not only achieves the purpose of guiding players to reflect on the harm caused by human activities to the marine environment, but also explore the possibility and feasibility of game promotion and technology for good.

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