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'Spill in my Gills'

A Board Game Design to Increase Oil Spill Awareness among School Children

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Abstract: In this paper, we are presenting a board game design, that is intended to create awareness among school children about Oil Spills and the adverse effects they have on the environment. We chose board games as media because of their higher accessibility and a unique multiplayer involvement that allows greater room for social interactions. Through this game, students were sensitized about how oil spills damage the flora and fauna in the nearby areas and what measures must be taken to prevent the damage. The game comprises of a board and tiles categorized as oil spills, different aquatic creatures and scientific protection mechanisms. The game uses a non-linear flow which allows players to discover new paths each time they head out to rescue the trapped aquatic creatures. The preliminary playtesting revealed that game indeed was engaging and informative in terms of "oil spills effects". With this game, we are trying to make a humble attempt to help build a healthy behavior towards the environment.

Key words: Board Games, Sustainability, Oil Spills, Educational Games, Behavior Change

1. Introduction

This paper presents a board game design that intends to increase the awareness of oil spill effects among school children. Oil spills caused by marine ship sources have everlasting negative impact on the environment as well as local coastal settlements. Spills are caused due to accidents, operations or due to intentional discharge of oily wastes into the water bodies. In the United States alone, more than 70 oil spills are reported every day. Flora on land, marsh grasses in estuaries, kelp beds in the ocean, microscopic plants and larger animals such as fish, amphibians and reptiles, when affected, suffer from toxicity of the petrochemicals leading to a deterrent natural imbalance. In addition, the long term affects of oil spills include decline in recreational activities (e.g. swimming, boating,

fishing) as well as economic means by virtue of demotivated tourism, drop in commercial fishing and unproductive agriculture [1]. In brief, oil spills greatly damage our overall natural balance by affecting the habitat of living beings and the food chain at large.

Sensitizing people about the devastating effects of an oil spill is equally challenging as often only those immediately affected are concerned with remedial action. Moreover, the suffering of the environment is difficult to fathom and thus it remains just another scientific bit of information for many. In order to generate a greater sensitivity in humankind towards oil spill effects, we have used a game based approach as a step in the direction of sustainable education. We have designed a multiplayer board game for school children of age 8 and above, to educate as well as persuade them towards greater awareness of oil spills. Children of today will be the leaders of tomorrow and therefore are the most suitable user groups to impart environmental awareness for a sustainable future. Furthermore, we have incorporated the core learning indicators of CBSE (Central Board of Secondary Education) 4th and 5th standard environmental studies book into an engaging board game.

Even though, the textbooks were rich in storytelling and offered project-based engagements to captivate the students, they lacked an active participation with formative assessment of knowledge that could engage students with the concept in a more enjoyable way. As a result, we adopted a game-based learning approach considering that games involve - engagement, peer discussions and activity-based learning. Board games in particular offer great ways to socialize, engage and learn at a very low cost and greater accessibility as against popular digital games.

2. Methodology

2.1 Secondary Research

Education for sustainability

Education for Sustainability (EFS) is a holistic system of inquiry that combines the best of what we know about teaching and learning with the content, core competencies and habits we need to move toward a sustainable future. Education for Sustainability may be defined as undertaking practices that do not compromise the quality of life of future generations[2]. The seed to work on 'water' as a central theme for our project was planted by a deeper understanding of education for sustainability, as water plays an extremely crucial role in our daily lives. Moreover, little has been explored to create awareness about some of the most obscure but harmful means of water pollution - oil spills. We chose to work with children of the age of 9-12 since their minds can be a powerhouse of new ideas and our seed will grow beautifully once they understand the importance of a sustainable environment.

National Council of Educational Research and Training(NCERT), which develops the curriculum followed by all Central Board of Secondary Education Schools (CBSE) in India, floats a subject called Environmental Studies(EVS) for primary and secondary school students. The focus of this subject is create awareness among children about their natural and social environment and this involves activities within the classroom and beyond[3]. We studied this particular subject to understand the existing curriculum and the prior knowledge children might have about the relevant topics. We came across a similar pattern of storytelling and activities throughout the chapters, which were used to make each chapter engaging for the students.

While the structure of NCERT curriculum development is well defined, we felt it was missing out on engagement which is often brought in by using games for effective learning. However, for the game to show effect in reality, it has to be grounded on theories of curriculum development. As a result, we chose the following from the learning indicators to help build the foundation for our game design-

1. Observation & Reporting-includes narration, sharing images, observing from the environment etc.
2. Classification-identifying objects based on observable features, similarities or differences.
3. Analysis-Deriving inferences from existing knowledge
4. Expression- Expressing and articulating one's thought verbally or gesturally [3].

Board Games

Board games are an important tool to provide hands-on and heads-on skill and knowledge development for people of all ages on all subjects. Not only do well-designed games create an engaging atmosphere, they also provide a nonthreatening, playful, yet competitive environment, which greatly helps in focusing on content and reinforce the messages through the gameplay. The board itself provides a visual metaphor to help connect information as well as brings together players in a co-located set-up to enhance social interactions[4]. Popular board games like monopoly, life, chess etc have all succeeded in educating children informally or rather "subconsciously" about finance management, life decisions and strategy. Spill in my gills attempts to sensitize children about environmental damage due to negligence of humankind in the same manner and hopefully to achieve a positive habit formation.

2.2 Ideation & Game concept

The game-play was centered around the main aspects of oil spills. For instance, the effects of oil spills acted as the losing moments, while the sustainable measures of prevention were the winning points of the game. After a series of iterative ideation, the final high-level game was detailed considering its ability to generate empathy with the aquatic life affected by oil spills as well as its engaging nature throughout a complex gameplay. Image 1 and 2 describe the game set-up and its components.

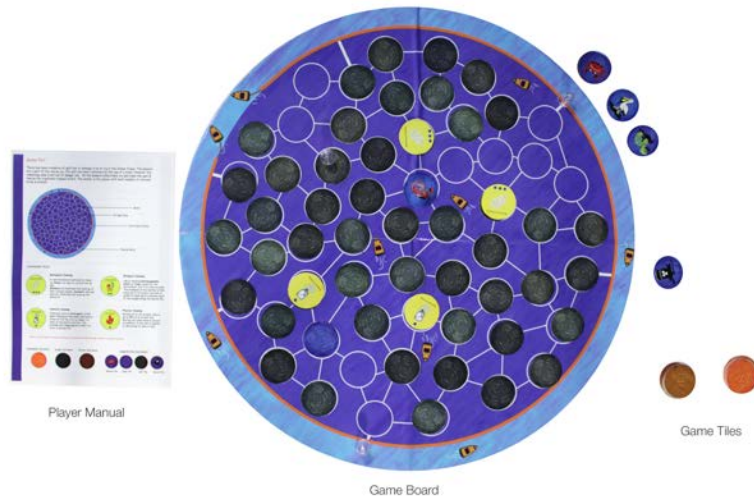


Figure.1 Board Game Setup

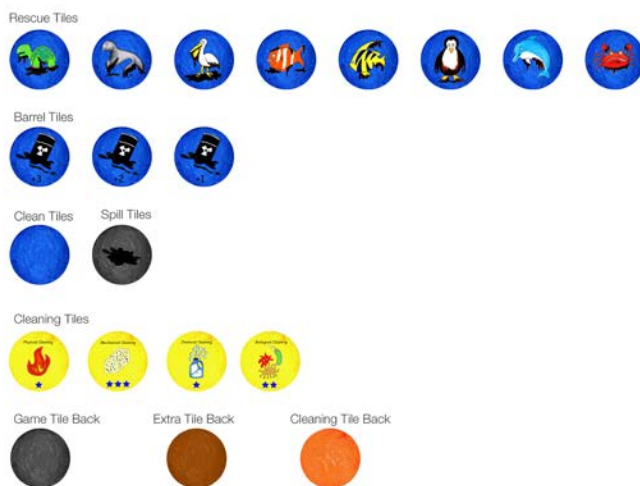


Figure.2 Board Game Tiles

The final concept is named "Spill in my Gills", which is targeted at the age group of 8 and above. It is a non-linear luck-based game, which requires two or more players. The game plot starts with role-play in which the players have to be a part of a rescue team that is responsible for cleaning a massive oil spill which has happened in the Indian Ocean and is contained by a boom. The game board is a representative of the ocean and the placeholders for the tiles are the path through which the rescuers can enter with their rescue boats(player tokens). The players race to rescue the animals trapped in the oil spill along with cleaning the spills on their way. The setup includes a game board, Game Tiles

and player tokens. There are three types of Game Tiles namely, General Tiles, Cleaning Tiles and Extra Tiles. The general/extra tiles can be either spill, barrel, clean, animal each having a different course of action. The players, indicated by tokens, enter the spill-damaged area and move across the board through the marked spaces. They can only move a step if it is an empty space or if there is a Clean Tile on it. If they come across a tile on their path, they have to flip it to see what lies beneath the tile. This also creates an added element of suspense in the game. If the tile is an animal, which needs to be rescued, the player rescues it by bringing it outside the board, thus the affected area. If he encounters a barrel tile, an equal number of extra tiles are drawn and placed in the adjoining places to the barrel. This occurrence can prove as a hindrance to the rescue mission, and slow the player down. If he encounters a spill, a cleaning tile is drawn and one player notes the stars on the tile (denoting the effectiveness of the method).

The player score is counted with each rescued animal giving a score of 1 point and each 5 stars on the cleaning tiles giving 1 point to the total. In addition, the random movement path of the game differentiates as well as complicates it with the traditional board games that have a linear and predictive progression. The game ends when all the tiles on the game board are flipped. Then total score is then calculated and the player with the maximum score wins. Figure.3 below, illustrates how the paper prototype was tested before the final design.



Figure.1 Paper Prototyping

3. Playtesting and Results

The game was tested for its effectiveness and overall game experience with 9 players: 5 boys and 4 girls of age 8-12 (standard 4th to 7th) with a mix of both formative and summative assessments. The formative aspects include, observational notes and weaved-in conversations with the children while they were playing the game. Likewise, a game experience questionnaire was designed to get a summative feedback on the overall gameplay and experience. The game was tested on 3 basic parameters- Learnability, Experience and Usability. In pre-Stimulus stage, the players were tested for their

knowledge on oil spills using a questionnaire. This revealed very few were confident about their knowledge on oil spills based on their prior knowledge. After several trial sessions with the game, children were asked to answer a game experience questionnaire along with a scale to measure their acquired knowledge on oil spills. 8/9 children now believed they knew all about oil spills. They also understood the damages it causes to the environment and recognized the sustainable methods of cleaning an oil spill. Finally, all the players understood the importance of rescuing the animals trapped in the oil spill.

While the girls were patiently enjoying playing the game, boys appeared to be restless and were constantly trying to cheat by turning the tiles. Boys seemed to be interested in more action in the game or were searching for competitive nodes within. The unpredictable nature of the game generated excitement about the outcomes. Manual score calculations during the game were slowing it down. Therefore, a suggestive improvement can be in the form of incorporating points on the tiles itself.

Players rated the experience of the game on a scale of 1-5, with 5 being most satisfying. 8/9 players gave a rating of 5 while one rated it 3. They all unanimously agreed that they would like to play the game with their friends. Whether this game made a good birthday gift (a parameter to indirectly measure their attitude towards the game) was unsure as 6/9 said they would. In addition, it was established that the game encouraged repeated play. The children also recognized the tiles easily. Overall, there were some early evidences of game incorporating a strong sense of responsibility in children towards oil spill effects. In particular, we noticed that children not only easily understood the damages caused by spills but also learned about the long-term sustainable ways of checking them. We believe that a ludic set-up such as this board game can lead to a more positive and sustainable behavior change and thus, should be encouraged in addition to the traditional formal instruction on environmental issues.



Figure.4 Playtesting the game with children



Figure.5 Children filling the game experience questionnaire

4. Conclusions

Children are a clean slate, whatever you write on them will always leave a faint mark. Our game was a sincere attempt to leave a lasting impression about how can the environment suffer due to man's reckless actions. Although the game was well received by boys and girls alike. We felt boys wanted more action in the game as they had showed lesser patience than girls during the game play. However, the overall positive engagement was reflected in both the genders with requests of a second trial. Moreover, in a very short time the game indeed entice a great interest and awareness of oil spill effects. We believe a longitudinal study on this design will certainly churn out more hidden insights of using board games as a way to teach sustainability principles. While we do not posit that text-book based sustainability education is inefficient, we certainly believe that it can be further augmented and made more engaging with ludic elements such as a board game.

5. Acknowledgement

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