How emotions can be used as an approach in assisting numerical rules design for critical play?

According to Flanagan (2009), critical play has influenced the history of creative exploration of the social and the political. Games as a genre can be used as thematic ways in which play can carry forward its critical thinking characteristic (Marcel, 1946). Games exist for entertainment purpose, but modern players are no longer satisfied with basic game characteristics as being dynamic, engaging and expressive: they also expect them to be effective, performative, serious, and valuable (Flanagan, 2009, p. 1; Sicart, 2014, p. 5). These aspects provide meaning to the game. Meaning-oriented game design can be seen as designing for critical play, developing a playful experience that can create critical thinking. The critical thinking in a playful way hence makes "design for critical play" an appropriate approach in game design.

If the type of game is a critical game, the game experience would meet the core purpose of thinking critically. As Flanagan (2009) mentions, critical play is about use play as a form to build a judgement system. Thus, the game should theoretically support players with systematic play experiences for critical play purpose. A formal game system consists of rules which are logical. The rules formulate the structure that results in an experience for players. As structures operate as the context for a meaning-making process, the rules that can create a logical and mathematical structure of a game are essential (Salen, 2010). This article will talk about the design process of the critical game Plantropocene, and focus on discussing the game rule design in meeting the purpose of critical thinking.

Plantropocene

The purpose of this game design project was to create an interactive process, that could help the participants/players to gain an understanding of our living environment from the perspective of plants, and reflect on human behaviours. With this purpose, the designers of this game project started the design process with a series of studies on plants, board games, and at the same time developed theme-related aspects and values. We found out that plants are dynamic, even when we perceive them as static, they fight where they stand. With this knowledge, we realized that players first needed to have an understanding of how it is to be a plant. So, we found consensus on a collaborative role-playing board game: a game genre that players are drive[SN3] n to pay attention to the scenarios of plant living conditions and make strategies for surviving together.

Critical thinking derives from the gameplay; its existence is reflecting the relationship between the player actions and the system outcome. Additionally, the gameplay is taken as a process of emotional engagement. Some earlier analysis of playstyles have shown how people experience different sets of emotions, directly related to how the game mechanisms work, but also, how each player plays the game. (Fullerton & Swain, 2008).

Game design is actually about designing the rules/system that can stimulate an emotional response in players. So, in the game Plantropocene, the rules and the paradigm of winning and losing conditions should offer players a play environment where scenarios and options can make them interested in critiquing.

How to apply emotional experience in finetuning the rules to create scenarios of critical games？

The process of finetuning the rules is about making adjustments in the regulations that create the scenarios of the game, where the emotional experiences are evoked to meet the purpose of critical thinking. Critical thinking emphasizes the unbiased analysis of the proposed question or topic (Flanagan, 2009, p. 5). To keep the authenticities and varieties of scenarios is essential to provide players with a holistic viewpoint on purpose. Before specific numerical rules' design, the game Plantropocene needs a basic game system.

Calculating the number for a deck of cards

The basic calculation on the number of cards is essential for building a game structure, so it can maintain an initial game operative status. The general calculation is also a step forward from the game concept to the lo-fi prototype; in the process, designers can gain a more comprehensive understanding of the game elements.

In the game Plantropocene's design process, the draft game concept was used as a reference for the primary calculation. The calculation is built on a hypothesis that 4 players participate, which was the most common scenario. Based on the fixed number in total rounds (16 at the beginning and each player has a turn in each round), number of players (4), and the number of event cards that are needed to dictate each round (4 Event cards), we have calculated the general numbers in forming a deck of Event cards for this game. Therefore, the game requires: 4 event cards per round x 16 rounds = 64 events cards.

Categorizing the game content and defining the emotions

The emotional engagement is used to describe the process of playing games. Emotions are regarded as an object for triggering players' reflection on the game's topic. Given that emotions are tightly bound with scenarios, the shifting of the scene can result in varied emotions. The step of categorizing the game content where designers interpret the scenarios logically, can contribute to their understanding of possible emotions in the game. In turn, this step can assist finetuning rules in balancing the tense atmosphere in the game process.

The game design started with creating and editing the content of "Event cards" and "Action cards" in order to integrate the theme-related information in the game. Those two types of cards were designed to create a game environment that mirrors realistic plant living conditions. At the same time, we designed other game elements: natural resource tokens, pollution tokens, and baby plants. Those game mechanics together constitute the plants' living conditions in the game system. Since the randomized "Event cards" rule mainly the storyline, we categorized its content for getting the picture of emotions that the designated narratives may trigger. The overall game system aims to provide narratives in which the plant characters need to follow the main storyline and make strategic decisions in order to survive a whole "year" (16 rounds) and make it through the winter.

Table 1 below shows that the content of "Events" was set up based on two aspects: natural events and human activities. The two types of events could support the players with a more holistic viewpoint, based on the content from multi-angles. While from the effects of "Event cards", we sorted out the 19 types of "Event card" into two directions, Positive and Negative. These two directions have emphasized the effects of the cards' content on the players' emotions. The cards sorted under the positive direction could bring players a sense of, for example, happiness or relief. However, the ones classified under negative direction could result in a sense of unease, worry or frustration.

		Positive direction		**Negative direction**	
		Supportive	Emotions	Destructive	Emotions
Event cards	Natural events	eg. Bee Get 1 resource	Happy, Relief	eg. Hurricane, -1 baby plant	Scared, worried
	Human behaviour effects			eg.Radiation Mutation!	Frustration, nervous

Table 1. The analysis of “Event cards”

Based on the classification, we realized that the game Plantropocene has 6 “Event cards” in the positive direction, and 13 cards in the negative direction. The number of cards classified under the negative direction was double the number of positive cards. To balance the tension of the game atmosphere we needed to understand the probability of occurrence of different types of events. The outcomes of the categorizing and the counting helped us gaining an intuitive understanding of the game elements and current structure, which lay a foundation for calculating and finetuning numerical rules in the next step.

Balancing the challenges and players’ mechanics

A game is a system; it has conflicts which are artificial (Flanagan, 2009, p. 7). Experiencing conflicts is how players access to different emotions. Building confrontation is essential, especially for critical game design. It means the game rules, the options they provide, and the winning and losing conditions can evoke controversies or create dilemmas in the game. The degree of tension is mediated by the mechanism diversity. In the game process, the tension will be influenced by the happening of different scenarios. To balance the degree of tension is to balance the occurrence of the probability of situations. Given that the gameplay stresses the relationship between players' actions and system outcome (Salen, 2010), the impacts of the events on the players' experience also need to consider the players' performance. The losing and winning conditions are the references when a player makes his/her decision in the game process. So, for the designers, having a clear view of these conditions is helpful to understand the creation of the scenario: The frequency of each event.

For gaining a clear view of the winning and losing conditions, we need to analyze what are the conditions and how a set of rules affects those conditions. In the game Plantropocene, the analysis is divided into three steps:

1. *Analyze the winning and losing conditions and figure out the main game components.* The player needs to have a certain number of resources, baby plants and restriction of pollution tokens as a winning condition. Based on the winning conditions, the analysis started with three categories: baby plants, resource and pollution tokens.

2. *Based on the content of the game components, analyze the rules for gaining and losing resources.*

Content	Gaining	Losing
Baby plant	Through the resource	**Event card** Draught
	Action card Spread	**Event card** Snowstorm
	Action card Fertilize	**Event card** Hurricane
	Event card Good weather	**Event card** Fire

Content	Gaining	Losing
Resource	Based on the seasonal counter Optional	**Event card** Flood
	Action card Nurture	**Event card** Tornado
	Event card Bee	**Event card** Heat wave
	Event card Beaver	**Event card** Parasitic plant
	Event card Pollinators	**Event card** Snowstorm
	Action card Cure, preventing from losing	**Event card** Draught
	Action card Sleep, preventing from losing	
	Action card Root, Protect your water & soil	

Table 2. Gaining and losing conditions

Table 2. above states the way of gaining and losing the baby plants and resources in the game. It can be seen that except for the one condition written in the rules for gaining baby plants or resources, the majority of obtaining them is based on the functions of specific cards. The table showing the information of the resource also states that there are some cards can use for protecting the resources from being lost: another way for players fighting against the game system. Those insights have reflected the complexity of the game system, at the same time have revealed that the findings are always referring to the relationship within game mechanics.

Compare to the complex system in gaining baby plants and resources, the core information of the tables 2 is showing that the event cards are the only way players lose them. Losing either of these two types of game mechanics or both, affect the game status which is directly related to the game outcome. So, event cards are the key to shaping players' emotional experience. The calculation of the number of positive and negative cards within an "Event deck" is essential for creating the estimated emotional experience for players.

Graph3. Playtesting and action cards

3. Analyze the impact level of cards and calculate the card frequencies.
The information on the card mirrors the real-world in a symbolic way. In this level, some instructions have a substantial impact, and some are slight. The impact level of cards adjusts the tension in the game. Hence, studying the cards' impact level before calculating the frequencies is needed.

The game Plantropocene has three types of event cards: "Long-lasting cards (affect everyone in each player's turn)", "Individual cards (affect a single player in his/her turn)" and "Collective cards (affect all players at the same time)". Those three types of cards can make the scenario atmosphere completely different, immediately. Before the playtesting, it could not tell whether the "Long-lasting cards" or the "Collective cards" has a stronger impact on the game status. Based on our primary design purpose and the instructions of the cards' functions, we assumed that the level of the impact of those three types of cards upgrades gradually. So, we decided that the ratios of each type of cards in total numbers should follow the ratio: 1 card (strong impact/ Long-lasting cards): 2 cards (medium level/Collective cards): 3 cards (modest degree/Individual cards). Then, we made the Lo-fi prototype with 32 Individual cards, 20 Collective cards, and 10 Long-lasting cards, according to the number of event deck, which is 64.

The level of the impacts helped to categories the number of each type of cards. Considering that the cards' positive or negative effects would influence the dynamic of scenarios, sustaining the balance of the game status needs to balance the number of cards regarding positive and negative directions. Since, each card has individual focus, some of them are similar, for example, both cards "Tornado" and "Flood" aim to make player lose resource; some cards are focusing on the different winning and losing game mechanics, for example, card "Beaver" focuses on affecting resources; card "Fire" focuses on baby plant. The balance the number of cards in positive and negative directions is a process to keep the number of cards with the same target but from the opposite direction similar. The analysis of the segmentation of cards' targets is essential for finetuning the balance in the number of cards regarding their effect's directions. For example, the number of cards gaining baby plants is similar to the

number of cards that could make players lose their baby plants. Based on this analysis regulation, the design group calculated the number of each card in its type and finetuning the number according to their contents.

The lo-fi prototype had been through playtesting and finetuning process for five times. According to the playtesting experience that players had encountered many difficulties in fighting against the system, designers have made the changes both on the content and the numbers of some cards. Step by step, the adjustments in the rules made the game dynamic can sustain the players' engagement in the game process. They were discussing the proposed topics and showing the will of mastering the game.

The final Hi-fi prototype shows that a deck of event cards includes 29 Individual cards, 15 Collective cards, and 10 Long-lasting cards. Even when the final numbers are slightly different from the beginning, the proportion within those three types of cards is still similar to the initial calculation. The outcome reveals the value of the emotion in an analysis framework that emotion as an object can be used in supporting the numerical rule's adjustments. The logic embedded in the number of mechanics assists the game mechanism in formulating a game environment where the players could experience the designated scenarios and would like to reflect upon the proposed questions.

Conclusion

This paper focuses on the numerical rules' design for a critical game. Through three steps, this article has discussed logical analysis in numerical rules calculation. From critical thinking design theory to the actual mathematical calculation, the outcome from the game iteration has proved that emotional experience can be used as an approach in critical game design. It offers a framework in supporting numerical rules design through the emotion analysis, which can ease the management of the complexity in the game elements' relationship. The numerical rules design can't simply happen apart from a systematic analysis. Its complexity is in balancing the emotional experience. Critical play has emphasized the emotional response in the game process. Hence emotions segmentation can be used as an approach in supporting sorting the rules that can assist the numerical rules' design.

Reference

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