

Mental State Transition in Gaming Experiences

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ABSTRACT

Theories about sources of fun from video gaming have been developed, such as challenge, reward, learning, growth, immersion, etc. Currently, there is not much work that integrates them. In this paper, we propose a model that describes the dynamics of gamers' experiences and behaviors utilizing these theories. Experiences and behaviors are presented as mental states in the model, and we analyze the forces that pulls/repels players into/from each of the states. This study is cross game genre: single player, multiplayer, and team match games are included in the framework. We found that reward mechanics and mental efforts are forces that drives state transition. We also believe that players do not stay in certain states for long: dynamic balances and state transitions are essential in keeping long-term gaming experiences.

Keywords

gaming experience, behavior analysis, mental model

INTRODUCTION

What makes gaming fun? Due to the variety of digital game contents, researchers have proposed multiple theories and models on this topic (Brown and Cairns, 2004; Koepp et al., 1998; Koster, 2013; Sweetser and Wyeth, 2005; Wang and Sun, 2011). In the very early ages of video games, game contents are primarily challenges in game levels, in forms of real-time action. Games like Space Invader, Tetris, and classic Super Mario Bros are examples of this kind. There is no or very limited narrative element in them. Although they seem to be simple, this type of games are still popular among gamers now. One of the most important theories about fun in this kind of game is Csikszentmihalyi's theory of Flow (Csikszentmihalyi, 2013), though it is not about gaming in the first place. In his study, Csikszentmihalyi interviewed experts such as sportsman and artist, and summarized several conditions and characteristics of optimal experiences while engaging in activities: challenge-skill balance, merging of action and awareness, loss of self-consciousness, clear goals, immediate feedback, sense of control, distortion of sense of time, intense concentration on the task, etc. Among them, challenge-skill balance is almost a must-have concept in game design now. According to the theory, a challenge too low (compared to player skill) makes players feel bored while a challenge level too high incurs frustration; both are generally not desirable for designers. Beside this, clear goals and immediate feedback are also widely used concepts in game design, as well as gamification design in school and workplace (Deterding, Dixon, Khaled, and Nacke, 2011; Hamari, Koivisto, and Sarsa, 2014). With

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challenge, goal, and feedback all in presence, another important source of fun is present: learning. Game designers have proposed some ideas about how to make fun-to-play levels by making players learn (Nutt, 2012; Taylor, 2013; Thorson, 2017). Learning is an autotelic experience, and the feeling of 'I learned something' is one of the best experiences in gaming.

With more elements come into digital games, players have more ways to enjoy games. Narrative factors such as story, character, roleplay, and cutscenes offer interesting content in addition to challenges. Multimedia technologies such as modern game engine and virtual reality (VR) enable designers to create gorgeous visuals and vivid large-scale 3-D game world. These elements allow players to enjoy games in a more relaxed status. To enjoy challenges, players have to concentrate on the tasks (unless the player's skill is higher than challenge level, but in this case the challenge is not that enjoyable). Narrative and visual aspects do not have such requirements. They could provide fun at those moments when players do not want to take challenge or the challenge level is too low.

Another essential factor that players can enjoy without concentrating (in most cases) is developable systems, where players can accumulate certain resources or establish/expand something. Examples are: level/experience system, skill system, and collectible items in RPGs, and monetary, territory, or properties in strategy games. Unlike narrative and visual factors, developable systems are almost always directly related to game mechanics which is necessary to overcome challenges. However, sometimes players play developable contents not for beating the game, but for fun. Grinding (doing repetitive task to get rewards), collecting, and feeling of growth are examples of the fun provided by developable systems. Although not welcomed by everyone, grinding is fun for many players and there are some games in which the primary gameplay is grinding, such as the *Diablo* series and the *Pokemon* series. Both psychological research and player interviews show that immediate feedback and reward provide positive experience and reinforces grinding (Game Wisdom, 2019; Koepp et al, 1998; Wang and Sun, 2011).

In MMOG (Massively Multiplayer Online Games), being able to talk to and play with fellow players is only part of the fun. The sheer presence of other people in games makes many of the elements mentioned above to have different and stronger meanings. For example, while challenges come from other players instead of a fixed level, the satisfaction of overcoming the challenges is different. Developable system is another example. In MMOG context, achieving certain level, acquiring rare items, or accumulating enormous wealth can be worldwide event and makes the player famous, which creates considerable sense of achievement compared to single player context. Bartle (1996) is one of the earliest to study how players have fun in MMOGs. He classified players into 4 types: killer, achiever, explorer, and socialiser, which are divided by 2 axis: player-world and acting-interacting. This model largely covers the fun from challenge, narrative factor, and socialization. Yee (2006) made a more fine grained classification model composed of 3 major categories: achievement, social, and immersion. In achievement, there are 3 sub-categories: advancement, mechanics, and competition, each roughly means achieve game goals, exploit game rules and calculations, and win over other players. In social, there are also 3 sub-categories: socializing, relationship, and teamwork. Each roughly means enjoy casual social activity, build stable and long-term relationship, and cooperating with people. In immersion, there are 4 sub-categories: discovery, role-playing, customization, and escapism, each roughly means explore game world, roleplay, dress up avatar, and use games to escape from real life matters. This model provides a measurable classification

of player motivation in MMORPG, which covers some previously under-discussed motivations such as optimization and customization.

The theories of the many ways to enjoy gaming were developed within different game genres from different point of view. To our knowledge, there is no unified model that describes the relationship between sources of fun or how and when players shift between them. Our goal of this paper is to propose a model that structurize the sources of fun and explains the forces that drive players to transit between them.

THE MODEL

See Figure 1 for the large picture of the proposed model. To analyze how players enjoy different kinds of fun, how the fun is maintained, and how players switch between different fun, we try to identify two concepts in and between each part of the model: dynamic balance and mental state transition. We briefly describe the idea here and discuss in more detail when describing each part of the model later.

Dynamic balance: As mentioned before, challenge-skill balance is one of the conditions of optimal (gaming) experience. In game level design, there is a popular guide: raise the difficulty a little bit to break challenge-skill balance for a short while which creates frustration, and players raise their skills to match it, then raise the difficulty again (Taylor, 2013). During this ‘dynamic balance’ process players learn and overcoming challenges, which makes them feel like personal growth as well as have pure joy of learning something. If the challenge curve is raised up too steeply, players may not be able to raise their skills to match it and restore the balance before giving up due to frustration. Inspired by this concept, we believe that dynamic balance might is important in several other kinds of fun, where the game content should change with player status .

Mental state transition: Mental state is what a player is doing in terms of mental effort and game content. For instance, while fighting a boss in Diablo, a player is doing ‘real-time action’. While defeated, the player may choose to ‘take a break’, ‘reflection about strategy’, or ‘farming’ on weak opponent to develop character. Possible mental state are limited by game genre while how players shift between mental state depends on game mechanics and player preferences. Imagine players who value action skill, they might avoid ‘farming’ because they want to beat the challenge with lesser character (avatar) attributes. With more game genres and media available, more mental states are possible: players can ‘roam’ in the game world in *World of Warcraft (WoW)*(Blizzard Entertainment 2004), ‘make friends’ in the physical world in *Pokemon Go*, ‘share’ their gaming experiences on Reddit and Twitch live streaming chat room, and run their own ‘live streaming’. The idea about mental state transition comes from the observation on change of pace in game design. Examples are mini-games (such as puzzles) in an RPG and various things to do in open world games. Designers try to extend gaming time by simply offering something else to do in a game when players get tired in one. This inspires us that mental state transition might be essential in long term gaming experiences. A curious topic to be discussed is what kind of ‘something else’ is more effective. A possibility is that an activity which offers a change in mental effort would be a good choice. We will discuss more in the following sections.

Figure 1 shows the mental state category proposed. We describe it from the inner circle.

1. **Challenge:** The source of fun of earliest video games; some people think that challenge is the core element of video games. Examples like Tetris and Space Invader have almost no narrative content, the visual design is simple, and features minimal achievement systems: Tetris and Space Invaders only have

score, recent games like *Getting Over It with Bennett Foddy* (Bennett Foddy, 2017) and *Jump King* (Nexile, 2019) do not even have score: reaching the end of the game world is the only goal. This type of games ask players to focus solely on overcoming the challenges. Even though the players seems to keep doing the same thing, there are dynamic balance and mental state transition in it. The rising challenge level makes dynamic balance of challenge and skill: Tetris and Space Invader get faster in later stage; the precision required and cost of mistakes get higher through progress in *Getting Over It with Bennett Foddy* and *Jump King*. During game play, acting and reacting, interleaved with reflection, planning, and practicing (while performance is unsatisfying or preparing for next challenges), are possible mental states for transition. Whether a player will go through all the states depends on his or her play style. Some players prefer acting over planning and want to beat challenges with acting skills honed by repetitive acting, while some players value preparation and optimization through planning and want to minimize try-and-fail from acting. Designers can also encourage certain behavior through game mechanics, such as rewarding small number of fails.

2. Narrative and developable contents: Classic single player RPGs, among many other games, offer contents of this category. With narrative contents (story, quest, visual design, etc) and developable contents (character level system, equipment, coins, etc), more states are present: narrative immersion (roaming, reading stories, viewing pictures and videos, dressing up avatar, etc) and accumulating/expanding (farming, collecting, leveling up, etc). These states require lower cognitive effort in general and may serve as pace changer during gaming. Here pace changer largely means they require less attention, focus, and cognitive effort, not really relaxing: farming and leveling up can sometimes feel heavy work. We identify two dynamic balance concepts here, at least. The first is balance between player skill/effort and ability-in-game. Not only the players feel they are growing themselves, but also the in-game entities should be getting stronger, richer, or more popular. This concept is related to skill system as a form of reward (Wang and Sun, 2011), where new skills in game are available when players make progress. When the player is getting better, player controlled entity should also get better, otherwise players will feel that their effort is not rewarded or their skills are not reflected. Also, if the player identify themselves as the avatar, a company owner, or a king, it is natural to expect the avatar, the company, or the kingdom becomes better along with the player. On the other hand, if the ability-in-game is higher than player skill, the developable system may seem cheap, and players would feel sort of bored about the developables. A similar case is that when players use cheat code or software to get avatar ability or virtual item, they tend to quit the game soon. Second is the balance between narrative-based, developing-based, and challenge-based enjoyment. Digital games, as a multimedia form of entertainment, players expect a mixed experience, beyond pure challenge (solving puzzle on paper) or pure narration (reading novels). This kind of mixed structure is popular in RPGs, but we can also see players' need for both story-telling and challenge in "career mode" or "campaign" in other game genres. However, players are known to neglect certain form of narrative element, such as quest descriptions. The reason could be that this kind of narrative content is shown along with developables and challenges, and players prefer to focus on the latter, which are considered core game elements compared to story. This also helps explain a phenomenon we observed in watching game streams: players complain about unsatisfying narrative content mostly only after play session, when players recall or talk about it. But they will criticize about challenge and developable elements immediately during

play. The dynamic balance can be seen as providing contents according to the players' preferences over the three kinds of enjoyment with time.

3. Socialization and cooperation: These contents are made possible in MMOGs. Yee (2006) provided a good base for the mental states: socializing, relationship building, and teamwork. It is worth mentioning that game design can foster socializing and relationship building. WoW are well known for people making long-term friends in it, for it features goals that can only be achieved by extensive teamwork and commitment (Williams, Ducheneaut, Xiong, Zhang, Yee, and Nickell, 2006). Location-based games are known to make people play together in the physical world. Ingress players form communities and travel together as a team. *Pokemon Go* (Niantic, 2016) successfully let people who do not often go outside and talk to others expand their social circle (Koskinen, Alha, Leorke, and Paavilainen, 2019). On the other hand, research has also revealed that players often play alone in MMOGs (Ducheneaut, Yee, Nickell, and Moore, 2006). People want play-alone and play-with-others both because there are different kinds of fun, and play-alone is sometimes more relaxing — knowing there are people around is good enough. The dynamic balance here is the balance between social activities required in game and players' ability and preference in engaging such activities. Designers do not need to maintain such balance in most cases though: when players feel tired in playing with others, they can just play alone in most situations, and vice versa. Teamwork is one of the most discussed factors in games, both because it helps/requires socialization and has the potential in teaching teamwork ability in physical world, such as schools and workplaces. Teamwork is enjoyable by itself: participation, helping each other, and group discussion can be intrinsically motivating activities. Achieving highly challenging goals with teammates creates unforgettable moments, such as the first successful guild raid in WoW. However, in teamwork, we believe there is also a dynamic balance: balance in being a team-player and being a lone wolf. Research found that having a team member who assist teammates can increase the willingness of playing a hard match in team match game. However, when it comes to achievements like personal stats, number of kills is much more valued than number of assists by players (Wang, Yang, and Sun, 2015). Although cooperative play is an essential element in team games (and people can blame others very seriously for not playing cooperatively), a room for showing personal skill and feel empowered or superior are important in gaming experiences. In our interview and forum discussion data, *Heroes of the Storm (HotS)* (Blizzard Entertainment, 2015) is often criticized of being asking too much on teamwork and lacking the possibility of winning through single player performance. Players sometimes choose to play in a lone wolf style when they are tired of being cooperative, want to pursue personal stats, or just feel like; it is the game designers' challenge to make games enjoyable for them and their teammates.
4. Metagaming: Sometimes players think and talk about their ideas, feelings, and even their stories about a game. In forums such as Reddit and chat rooms of game live streaming platforms such as Twitch, we can see players actively share their thoughts. In the era of sharing over the Internet, we believe sharing gaming experience should be considered part of the experience. What, why, as well as when they share are all worth studying. Players talk about their achievement, strategy, and memorable experiences about a game when they are deeply engaged. On the other hand, a poorly designed game may simply repel players, or make players think about design issues and share their thoughts. Furthermore, players may implement their ideas by 'modding' (use game content editor to change game mechanics, create levels, or even make new games). Research has shown that game modding is valuable in developing

certain abilities such as coding, critical thinking, creativity, cooperation, etc., and is used purposefully in education (El-Nasr and Smith, 2006; Prensky, 2006; Thiel and Lyle, 2019). The transition between gaming and metagaming activities is less frequent compared to in-game transitions, but has significant meaning. Sharing thoughts and participating in discussions make player reflect their experience and provide socializing opportunities; becoming a reviewer or a modder can change a player's life.

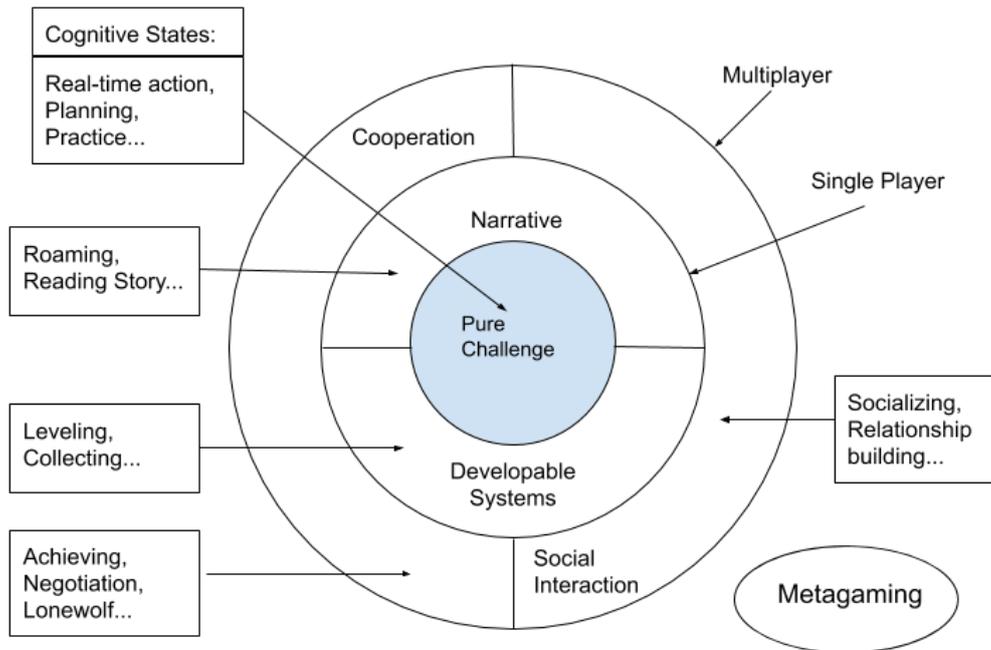


Figure 1: The mental states model

MENTAL STATE TRANSITION

In the previous section, we proposed some mental states in enjoying various elements of video games. Although players seem to choose how to play at their will most of the time, in some situations players can be pushed/pulled from one mental state to another. In this section, we discuss about some of the forces that makes mental state transitions.

1. Dynamic balance fails: We have argued that dynamic balance is important for fun, so it is natural that imbalances will push players to other mental state. For example, players feel anxiety or boredom when challenge and skill are not balanced. This should create a force repelling players from 'challenge' state to another, if there is no adequate challenge level available. If the challenge is too high, players may stop action and start planning. The he or she can go farming for necessary resources/items according to plan, then go back to challenge again. If the challenge is too low, players may continue progressing and hope to challenge a higher level, turn into narrative contents, or socialize with fellow players. Another example is imbalance between team play and lone wolf play: players feel they are forced to cooperate with teammates, or in the other end, they want to play cooperatively but teammates' play style or game mechanics do not allow them to. In these cases, players may just go to other game modes in MMORPGs. For team match games where there is no other game mode, players may transit to metagaming: criticizing it or modding it, if they still want

to stay with the game. State transition is not necessarily a bad thing; sometimes designer creates imbalances to make it happen on purpose. An example is Getting Over It with Bennett Foddy, in which frustration is the intended gaming experience, to test players perseverance, make them reflect about themselves (sometimes philosophical), and bring exceptional joy after reaching the goal. This game makes players go through self-reflection, which rarely happens in game, and arouses a lot of discussions (a metagaming state) in game forums and live streaming chat rooms.

2. Reward system: Reward is involved in several state transitions, mostly act as pulling force. Modern game reward systems reward players for both in-game actions such as improving skills and collecting items, as well as physical world actions such as meeting with other players or go to specific locations (Wang and Sun, 2011). Although rewards are more related to achievement and functional aspect of game mechanics, they can be used to encourage transitioning to narrative oriented mental state. For example, achievement system in WoW that reward visiting new places draws players to exploring game world. Reward system may involve multiple mental states too. The exploration rewarding achievement also makes players improve their avatars' ability (go to farming state) because some places requires strong avatars to survive. Another example is the reward systems of Diablo series, which make players switch between grinding and optimizing. Players grind to get better equipment, and try to optimize with what they get to reach a more challenging level, which gives better reward when grinding in it. This cycle is one of the successful models in extending gaming time while maintaining fun. Most MMOGs reward players to participate in in-game organizations, often called 'guild'. After that, there are rewarding quests that can only be completed by tight cooperation of guild members. Once players participate in guild for the initial reward, they will be pressured by other members to complete the guild quests together, which often take a long time. This kind of multilayer structure reward may be effective on players who are harder to motivate by simple reward: in this case, for players who prefer to play alone rather than play together at the beginning.
3. Multitasking: From Bartle and Yee's work, we know that in a complicated game like MMORPG, players have many ways to enjoy a game, and each player is often interested in more than one activity. Naturally, players will switch their attention between several activities to maintain enjoyment, and immersion as well (Wang, OuYang, and Sun, 2019). The transitions happen during multitasking are frequent: players must switch between activities every couple of minutes or even seconds to keep track of all what they are doing. If game designers want to allow or encourage this way of play, they should make some game interface friendly to multitasking, such as alarming sound that reminds the player about the progress of what he or she is not looking at. We believe that it helps keep players in the game. After all, boring moments are not evitable in most game activities: allowing players to avoid these moments while staying in game is a choice for designers.
4. Mental energy: Gaming is an activity of hard fun. The most memorable experiences are often hard earned rather than given: learning something, overcoming difficult challenges, and working out complicated strategies. The need of pursuing challenge and accomplishment draw players to mental states related to challenge, like real-time action, planning, and optimization. However, all of us have limited mental energy: players need to rest between intensive challenge activity. Simply feeling tired may draw players from concentrated play to relaxed play: narrative, developable, and socialization elements. It is worth noticing that sometimes players play a single game for

such a long time without rest that it looks like an addiction. According to the limitation of mental energy, players are probably not fully engaged in intense challenge all the time. We think that a way to change addiction-like play behaviors can be encouraging them to play games which have very limited elements beside intense challenge. Examples are one-on-one competition games like Starcraft series (no trash talk with teammates), or single player challenging games like *Getting Over It with Bennett Foddy* or *Celeste* (Matt Makes Games, 2018).

Figure 2 shows how different players' preference for reward system and mental energy draw players into different mental states. Note that it is only a rough graph representation because there are exceptions. Functional rewards are helpful in making progress and achieving game goals. Non-functional rewards include score/ranking/stats and narrative elements like story and visual art. Some rewards are both functional and non-functional, depending on how players use it (Wang and Sun, 2011).

With the forces listed, we analyze the possible conditions here, as an example, that make a player leave the challenge related state. First, they may stop challenge because they feel bored or frustrated (dynamic balance fails). Second, there is a reward for grinding, exploring, or any other activities that are attractive (reward system). Third, the player just stop for a while and chat with friends (multitasking). Finally, they feel tired and want to play something easier (mental energy). The method can also be applied in listing possible conditions that make players go into certain mental state. Although it may not be complete, we think this framework can be useful in analyzing players' gaming behavior, especially for long term.

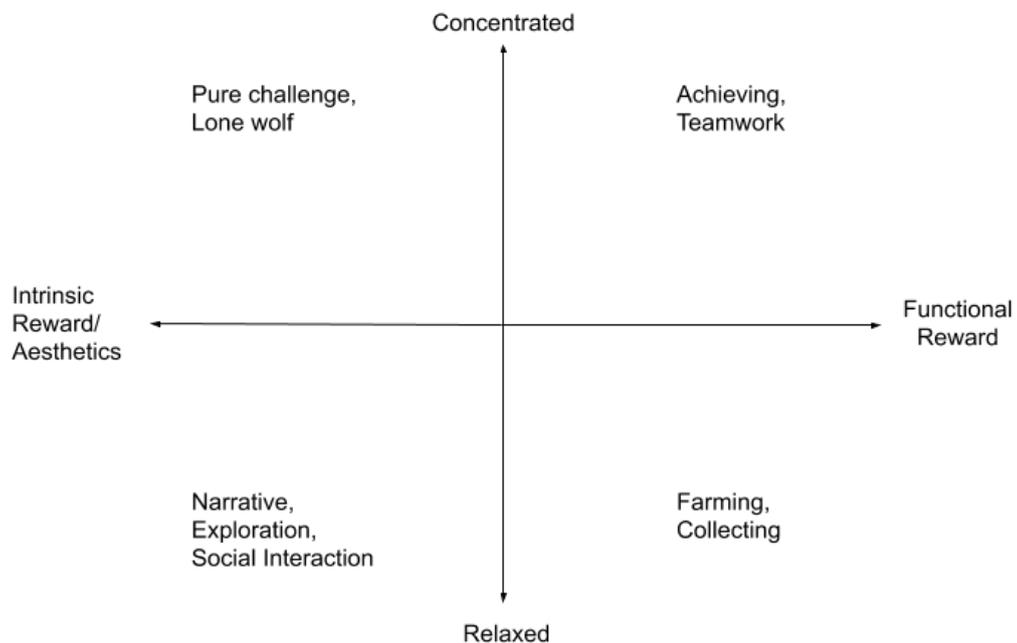


Figure 2: Forces and mental states

GAMER OPINION INTERVIEW

While collecting data from forum, chat room, and live streaming, some games caught our attention due to the strong opinion from both positive and negative sides. In order to understand how a design results in extreme different opinions, we select two of them: *Getting Over It with Bennett Foddy* and *Heroes of the Storm* for further case study. We select several game streamers and watch the game live streaming and invite players from forums for interview. In selecting streamers, we chose who like to speak out what he or she is thinking. Also, we exclude professional gamers for HotS for their purpose might not be having fun, but practicing. We think it is better to analyze professional gamers in a separate project. For each game, we invited 4 players, covering high skill and low skill players. We ask the interviewees to talk freely about their experiences and discuss about some observations from live streaming with them.

Getting Over It with Bennett Foddy: Two players who finished the game and two who didn't were interviewed. From their sharing, we notice that there can be a long reflection period: not reflecting about strategy, but about self. For interviewees who see themselves as skilled gamers, they questioned their own self-identity and struggled about giving up. According to the designer, this kind of experience is his intention. So we think this kind of mental state should be considered part of the game, instead of stopping play. On live game streaming, the time spent on reflecting is shorter, probably because streamers feel that they should not stop playing too long.

Heroes of the Storm: According to both official advertisement and forums, the game is designed to emphasize teamwork. From viewing the game streaming, chats, and forum posts, we draw the possible states of the gameplay as: cooperation (following command and helping teammates), challenge (fighting other players), developable system (farming), and achievement (earning personal stats). While reading the forum posts and live streaming chats, we noticed that a lot of criticism are about too much teamwork and farming (or PvE play). In the interview, some of the participants reported that they expect to spend more time fighting other players and earn their personal stats. However, they often feel forced to transit to farming or cooperation by game mechanics, rather than actively choose to. In a team competitive game, players have to take an effective routine to win and have less room for doing what they feel fun, unless they ignore teammates' criticism. Hence, designers of such games are wise to be careful about the choices they provide to players, try not to make players feel their actions are compulsory.

DISCUSSION AND CONCLUSION

In this work, we propose a model that organizes various gaming activities into mental states and the forces that drive players transit between them. Through observing live game streaming, analyzing forum and chatroom posts, and interviewing players, we argue that there are dynamic balances in some of the mental states. When the balances are kept, gaming experiences are better in general. While balance is not kept, players will be driven to do something else, or leave the game. Researchers interested in analyzing gaming behavior may utilize this model to infer player experience and motivation change through time, by observing gaming session. Most experience or motivation study rely on questionnaire, which is difficult to provide time series data. Game designers may think about if there is a desired mental state transition pattern in their design. For instance, as mentioned before, Diablo's grinding-optimizing model successfully keep players having fun for a long time. Designers may reference some previous games and try to create a desired mental state flow with game design. We believe it is especially useful in designing game based learning (GBL) materials. There is a dilemma of GBL: learners are forced to play at the beginning. Currently, there is no guaranteed way we can mitigate the feeling of being forced. From our model's point

of view, a possibility is to offer players several kinds of contents, which require different mental effort and gives different kinds of rewards in the game. It may be good to utilize the model to embed learning material into different mental state according to natural transition flow. For example, materials that requires less cognitive effort can be arranged to be a place to rest after trying a major challenge, and reward can be set to pull learners back to challenge instead of forcing them to do so. This method is similar and can be applied with self-regulated learning in GBL, where learners are encouraged to freely choose when and what to learn in a game (Schunk and Zimmerman, 2012; Taub, Azevedo, Bradbury, Millar, and Lester, 2018).

There are some exceptions that we are not able to cover in the model, since gaming experience is so complicated. For instance, although balancing challenge and skill is almost a must-do, and feel of progress keep players in game, some games like Getting Over It with Bennett Foddy and Jump King intentionally violate the design principles in order to create intense frustration. For those who can endure and finish the game, the sense of achievement and self reflection experiences are exceptional. After all, it is hard fun that is unforgettable. Another example is the guild raid activity in WoW. Dozens of players must join together and only in fixed time. It costs several hours and players must keep focusing on the activity (not possible to switch to other activities) because it is designed to be very challenging; leaving the team in the middle of the activity will incur harsh criticism from teammates, even being kicked out of guild. It might take months to reach the final goal. The task feels like a job more than some real jobs. However, that's also why players who choose to participate in this activity feel it memorable: sense of achievement and relationship built (Corneliussen and Rettberg, 2008; Williams, Ducheneaut, Xiong, Zhang, Yee, and Nickell, 2006).

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