Designing game rewards using experimental psychology

Previous compulsory steps / Prior students' knowledge	None in particular.
Learning objectives	Learning about cognitive biases and how some game designs can take advantage of them.
Subjects	English as a foreign language, Economics, Social sciences, Media Education
Recommended Age (10 – 14) or (15 - 18)	15 - 18
Material needed	Video display device
Sequence duration	60 minutes
Individual or group activity	Group activity
Skills developed (after learning objectives)	Critical thinking, Digital literacy, Research

Step by step: how to implement the sequence

In this pedagogical sequence, we will design a videogame's reward system. First, we will try to figure out the pitfalls to avoid while designing rewards by analysing an article of experimental psychology. We will also discuss evidence-based information from the game industry on the psychological impacts of rewards. Finally, we will develop an engaging game reward system while avoiding "unethical" ways of implementing rewards.

- **Step 1 – Background knowledge (15 minutes)**

Intrinsic vs extrinsic motivations:

- Ask your students to define these 2 concepts. You can help them with the following video:

  💡 'Is It Extrinsic or Intrinsic Motivation?' by VeryWell Mind.

- Ask your students what can be a source of **intrinsic** rewards in games. Do they have examples from their own experience?

→ It is the intangible pleasure to succeed at something we wanted to do. It can be driven by curiosity, feeling of mastery over skills or environment, knowledge, or just sheer fun.

- Ask your students what can be a source of **extrinsic** rewards in games. Do they have examples from their own experience?

→ They are dissociated from the act of playing. The most obvious example are achievements. They are virtual "carrots" that give an artificial interest to activities we otherwise never would have partaken in (like finding hundreds of collectibles).

- **Step 2 – The undermining effect (10 minutes)**

Explain to your students the experiment performed in a study from Lepper et al. (1973):

Three groups of children that like drawing are asked to draw something. One group was told that they will get a reward, another group had no reward, and a third group got a surprise reward at the end.

The researchers followed the children several weeks after to track how much time they choose to spend on drawing instead of other activities.

Experimental condition	n	%
Expected award	18	8.59
No award	15	16.73
Unexpected award	18	18.06

Figure 1: Mean percentage of free-choice time that subjects chose to play with the target activity, by treatments.

Ask your students what those results suggest.

Ask your students how they would define the undermining effect → if you provide incentives for someone to carry out an activity they already enjoy, it undermines their original reason for doing it.

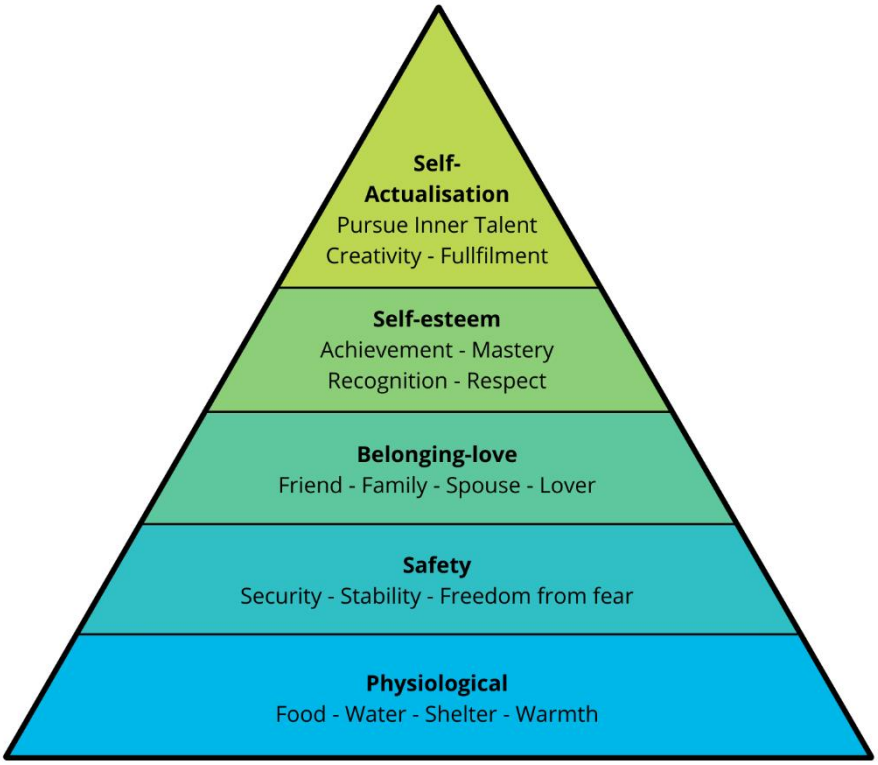
- **Step 3 – Article analysis: the role of self-determination (25 minutes)**

Read with your students the summary of the article's analysis of the effect of rewards on motivation. It can be found in annexes.

Remind your students of the fact that brain activity in the striatum and midbrain are associated with the feeling of subjective value and engagement in a task. Activity in the striatum is linked to a feeling of self-determination.

Ask your students what these results suggest. → The results show that performance-based reward undermines intrinsic motivation, as assessed by the number of voluntary engagements in the task. When a reward is no longer promised, people do not feel subjective value in succeeding in the task, as indicated by the dramatic decrease in the activation of the striatum and midbrain, and by the fact that subjects are not motivated to show cognitive engagement in facing the task. The undermining effect is closely linked to a decreased sense of self-determination

- **Step 4 – Basic human psychological needs (10 minutes)**



In 1943, psychologist Abraham Maslow proposed a hierarchy of human needs. The highest needs an activity fulfills the more motivating it is. Nowadays research has progressed, and it is recognized in game industry that satisfying 3 basic psychological

needs is the key to maintain player engagement. These needs are competence, relatedness and autonomy.

Ask your students to define these 3 concepts.

- Competence: feel a sense of moment-to-moment efficacy as well as meaningful growth over time that unlocks new experiences;
- Relatedness: meaningful connexon to others, it's feeling "I matter to you", it's not having 10.000 friends on social media;
- Autonomy: the feeling of having meaningful and interesting opportunities and choices in front of us.

Ask your students to find on which level these needs fall onto Maslow's pyramid, and for examples of rewards or game mechanics that satisfy each need. Ask them to think about bad examples for each need.

Competence:
Good questions to ask when designing such a reward are: "what can I do now that I couldn't do before?", "how did my capabilities grow?". (Items should unlock gameplay features and new zones to explore, not to be just collectibles)

Feedback is a good way to support the feeling of competence of the player in a game: use animations, sounds, vfx that say, "great job!".

Relatedness:
Create mechanics that foster the feeling of mutual support and relying upon each other. It encompasses relation to other players, but also non-player characters (NPCs). To trigger relatedness, other players or NPCs must perform actions that matter to the player.

For example, teammates that help you and joke with you on the battlefield. And for which you perform missions that reveal their background story.

Autonomy:
Create mechanics that trigger a “What if” thinking: “what if I tried this instead?” Avoid forcing players to do something. For example, in Red Dead Redemption or GTA games, there are many ways to complete a task.
Avoid “to-do list” quests and missions that promise a reward since they trigger the undermining effect.

Extrinsic rewards are “bad” when they control or thwart players’ needs. They are “good” when they facilitate them.

Ask your students how we could use extrinsic rewards in a way that satisfies the basic needs?
→ Instrumentalize extrinsic rewards:
In-game currencies like money and experience points, although extrinsic by nature, can by instrumentalized to attain intrinsic rewards. They can be used to prepare the player for a challenging confrontation. By tackling this challenge prepared, we feel stronger, more serene and proud of our effort. Experience points and gear are no longer an end in themselves but a way to attain intrinsic rewards.

- **Step 5 – Application (15 minutes)**

Implementing an extrinsic rewards system is a game design choice that comes with pros and cons. It must be done in a way that supports the theme of the game.

For example, if the game's ambiance is horror and its theme is the overcoming of challenges, the possibility to accumulate experience and gear in order to feel strong and safe for an expected challenge might be a bad decision.

Based on the game you want to create, ask your students to think about its theme, the atmosphere of the game and what rewards and mechanics can be used. You can think about it in class and ask a written essay or a presentation as an assignment.

References

Cherry, K. (2020, January 15). Differences of Extrinsic and Intrinsic Motivation. verywellmind.com Retrieved from https://www.verywellmind.com/differences-between-extrinsic-and-intrinsic-motivation-2795384.

[Game maker's toolkit]. (2020, September 13). 'This psychological trick makes rewards backfire' [Video File]. Retrieved from https://www.youtube.com/watch?v=1ypOUn6rThM

Lepper, M.R., Greene, D. (1973). Undermining children's intrinsic interest with extrinsic reward. Journal of Personality and Social Psychology, 28(1), 129-137; DOI:10.1037/h0035519

Murayama, K., Matsumoto, M., Izuma, K., Matsumoto, K. (2010) Neural basis of the undermining effect of monetary reward on intrinsic motivation. Proceedings of the National Academy of Sciences, 107 (49) 20911-20916; DOI: 10.1073/pnas.1013305107

Schell, J. (Ed.). (2008). The Art of Game Design: A book of lenses (1st ed.). Burlington, MA: Morgan Kaufmann Publishers

[Scott rigby]. (2012). ‘Intrinsic and Extrinsic Player Motivation: Implications for Design and Player Retention’ [Video File]. Retrieved from https://www.gdcvault.com/play/1015568/Intrinsic-and-Extrinsic-Player-Motivation

Annex: Except from Neural basis of the undermining effect of monetary reward on intrinsic motivation, Murayama, K, (2010).

- Hypothesis based on previous research

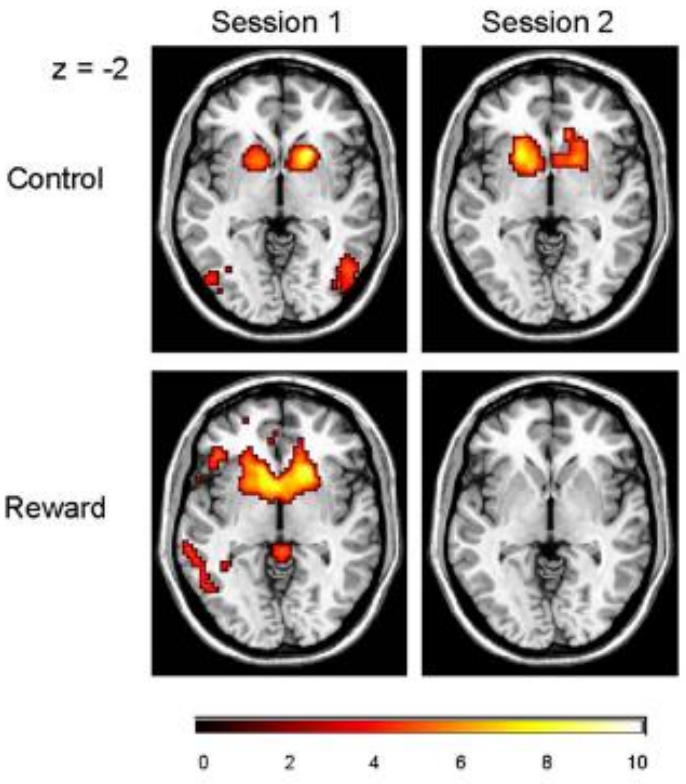
"A source of intrinsic motivation is the intrinsic value of achieving success on a given task. the undermining effect may involve the interaction of […] the extrinsic value of obtaining a reward and the intrinsic value of achieving success.
[…] recent studies have suggested that activation in the anterior part of the striatum is modulated by […] a sense of self-determination. Previous studies have also suggested that the midbrain, which has a strong anatomical connection with the anterior striatum, is responsive to both monetary and cognitive reward […] **.** Therefore, we expected that the undermining effect may manifest as brain activity changes in the reward network, especially in the anterior striatum and midbrain."

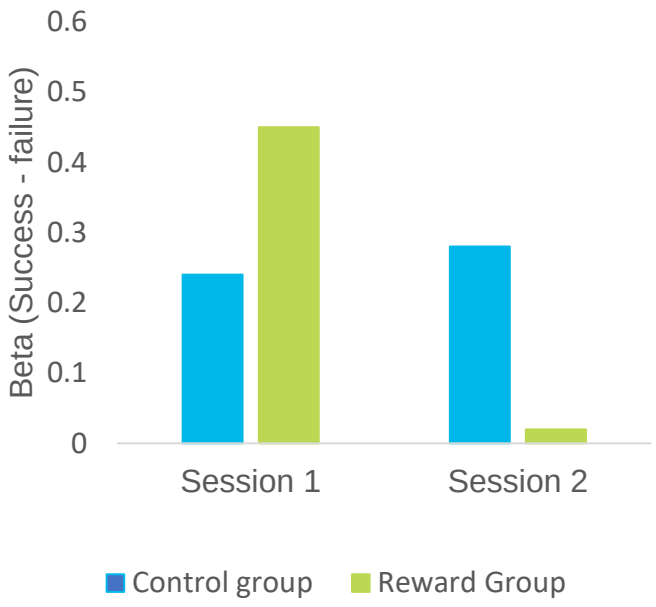
- Method

"Twenty-eight participants were randomly assigned to a control group or a reward group. […] participants in the reward group were told that they would obtain […] $2.20 for each successful trial […] , and received the reward […].
Participants in the control group were told nothing about reward and received money just for task participation, […] unrelated to the participant's performance.
This allowed us to examine the effect of performance-based reward apart from the amount of monetary reward offered.
After being released from the scanner and receiving the reward, participants were left alone in a quiet room for 3 min, where they could freely spend time playing the task on a computer, read several booklets, or anything else (i.e., free-choice period). To track the brain activity associated with the undermining effect, we asked participants in both groups to perform the tasks again after the free-choice period and without performance-based reward, followed by a second free-choice period."

- Results


12
8
4
0
Number of voluntary play
First free choice period
Second free choice period
Control group
Reward Group


Session 1
Session 2
z = -2
Control
Reward
0
2
4
6
8
10


0.6
0.5
0.4
0.3
0.2
0.1
0
Beta (Success - failure)
Session 1
Session 2
Control group
Reward Group