

# Research and analysis of enlightening education games

Chengyu Huang \*

Office of the Provost, Northeastern University, Boston, USA

\* Corresponding Author Email: [huang.chengyu@northeastern.edu](mailto:huang.chengyu@northeastern.edu)

**Abstract.** There are many different types of games on the market, such as AAA games that focus on commercial profits, independent games that express the ideas of some producers, experimental games for the purpose of exploration, and the rare enlightenment games for education or interest enlightenment game. Enlightenment games are very important for a person's interest enlightenment or for children's basic education because they provide a relatively simple and easy-to-accept way for users to acquire knowledge in new areas. The purpose of this article is to summarize existing educationally inspired games and summarize their strengths and weaknesses. This article outlines a comparison of positive feedback in video games and educational games, a professional survey of educational games, and the impact of educational games on players. As well as investigating the professionalism of the game and its impact on people. In the future, educational enlightenment games can replace some simpler enlightenment education or experience some areas that have never been experienced before.

**Keywords:** enlightenment games; education games, feedback; professional

## 1. Introduction

There are many different types of games on the market, such as AAA games that focus on commercial profits, independent games that express the ideas of some producers, experimental games for the purpose of exploration, and the rare enlightenment games for education or interest enlightenment. game. Enlightenment games are very important for a person's interest enlightenment or for children's basic education because they provide a relatively simple and easy-to-accept way for users to acquire knowledge in new areas [1-2]. For example, Nintendo's Game Builder Garage is a game design enlightenment game for zero game production base but interested in this field. This game makes designing a game as easy as possible by providing some pre-programmed logic blocks, easy-to-understand educational levels, and some pre-made art or music materials. Facts have proved that Game Builder Garage has indeed aroused some people's interest in game production, which can be seen from the still active Game Builder Garage community, there are still many people willing to upload their own small games. Enlightenment games are of great help to the society [3]. Not only can they help some industries with high entry barriers to reduce entry barriers, but they can also provide a better way to enlighten preschool children, which not only reduces enlightenment education The pressure can also increase the talents of some industries with higher thresholds. After the development of VR technology in the future, these enlightenment games can even properly replace the teaching or enlightenment of some industries that require practical operation, such as cooking, circuit welding, mechanical repair and so on. Allowing players to receive knowledge through level design and positive feedback is more effective and cost-effective than sitting in a classroom to receive knowledge. As an example of VR teaching, although this game is not perfect, person can see what the future VR education enlightenment game will look like from this game. This game is called Cooking Simulator VR [4]. In this game, the player will play a Chefs come to cook different meals for customers. In the game, players can make more than 80 recipes by themselves, and all ingredients will change their smell, appearance, and taste according to the player's behavior. Realistic physics applies every time a player slices a potato, flips a steak, or cooks a soup. After learning the basic operation of cooking, players will be able to create their own dishes and grow through each dish. In this way, one can successfully enlighten a person how to make a dish without wasting ingredients [5].

However, even though there are so many benefits of educational enlightenment games, the academic summary materials in this field are not comprehensive and perfect, so the main purpose of

this article is to summarize the current positive feedback design in games, and to discuss the differences in the design of positive feedback in educationally inspired games. The second will discuss the professionalism of knowledge of educationally inspired games, as well as the different ways of expressing it. Finally, the acceptance of these games will be investigated through case studies.

## 2. Postive FeedBack in Game

In game design, there is a term called positive feedback, which is used to refer to a positive reinforcement that allows players to continue playing. In video games, it generally refers to giving players some material or psychological rewards in game design. To keep the player motivated to keep playing, for example in a role-playing game, after the player has gone through a difficult but optional battle, the game designer should reward the player better than usual because of this let the player know that it makes more profits to do so, so they will continue to challenge the difficult battle. This chapter will introduce the embodiment of positive feedback in video games.

### 2.1. Feedback in vidio games

Positive feedback is quite common in video games, and these positive feedbacks can be roughly divided into physical and psychological. Physical positive feedback refers to providing some game props in level design or unlocking more game content [1]. This positive feedback will encourage the player to continue to be motivated to do certain things in the game, such as exploring the map more actively, because in the player's mind the player associates exploring the map with getting rewards through operant conditioning so that there is more motivation to explore the game map. Take the most classic example in game design: the game Metroid is a role-playing game. Players play the role of Metroid Samus to explore freely in a huge dungeon and by constantly collecting resources and defeat bosses one by one to finish the mission. The most classic example of positive feedback is in the Metroid (Figure 1) [2]. When player start the game, the player will initially place at the center of a scene at the start of game. Most players would choose to go right. But after those players have walked some distance, they will find that there is a short tunnel ahead that they cannot pass through. At this point the player will explore the map to move forward, and as the player explores the left side of the starting point, they will discover an ability that allows the player to pass through a low tunnel. This time the game gives the player positive feedback because they explore the map.

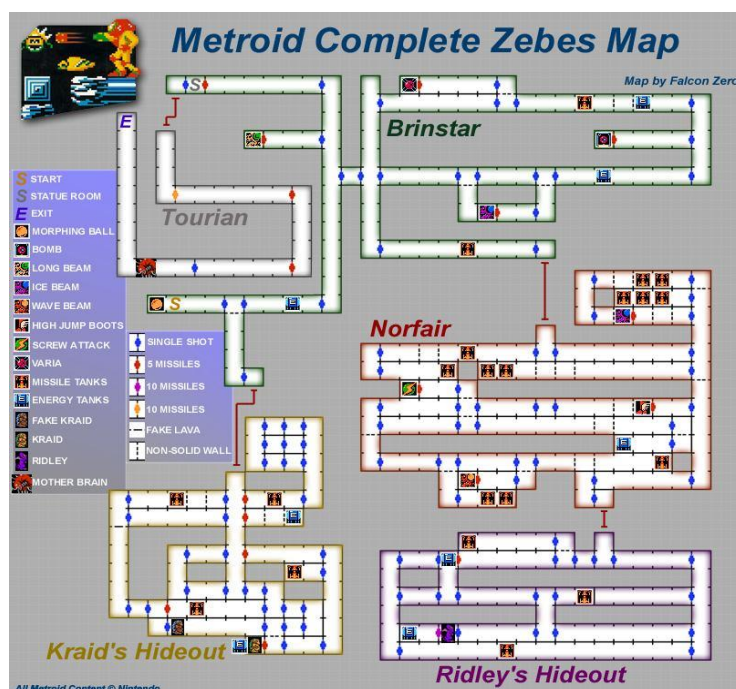


Figure 1. The map metroid on the left of S player can get the ability pass right side [2].

Another kind of positive feedback is psychological. This kind of positive feedback will not reward the player in the game reward. But will give the player joy which is the reason why they play games. For example: in the game Rhythm Doctor which player will play as a doctor using music to cure the patient. To cure the patient player, need to press the space at 7<sup>th</sup> beat There is a level, which is a dialogue level. In this level, there is no rigid rhythm requirement, but the player is free to play individual notes, and these notes will be subtly integrated into the BGM of that level. When the player appreciates the dialogue, he will gradually enter a state of narcissism through continuous performance. Until the end of the level, a comment will pop up: You are now the café's in-house musician![3]. At this time, players will feel an indescribable beauty (Figure 2).



**Figure 2.** The end of scene in rhythm doctor [3].

There is also a kind of psychological positive feedback that comes from the player himself, from the player's own technology becoming stronger and overcoming more and more difficult levels. This flow will also bring fun to the player. These kinds of psychological positive feedback often appear together with material positive feedback to make players more motivated to continue playing.

## 2.2. Feedback in education-inspired games

In education-inspired games, positive feedback will be more difficult because of the way the game is designed. Because the game simulates reality and achieves some professional education purposes or inspires some players' interests in some fields, it is difficult to have some positive feedback. Many games just give players more in game current as the positive feedback of the game, and this kind of positive feedback is too simple, it is easy to make players feel tired or bored. However, in some games, players are actively encouraged to appreciate the results of their labor. The reason is that one of the joys of labor is to appreciate the works that you have made. For example: in the cooking simulator, players will personally make over 80 different foods and try to cook the perfect dish using dozens of real ingredients. At the same time, all ingredients will change their smell, appearance, and taste according to the player's behavior. After learning the basic operations of cooking, players will start to create their own dishes and grow through each dish. After the player completes a dish, the game will have a section to take pictures of the dish. Although this step can be skipped, this step also implies that the player can make a beautiful dish and try to share it with their friends [4].

After this process, players may get praise from their friends, and this praise is also a kind of positive feedback, which will continue to encourage players to continue playing. It is a good way to encourage player keep creating some high-quality work in the game. Also because of the high fidelity of these games, these players also successfully learned how to cook a dish during the game. But in some game which doesn't produce image that player can share like driving simulator because it has a boring theme. So, it might be hard for all these kinds of game to create an enjoyable gameplay.

## 3. Discussion and Analysis of Game Professionalism

In this section, the professionalism of the game will be discussed. By discussing the knowledge and expressions in the more popular games based on reality or history. For example: in the first-person shooter game: Battlefield 5, players will play a World War II soldier and experience what war

was like in that era. However, the firearms in the game are very misleading. Players can choose to add red dot sights to firearms from World War II. However, the product commonly referred to as the red dot sight did not appear until 1970 and was widely introduced in 2000 [5]. So, there is a deviation from the original historical process. There are many games created based on historical processes on the market. The common feature of these games is that they have a technology tree or political tree, which allows players to gradually develop the technology or politics of their own civilization. These can be roughly divided into two types: a technology tree that focuses on real history, and a technology tree based on historical events for secondary creation.

### 3.1. A technology tree based on historical events for secondary

In the first example, Sid Meier's Civilization VI is the best example [6-7]. This is a game in which players play the leaders of various civilizations, starting from the Stone Age, and eventually becoming the most successful civilization on earth through diplomacy, war, scientific research and development. There are technology trees and municipal trees in the game, and these technologies or municipalities are also divided into ancient times, classical times, medieval times, renaissance times, industrial times, modern times, atomic energy times, information times and the future. In each era, technology or municipality is one of the most typical inventions of that era. For example, in the Middle Ages of the game there was a technology called buttresses [7], which unlocked the Hagia Sophia and the embankment for the player (Figure 3). A buttress is a building structure used to reinforce walls, enabling people to build higher walls than unsupported structures. Gothic architecture is an example of the development of flying buttresses, in which the lateral thrust of the walls is transmitted through half-arch columns to columns or window partitions, resulting in thinner and taller walls. [6] and Hagia Sophia is indeed a famous Gothic building in the Middle Ages.

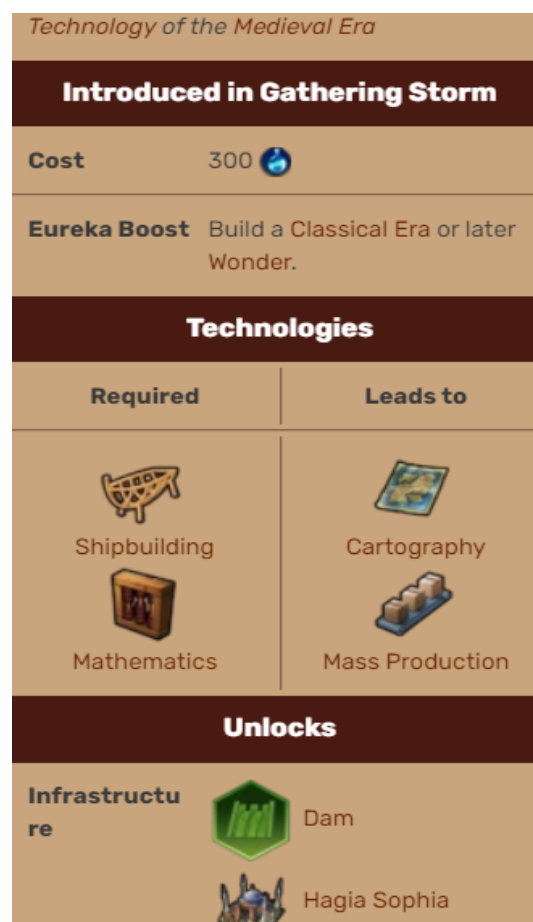


Figure 3. The information of buttresses in game [7].

And the front technology of the buttresses was indeed mathematics and shipbuilding, and the development of mathematics led to the invention of this important architectural element, which allowed civilizations to build very interesting large structures that could withstand incredible pressure. When the keel was made, the structure also provided help for the subsequent development of the buttresses. But in history, it is not just the above two technologies that have helped the emergence of buttresses. The development of engineering and construction has also helped the emergence of buttresses, which is not directly reflected in the game.

### 3.2. A technology tree based on historical events for secondary creation.

The second focus on small events in history is more precise. Case in point: Hearts of Iron is a strategy game that focuses on the formation and progress of World War II, where players take part in the war as a nation during the turmoil. Take France in the game as an example because France has a fresh memory of World War I and is reluctant to play another European war. If an enemy like Germany threatens its heartland, it is unlikely to be willing to continue the war, which greatly reduces its courage to resist to the end. What's more, the French military leadership is made up of World War I veterans who are inexperienced in modern warfare and are merely content to defend and maintain the front. Therefore, in the game, when the game starts, the national support for the war and the eligible population will decrease. France's conservative and more defensive bias is reflected in the national policy tree [8].



Figure 4. A part of the France national policy tree [7].

In the game, players can choose to focus on defense or offense after France begins to rearm its armaments. Also, there is a machine called the national policy tree in the game describes the resources and war potential that a country can mobilize and the logical relationship among them (Figure 4). For example, Germany has a lot of factories left in its history, so it can obtain a high construction speed bonus and many military and migrant workers through national policies. In the national policy tree

of France that attaches importance to defense, players can choose more branches than attaching importance to offense, which reflects that France is essentially inclined to defense. And the emphasis on more options in defense also encourages players to focus on defense when choosing to play France. It can be seen from the above that the game is based on the history of World War II, so it has a good degree of restoration in history, and it will not make history or re-create history [9].

#### 4. The influence of Education-Inspired Games

Survey some players who have played these games and observe their knowledge of the gains after playing or how the players gain from the game after playing for a long time. The goal of this survey was to focus on whether Steam players and children covered in some academic papers improved their knowledge after playing these games.

##### 4.1. The Influence of Education-Inspired Game to different people

There is a review on the Steam page for Cooking Simulator. It is a player who has played for 119.6 hours. He thinks this game is very fun, and because the recipes in the game are all real, after playing the game, he successfully made the game according to the steps in the game. dishes in. At the same time, the game also added Western-style kitchen utensils such as ovens and frying pans to his home, who did not make much Western food before. Another player played the cooking simulator for 607 hours [10]. Through the game, he successfully learned how to cook, and through cooking, he successfully improved his family relationship. Then the enlightening effect of educational games is successfully reflected. In Euro Truck Simulator 2, players will play as a truck driver and travel through different cities in Europe. In the game, players will experience a variety of different trucks from European manufacturers. In the evaluation on steam, there is a former truck driver who has played more than 700 hours and said: This game evokes the time when he was driving a truck and expresses it very restored. From this, this game will have a good educational effect on people who do not know trucks because it restores reality better and can experience the experience of driving a truck for those who are interested in this industry (Figure 5) [11].



**Figure 5.** The game play of Euro Truck Simulator [11].

In Wei-Fan Chen's paper Effect of Computer-Based Video Games on Children: An Experimental Study, he expounded the positive impact of games on children, and got the result: First of all, computer-based video games can promote students' cognitive learning process, and secondly, the game has important theoretical and practical significance, which is beneficial to children's development and learning [12]. From the above two cases, it can know that video games can indeed help children or adults who are interested in certain fields to learn or inspire.

#### 5. Summary and Outlook

To sum up, enlightening educational games are very reliable professional and enlightening. It can fully inspire a new field for players or make players interested in a field. At the same time, from the

feedback of players, these educational games have indeed played an educational or inspiring role. Players who have played more than 100 hours in Steam's user reviews feel that they have been greatly helped. But heuristic games still have insufficient positive feedback or single positive feedback. The most obvious example of this is in a car repair simulator where the final reward for the hard work of the player is just some money to buy more equipment. The purpose of those devices is to make the player's repair speed faster. In essence, this poor and weak positive feedback will make the game become repetitive work. Looking ahead, educational games can play a huge role in enlightenment education in the future. For example, for players who want to enlighten music, they can make a music creation game, simplify the original mixing interface, and add guidance reasonably. When the player successfully creates a song of his own, the player can choose to let the computer judge whether the song is good or not or upload it to the community for other players to evaluate it.

Players who get good reviews can get gold coins to get more instruments or mixing effects to create more creative music, and get more encouragement from more people, through this positive feedback loop, let players have positive feedback on the mix. Interest. Or to give another example, players experience the process of repairing things through the simulator, to develop some structural understanding of the surrounding things. For example, a cosmic simulator can be made. Players can learn how these planets are formed by controlling the amount of matter in the universe or the type of  $g$  in the planetary sedimentary disk, or what these elements bring to the planet. influence. Through such interactive exploration, the original boring knowledge can be presented to the player in a more vivid way. Or help some people who are interested in certain occupations to inspire themselves to understand the content of this occupation. For example, people who do not know the work content of farmers can experience the life of farmers in some simulator games. And some existing stereotypes can be thrown away, in this way players can learn more about occupations and eliminate some stereotypes.

After the VR technology matures in the future, some simulator games can also be used to perform more immersive vocational education. For example, chef education can use VR equipment to familiarize players with the cooking process without consuming ingredients of players experience the fun of cooking or experience different cuisines, and reduce the cost of failure, which not only saves resources, but also reduces the sense of failure. It's hard not to believe that in the future this game will become the mainstream way of enlightenment.

## References

- [1] J. Schell, "The Art of Game Design: A Book of Lenses 2st Edition," CRC press, 2008.
- [2] L. Arnott, "Mapping metroid: Narrative, space, and other M," Games and Culture, vol.12(1), pp. 3-27, 2017.
- [3] Y. Kartika, R. Wahyuni, B. Sinaga B, et al. "Improving Math Creative Thinking Ability by using Math Adventure Educational Game as an Interactive Media," Journal of Physics, vol. 1179(1): 012078, 2019.
- [4] J. Beedle, "Totally Accurate Cooking Simulator," UC Santa Cruz: Center for Computational Experience, 2020.
- [5] M. A. Ryan, T. Smith, B. Smith, et al. "Millennium Cohort: enrollment begins a 21-year contribution to understanding the impact of military service," Journal of clinical epidemiology, vol. 60(2), pp. 181-191, 2007.
- [6] A. Simons, Wohlgenannt I, Weinmann M, et al. "Good gamers, good managers? A proof-of-concept study with Sid Meier's civilization," Review of Managerial Science, vol. 15(4): pp. 957-990, 2021.
- [7] A. Politopoulos "Virtual Ziggurats: Orientalist Views and Playful Spaces," Near Eastern Archaeology, vol. 84(1), pp. 52-61, 2021.
- [8] C. Albert, W. Thuiller, S. Lavorel, et al. "Land-use change and subalpine tree dynamics: colonization of Larix decidua in French subalpine grasslands," Journal of Applied Ecology, vol.45(2), pp. 659-669, 2008.

- [9] R. Loban “Digitising Diplomacy: Grand Strategy Video Games as an Introductory Tool for Learning Diplomacy and International Relations,” Conference of Digital Games Research Association. pp.18-23, 2017.
- [10] F. Kato, H. Mitake, S. Hasegawa, “Interactive cooking simulator,” Virtual Reality Society of Japan, pp.390-393, 2020.
- [11] O. T. Leino, “Performing and Audiencing Profound Boredom in Euro Truck Simulator 2 Multiplayer: An Existential-Ludological Perspective on Computer Games and Performance,”Artistic Research in Audiovisual Composition, pp. 125-138, 2021.
- [12] T. Y. Chuang, W. F. Chen, "Effect of Computer-Based Video Games on Children: An Experimental Study," International Workshop on Digital Game and Intelligent Toy Enhanced Learning, pp.114-118, 2007.