

# DM3107: Major Research Project A 25/26

## Learning in Play: Investigating the Effects of Reward Systems on learning in Entertainment-focused Games

Question: How do Reward Systems in entertainment-focused video games facilitate players' implicit Learning?

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## **1. Abstract**

Entertainment-focused games are often more complex than their educational counterparts and often contain less instruction. This study explores the phenomenon of implicit learning that these games utilise to inform and teach players. Observing the current research surrounding game-based learning and the implications of future research. The study observed player learning through a mixed-method design in which qualitative insights were gained through controlled play sessions. During which participants were introduced to Mario Kart World, and surveyed for signs of implicit learning.

This study highlights a notable gap between entertainment and educational game design and suggests the adoption of entertainment-focused reward systems into educational games to better support learning and increase player motivation. The findings further advance current understandings of reward-driven learning and offer practical implications of rewards to create more engaging entertainment games and more informative entertainment-focused ones.

## **2. Introduction**

### **2.1 Context and relevance**

Evolution is a process present in all facets of the world; games are no exception. Modern games take on a largely unrecognisable form compared to their predecessors. They now require players to access a wide range of skills to play as intended. However, many do not provide players with sufficient instruction as to how to utilise available skills or overload the player with informative text/tutorial which most skip, both ruin the gameplay experience. As a consequence, players often go into gameplay with low-level understandings and must learn as they play. This is known as implicit learning and is a process by which people learn unintentionally without direct instruction.

### **2.2 Role of reward systems**

The implicit learning process relies on positive reinforcement and negative feedback in order to shape one's understanding. Games achieve this process through the use of reward systems. These are wide systems responsible for distributing awards to players based on their accomplishments. They are capable of taking many forms, some of which include progression systems, auditory and visual feedback, unlockable content, and achievement systems. Implicit learning is often a byproduct of these systems when present in entertainment-focused games, as they are typically designed to sustain engagement. Yet they still hold the capability to induce learning among players and thus offer a framework for more engaging entertainment-focused games and even educational games.

### **2.3 Gap in existing research**

Despite the prevalence of these mechanisms within games focused on entertainment little research exists on the matter. Research in the area primarily targets educational games, with the intention of creating better learning environments. Researchers appear to overlook an obvious area of improvement

in educational games: their engagement. Entertainment games offer an experience that induces prolonged play with little educational value, while educational ones offer a short experience overloaded with learning material.

## **2.4 Research aim and focus**

This study aims to further explore the implicit learning process with entertainment games to understand how to increase the learning potential of said games through rewards. Additionally, it intends to bring attention to such games and the information they can provide to developers of educational games. Implicit learning is a process undergone through one's regular actions, yet remains underutilised in the realm of education. Education is a facet of life that can be better presented in our entertainment.

## **3. Literature Review**

### **3.1 Introduction**

The entertainment-focused video games of today are filled to the brim with complex systems and mechanics, yet offer little instruction as to how to utilise them. Many offer short insufficiency tutorials aimed at capturing the essence of the mechanics. Players are left to deepen/improve their understanding, knowledge, and skills within these games. This process of learning without conscious effort or awareness is known as implicit learning. Reward systems are key to this learning process as they allow developers to guide player behaviour, sustain prolonged engagement and provide feedback on performance. Many of the latest games employ a multitude of reward systems in comparison to older entries(see Appendix C); some of these include progression-based motivators, auditory/visual feedback, and achievement systems.

### **3.2 Theoretical Foundations of Learning and Motivation in Games**

#### **3.2.1 Implicit Learning in Interactive Systems**

Within interactive systems(such as games), learning occurs through repeated interaction/exposure and the feedback given in response, instead of directly imparting knowledge upon the participant. Studies reveal that game-based learning(GBL) is more effective than traditional learning methods due to an increase in focus and curiosity, especially in children (Ronimus et al., 2014). GBL is a constructivist process by which knowledge is actively created by the student. (Zapata-Cáceres and Martín-Barroso, 2021) This constructivist process is what leads to increased engagement, as players are encouraged to construct a personal understanding to play the game. Naturally, humans find the regurgitation of information to be boring; however, they find interaction to be fascinating. This explains why educational games are often more successful than traditional learning methods and further supports the innate implicit teaching aptness of games.

### **3.2.2 Motivation Theories Relevant to Game Rewards**

Motivation is key to all learning, and GBL is no exception. Researchers have found several theories that aid educators in understanding how to correctly utilise games to facilitate learning. One such theory is Self-Determination Theory (SDT) responsible for explaining the types of motivations and how to predict performance based on motivation type (Park et al., 2019). Cognitive Evaluation Theory (CET) assists SDT by further examining the effects of external rewards and how they affect a person's competence and autonomy in the respective area (Park et al., 2019). Together, the aforementioned theories provide insight into how specific rewards may strengthen the intrinsic motivation of rewards, while abstaining from undermining said rewards through implementing excessive extrinsic motivators. The above-mentioned theories can be applied to entertainment-focused games to affect reward system perception and the learning outcomes reached as a result.

### **3.3.0 Reward Systems in Games: Types, Functions, and Player Impact**

#### **3.3.1 Typologies of Reward Systems**

Game reward systems can be categorised by type, and the function and effectiveness of these typologies vary heavily. Phillips and his team utilise a 6-category model to define game rewards, access, facility, sustenance, glory, praise, and sensory feedback (Phillips et al., 2015). However, this isn't the only prevalent typology; Wang and Sun instead propose the idea of 8 types of reward systems, score systems, item-granting rewards, resources, achievement systems, feedback messages, and narrative-based rewards (Wang & Sun, 2011). Reward systems are flexible and, as a result, are hard to define as seen in the provided research. Nevertheless, the aforementioned typologies provide a foundational understanding and simplistic categorisation to understand the proposed question.

#### **3.3.2 Reward Systems in Entertainment Games**

Entertainment-focused games rely on a reward system primarily to maintain player engagement and complete feedback loops to encourage prolonged play. Research reveals these types of games employ a wider variety of reward types (see Appendix D) than their educational counterparts. (Tyni et al., 2023). The number of reward types present has been shown to directly correlate with play time (Ronimus et al., 2014). As a result, the larger number of rewards results in higher playtime across these types of games compared to educationally inclined ones. The distribution/application of these rewards is also different from those used in educational games; rewards are oftentimes embedded into progression systems that prioritise intrinsic (internal) engagement. Studies show that learning evoked through intrinsic motivation leads to a deeper and more comprehensive understanding of material when compared to learning done through extrinsic means (Zapata-Cáceres and Martín-Barroso, 2021).

#### **3.3.3 Reward Systems in Educational Games**

Educational games typically utilize rewards systems to aid in learning and concept acquisition, rather than to maintain long term engagement (Tyni et al., 2022). They often rely on extrinsic rewards such as point systems, badges and completion feedback to promote learning. Overall, educational games use

simpler types of rewards and fewer of them when compared to games designed purely for entertainment values. (Tyni et al., 2023). Research reveals that these factors often result in less player engagement and shorter play sessions. (Virvou et al., 2005; Wouters & Van Oostendorp, 2013).

### **3.3.4 Extrinsic vs Intrinsic Integration in Game-Based Learning**

As mentioned prior, intrinsic integration incorporates rewards and learning material directly into the game's core mechanics. While the method leads to increased learning motivation and engagement, it is difficult to apply and implement; as a result, games that intend to encode GBL often prefer to utilise extrinsic rewards (Brezovszky et al., 2019; Habgood & Ainsworth, 2011; Park et al., 2019). Extrinsic integration offers external rewards such as points and or badges. It is often more flexible and offers scalability to developers than its counterpart. (Preist & Jones, 2015). However, the use of such rewards can often result in less intrinsic motivation and less focused learning in players.

## **3.4.0 Reward Systems and Learning Processes**

### **3.4.1 How Rewards Shape Player Behaviour**

Reward systems shape player behaviour through positive reinforcement, rewarding players for completing tasks as intended. They may additionally discourage certain player behaviour through warning indications or direct gameplay hindrance. Players are encouraged to adapt their style of play through trial and error, based on the rewards they receive (Kaelbling, Littman, & Moore, 1996). Research shows that more immediate rewards lead to the development of more rapid behavioural changes in players, while delaying rewards often encourages more strategic planning and promotes more sustained, focused play. (Tyni et al., 2022). Moreover, studies also find a link between the frequency and the assortment of rewards provided, witnessing a positive correlation with higher amounts and length of player sessions (Johnson et al., 2018; Ronimus et al., 2014).

### **3.4.2 Implicit Learning Facilitated by Reward Structures**

The facilitation of implicit learning through the application of reward structures relies on the repeated interaction of players and the use of behavioural adaptation techniques that avoid explicit instruction. Players must engage with the process of trial and error to begin to internalise gameplay strategy over time. (Kaelbling, Littman & Moore, 1996). Through the introduction of rewards, developers can establish rules that the player is encouraged to follow, which promote the acquisition of the intended skills, unannounced to the player and occurring without their conscious awareness of the process. Over time, this positive reinforcement firmly establishes concepts within the players' minds and enables them to develop the intended skills required for play, inducing implicit GBL through sustained play.

### **3.4.3 Motivation as a Mediator of Implicit Learning**

While reward systems are a key component to evoking implicit learning among players, it is not the only factor to account for. Inherent player motivation plays a monumental part in the process, as SDT suggests that rewards themselves influence player motivation and that motivation governs the quality of the

learning that takes place in players. (Park et al., 2019). Players will learn the material to a greater degree and depth when intrinsically motivated by rewards. In contrast, when player motivation is determined by extrinsic rewards, player focus is instead on the accumulation of said rewards rather than the understanding of material. Moreover, if player motivation is nonexistent, then players are likely to disengage in gameplay before sustainable learning has occurred.

### **3.5.0 Gaps Between Educational and Entertainment Games**

#### **3.5.1 Why Educational Games Often Fail**

Educational games often fail for a few reasons, all of which are a result of poor integration of learning material into gameplay. Many rely too heavily on extrinsic rewards instead of implementing intrinsic rewards where possible. Extrinsic rewards, as discussed previously, have a variety of problems that result in reduced engagement compared to their entertainment-focused counterparts.

#### **3.5.2 What Entertainment Games Do Differently**

Contrarily, entertainment-focused games place priority on long-term player engagement. A result of modern game revenue often being driven by in-game transactions, where playtime correlates directly with revenue generation. Due to this differing design philosophy, these games often deploy reward models that utilise continuous feedback and layered rewards. Studies reveal the aforementioned model to lead to longer engagement, higher motivation, and more effective learning environments (Johnson et al., 2018; Tyni et al., 2023).

#### **3.5.3 Research Gaps**

Despite extensive research into the reward systems and their ability to induce learning, little focus has been placed on how reward systems in entertainment-focused games facilitate implicit learning. This is due to a few studies exploring implicit learning in games, both educational and entertainment-oriented. Most studies focus on instructional learning and its presence in games. As a consequence, this study explores its focus area with minimal pertinent secondary research.

### **3.6 Synthesis and Implications for Implicit Learning**

Entertainment-focused games as a whole demonstrate excellent use of reward systems to induce learning, oftentimes better than their educational relatives. Typically garnering more playtime than educational games, and can serve as a valuable tool for educational developers to investigate and design more effective educational games. Educational games often aren't played to the same degree as ones with entertainment value; better utilisation of implicit learning and more engaging gameplay mechanics may grant the ability to better promote learning in individuals.

## **4. Methodology**

### **4.1 Research Design**

This study employs a mixed-method exploratory research design technique to examine how various types of reward systems evoke implicit learning in players. A quantitative survey was used to identify broader learning trends within players of all backgrounds. The intent behind the survey was to supplement the larger focus within the study being the qualitative play sessions. These play sessions were employed to inform the study with deeper insight into the learning process that occurs after gameplay. This combined approach aimed to understand the motivations and player thinking without explicit mention from participants.

### **4.2 Participants**

The participants of the study consisted of people from all backgrounds with varying gaming experiences. No particular traits of participants were targeted; this was done to obtain results that reflect general learning within all levels of players, from the casual to the hardcore. A smaller selection of survey takers was requested for additional play sessions and further discussion/questioning. Participants of the play test were required to have no experience with the selected game, Mario Kart World, to avoid the warping of the results of the study.

### **4.3 Data Collection Methods**

#### **4.3.1 Survey Instrument**

The aforementioned survey included a variety of closed-ended questions that focused on determining demographics and gaming habits of participants, reward system engagement habits, perceived learning in games, implicit learning behaviours displayed, and the effects rewards have on the player motivation experience. The survey took great care to avoid influencing participant answers and made a considerable effort to avoid the use of leading questions and surveyor bias. Additional optional open-ended questions were present on the survey to allow participants to add more personal perceived learning experiences they have undergone during private recreational gameplay sessions.

#### **4.3.2 Play Session**

Some survey participants were informed and offered to participate in a gameplay session of Mario Kart World. During which participants would be asked to play 3 repeated sessions of the game's Grand Prix mode. The purpose of these sessions was to identify behavioural indicators of implicit learning, such as improved control and strategic item use. After the conclusion of the sessions, a short semi-structured discussion was conducted to analyse participant observation.

### **4.4 Case Selection: Mario Kart World**

During the play session, participants raced through a selection of tracks present within the game's Mushroom Cup. All participants played the same selection of tracks. Grand Prix is Mario Kart World's premiere game mode, and the Mushroom Cup is the first in the set and thus has a focus on track simplicity. Accordingly, this is why the above-mentioned were selected for the gameplay session. Mario Kart World was selected due to the high likelihood of general familiarity with previous entries as a result of the series popularity. Additionally, the game was selected for its recent release date, as of the time the study was conducted and as a result was a new experience for many participants.

#### **4.5 Data Analysis**

Survey data was analysed using descriptive statistics to discover trends in the habits and/or perceptions of participants. Thematic analysis was subsequently used to interpret data from the conducted play sessions, focusing on participant behavioural adaptation, feedback use, and reward-driven persistence. Findings from both were compared to locate patterns within the data sets to further understand reward systems and their effect on the implicit learning process.

#### **4.6 Ethical Considerations**

All participants of both the survey and play test were informed that participation was voluntary and they had the option to withdraw from the study at any time(see Appendix E, F). No personal data was collected from participants, and any data collected was done so in compliance with the Data Protection Act (2018). Information regarding the above was provided to participants within the survey(see Appendix E and F).

### **5. Results/Evaluation**

#### **5.1 Survey Results**

Participant responses from the distributed survey revealed that participants predominantly played entertainment-focused games(see Appendix A). Most participants stated that they played daily or a few times a week. However, participants' reports showed a notable decrease in the frequency of educational games played compared to the aforementioned entertainment games. Participants also commonly reported that they often found themselves improving at games without explicit understanding of how the improvement occurred, suggesting the presence of implicit learning processes.

Participants appeared to value intrinsic motivators more heavily than extrinsic ones. As they often reported motivators such as mastery, challenge, and personal improvement to be substantial motivators. However, the perception of in-game rewards was still positive as many found them to be important motivators in prolonged play.

Participants additionally recalled their improvement without explicit intent in various skills such as pattern recognition, problem solving and spatial awareness. Reports show mixed results on intentional player learning, but do reveal insight into implicit learning as players described improving without

understanding. Overall, this data suggests players will undergo implicit learning regardless of their intention and are likely to further develop their cognitive thinking abilities.

## **5.2 Play Session Observations**

During the play sessions, several observations were made (see Appendix G, H, I). One of which was that participants initially requested guidance as to the controls of the game. Upon this initial request, it was given; however, on subsequent requests, participants were not instructed on the control scheme. These requests continued regularly throughout play; however, they noticeably decreased as play progressed. Participants appeared to show significant improvement in driving ability during subsequent sessions. The examiner noticed participants maintaining more optimal paths, utilising the game's various alternate mechanics to take shortcuts, and adapting play to manipulate item distribution. Prior experience with similar games appeared to influence the rate of improvement among participants. Experienced players seemed to improve faster; however, race times appeared to be similar among all participants by the final session, indicating a similar level of competence among all. These findings suggest that participants were capable of achieving a certain level of competence through implicit learning but were unable to surpass that ceiling within the given time period.

## **5.3 Participant Reflections and Discussion**

Participant responses consistently indicated that learning occurred primarily through trial and error. The game provided no explicit instructions, so players were left to experiment. Participants revealed their gameplay process, in which they described experimenting with the controls in the beginning. During which they attempted to identify the functions of the buttons, i.e. using items, drifting, and jumping. As play progressed, participants found themselves utilising speed management techniques. They noted learning these techniques through the visual feedback the game provided. Participants noticed a correlation between the speed of their carts and the length of time/the amount of flames that were present on their cart's exhaust.

Participant motivation seemed to be linked closely to competition. Participants mentioned Competitive rewards such as remaining in first place, achieving a crown icon, or beating AI opponents as primary motivators.

# **6. Discussion**

## **6.1 Linking Findings to Theory**

The findings of this study align with the information provided by existing related studies and theories. Participants revealed significant reliance on trial and error to induce gradual behavioural improvement when deprived of explicit instruction. In Kim's study, "Enhancing Reinforcement Learning Performance in Delayed Reward System Using DQN and Heuristics", he finds a similar result. He likewise observed a performance plateau when rewards were delayed too heavily (Kim, 2022). Noting his observations

implies that Mario Kart World's rewards are excessively delayed, as suggested by this study's observed performance plateau in participants.

Additional attention should be placed on sensory rewards, as they appeared to have the most perceived impact on participants. A phenomenon explainable by Tyni's 2023 study showcasing the prevalence of the difference type of reward systems in games(See Appendix B and D), in which sensory feedback was displayed to be the most used type(Tyni et al., 2022), as a result, participants were likely to notice its presence more.

## **6.2 Reward Systems as Drivers of Implicit Learning**

The results of both the survey and the session suggest the essential role of reward systems within implicit GBL. It appeared that specific types of rewards that evoked learning depended on the genre. Partakers of the survey were primarily players of shooter games, who appear to place significant value on progressive rewards. While participants of the game session(a racing game) noted the importance of sensory feedback in learning. On the surface, this may indicate that shooter games induce player learning through progressive rewards while racing games utilize sensory systems. However, further observations of the survey results reveal that participants believe they have improved in skills directly linked to sensory feedback, such as pattern recognition or spatial awareness.

## **6.3 Motivation and Player Engagement**

Player motivation appeared to derive from challenge; survey takers and game session participants both noted so. A notable observation that reveals where player intrinsic motivations lie. Glory and/or challenge are the reward types that evoke the greatest amount of player motivation, which in turn result in the deepest form of implicit learning. This can inform further game design to create more informative tutorials capable of engaging audiences while maintaining a thorough instructional premise.

Survey takers added additional value progression, while session participants revealed competition as a stronger motivator. Participants of the survey did not find competition as a highly motivating factor in games, which greatly contrasts the reports provided by game session players. This discrepancy may reflect differences between retrospective self-reporting and motivation experienced during active gameplay.

## **6.4 Awareness vs Unawareness of Learning**

All participants within this study reported a feeling of improvement before understanding all of what they were doing. Session Participants especially found themselves attempting to keep up with the game's pace and did not view it directly as learning. This is in line with what studies about implicit learning show, that implicit learning often occurs without conscious thought. (Kim, 2022). Reward systems in general encouraged players to explore different strategies. However, each seemed to influence player behaviour to different degrees. When players deemed rewards as important to their goals, they were likely to go out of their way to achieve them, even if that required some

experimentation. Players deemed some rewards insignificant to gameplay and, as a result, did not feel a need to pursue them. A connection appears to be present between the perceived value of a reward and the implicit learning surrounding it. As a result, implicit learning is only likely to occur if the perceived value of the rewards is greater than the effort expended to achieve them. Players are unlikely to acknowledge any learning that occurs within entertainment-focused games due to the perception surrounding the said reward.

## **6.5 Entertainment Games vs Educational Games**

The report revealed the higher rate at which entertainment-based games are played among the general populace. This information reveals the presence of a flaw within the current philosophy of educational games. Greater use of implicit learning strategies and better learning material integration can be achieved via the utilizing rewards, similarly to that of entertainment games. Educational games often use significant amounts of explicit instruction, which differs from the implicit strategies employed by entertainment-based games. Educational games likely lack the proper reward systems to evoke implicit learning and rely on instruction to remedy. Entertainment-based games should, in contrast, utilise explicit instruction to remedy gaps within the implicit learning gameplay loop. Participants were often confused by the lack of instruction and avoided rewards that did not appear to make sense upon initial inspection.

## **6.6 Limitations and Methodological Reflections**

In a retrospective view, the conducted study lacks a large enough audience to produce a comprehensive study reflective of the general populace. This issue in the data set likely led to the formation of the contrasting results found in player motivation. Further study would likely need to target a larger audience and a specific genre of games within the entertainment category to assemble further insight into player motivation and the effect they have on implicit learning. Narrowing the scope of this study for future endeavours would likely result in more conclusive results.

## **6.7 Implications for Game-Based Learning Design**


Reward systems appear to positively impact the implicit learning process for players of entertainment-focused games. Game developers should take better consideration of the effects said systems have on their players. Further research into the systems being utilized create the potential for informative games people want to play. Players will be granted skills and knowledge that they otherwise would not have obtained. Merging education and entertainment to create a new category of games focused on producing well-rounded intellectual gamers. Implicit learning appears to be the most effective way to implement learning into games while maintaining a balance of educational content and intrinsic player motivation.

## 7. Conclusion

Given the question of this research report, what are the key takeaways present? Players enjoy the process of implicit learning more than the instructional process, as explained by the higher popularity of entertainment-focused games. Sensory feedback is the most effective reward type to induce player learning. Implicit learning is an underexplored area of GBL, greater research into the area of implicit learning and the effects of each explicit reward type is a necessity moving forward, as the current study placed a focus on sensory feedback and glory. While this study is targeted at game developers, both educators and psychologists can similarly gain knowledge on the effects reward systems have on players of entertainment-focused games.

## 8. Appendices

### Appendix A: Survey Results

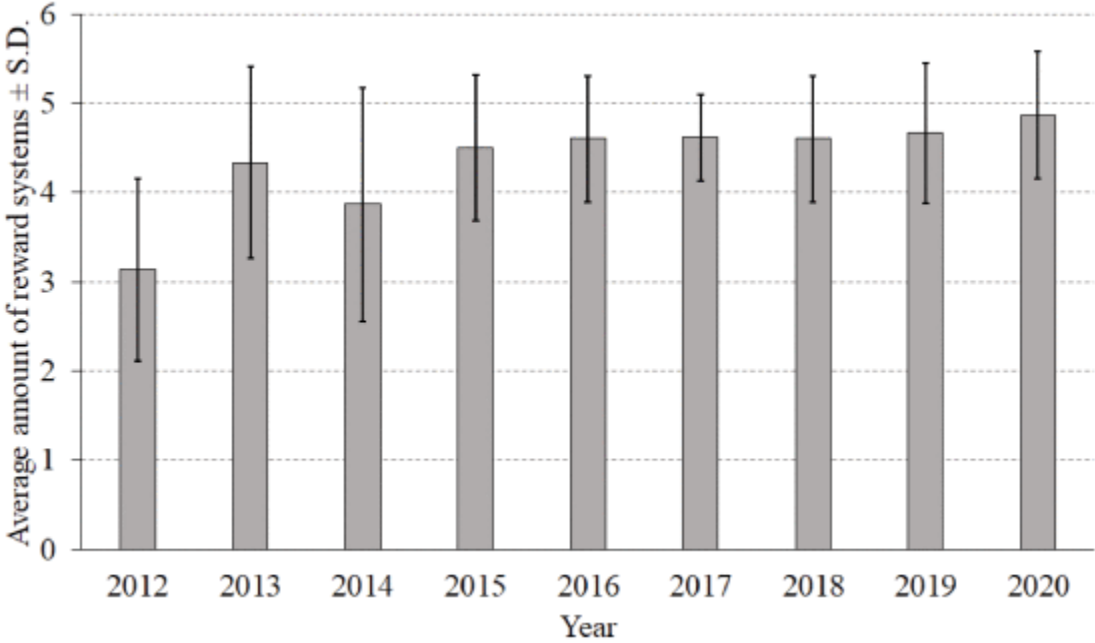
 Learning in Play: Investigating the Effects of Reward Systems on learning in Entertainment-focused...

### Appendix B: Table Demonstrating the percentage of each Reward type found in games during the years 2012 to 2020

Year	Access	Facility	Sustenance	Glory	Praise	Sensory Feedback
2012	60.0%	20.0%	13.3%	86.7%	20.0%	100.0%
2013	93.3%	66.7%	60.0%	93.3%	20.0%	100.0%
2014	100.0%	57.1%	57.1%	100.0%	0.0%	100.0%
2015	100.0%	71.4%	71.4%	100.0%	7.1%	100.0%
2016	100.0%	66.7%	73.3%	100.0%	20.0%	100.0%
2017	100.0%	69.2%	84.6%	100.0%	7.7%	100.0%
2018	100.0%	66.7%	80.0%	100.0%	13.3%	100.0%
2019	100.0%	66.7%	80.0%	100.0%	20.0%	100.0%
2020	100.0%	73.3%	86.7%	100.0%	26.7%	100.0%
<b>Average occurrence</b>	<b>94.7%</b>	<b>61.8%</b>	<b>67.2%</b>	<b>97.7%</b>	<b>15.3%</b>	<b>100.0%</b>

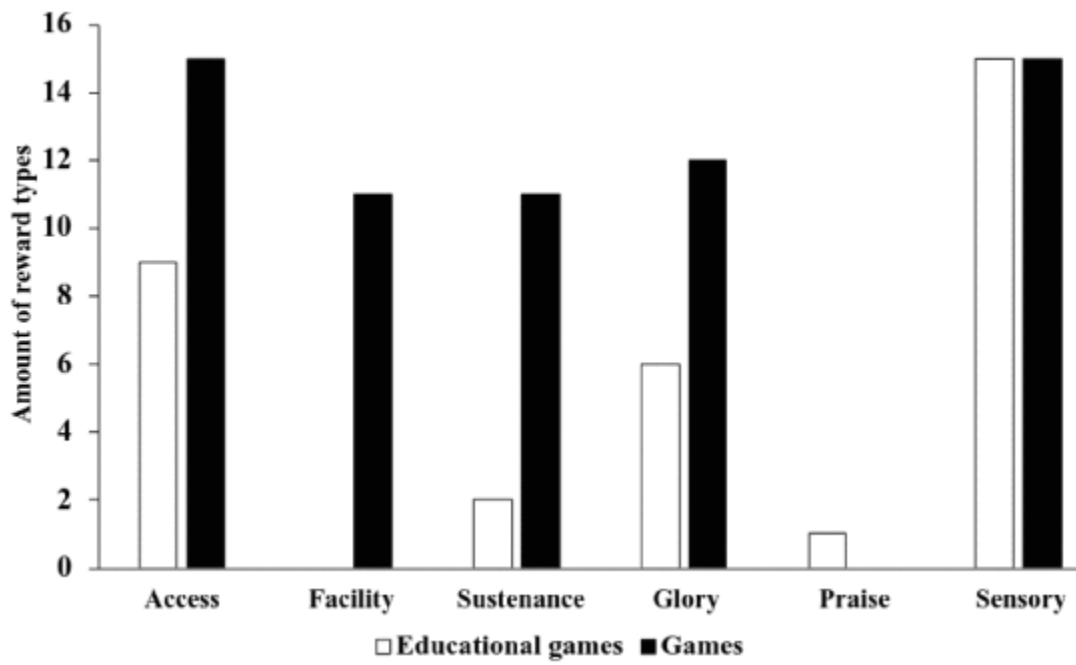
Source: (Tyni et al., 2023)

**Appendix C: Chart Demonstrating the average number of individual reward types found in games during the years 2012 to 2020.**



Source: (Tyni et al., 2023)

**Appendix D: Chart Demonstrating the number of different reward types found in the 15 most-installed educational mobile games and paid mobile games of 2022**



Source: (Tyni et al., 2023)

**Appendix E: University of Winchester Ethics Form 1**



## ETHICS FORM 1

### WHAT LEVEL OF REVIEW DO I NEED?

#### GUIDELINES

**This form is for staff and doctoral students. It will help you identify the level of review needed for your project. Before completing it, you need to:**

1. Read *The University Research Ethics Policy*.
2. If you are a student, discuss the ethical aspects of your project with your supervisor.

It is your responsibility to follow the University's Policy on the ethical conduct of research and to follow any relevant academic guidelines or professional codes of practice pertaining to your study when answering these questions.

The questions and checklist in this proforma are intended to guide your reflection on the ethical implications of your research. Explanatory notes and further details can be found in the Policy document.

## SECTION 1

## DETERMINING WHETHER YOU REQUIRE ETHICS REVIEW

<b>YOUR PROJECT</b>
Project title: Learning in Play: Investigating the Effects of Reward Systems on learning in Entertainment-focused Games
Your name: Ethan SMith

1.	<b>Is the proposed activity classified as Research or Audit /Service Evaluation or similar?</b>	
	<b>Research</b>	Audit or Service Evaluation
	<p>Use the Policy to help you answer this question. If the proposed activity meets the definition of <b>research</b> (see the policy), CONTINUE.</p> <p>If the activity is an <b>audit</b> or a <b>service evaluation</b>, STOP. You do not need to seek ethics approval, but you do need to formally register your project with UREC, along with a project outline. To do this complete Form 2.</p> <p>If you are unclear what type of activity you are undertaking, please refer to the Policy for additional types.</p>	
2.	<b>Does the research involve living human participants, human samples or data derived from individuals who may be identifiable through the data collected?</b>	
	Yes	<b>No</b>
	<p>Use the Policy to help you answer this question.</p> <p>If you answer <b>NO</b>, SKIP to QUESTION 6 and CONTINUE.</p> <p>If you answer <b>YES</b>, CONTINUE.</p>	
3.	<b>Is the research being conducted for a medicinal purpose?</b>	
	Yes	<b>No</b>
	<p>Use the Policy to help you answer this question. See Appendix 2 - FAQs and definitions.</p> <p>If you answer <b>YES</b>, and think your research comes under the definition of 'for a medicinal purpose,' it will need to be scrutinised by the Committee. Please email the Committee Chair (ethics@winchester.ac.uk) for further guidance on what to do.</p> <p>If you answer <b>NO</b>, CONTINUE.</p>	
4.	<b>Does your research require external ethics approval or review?</b>	
	Yes	<b>No</b>
	<p>For example, from the NHS or another overseeing body. Use the Policy to help you answer this question.</p> <p>If you answer <b>NO</b>, CONTINUE.</p> <p>If you answer <b>YES</b>, you need to formally register your project with UREC, along with the relevant external ethics approval. To do this complete Form 2.</p>	
5.	<b>Is the project underway and, the researcher or PI, has moved institution to Winchester?</b>	
	Yes	<b>No</b>

	<p>If you answer <b>YES</b>, please read the following:</p> <p>If the research began when the PI was employed at another institution but has subsequently moved to Winchester, and the project has previously been subjected to ethics scrutiny at that institution, then it need not go through ethics review again. The outcome of ethics review by that institution should be communicated to UREC for formal recording. To do this complete Form 2 and include evidence of the previous ethics approval.</p> <p>HOWEVER, if there have been significant changes to the original research design which have ethical implications or recruitment of a cohort of participants will be undertaken through Winchester, then the project will require ethics review and you should apply for approval, CONTINUE.</p> <p>If you answer <b>NO</b>, CONTINUE.</p>	
<b>6.</b>	<b>Is the research collaborative?</b>	
	Yes	No
	<p>If you answer <b>YES</b>:</p> <ul style="list-style-type: none"> <li>where the Principal Investigator (PI) of the research is located at another institution, it is their responsibility to seek ethics approval, including partner research sites. The outcome of ethics review by that institution should be communicated to UREC for formal recording. To do this complete Form 2 and include evidence of the previous ethics approval.</li> <li>where the PI is located at Winchester, then the project will undergo scrutiny as per Winchester's Ethics Policy, CONTINUE.</li> </ul> <p>If you answer <b>NO</b>, CONTINUE.</p>	
<b>7.</b>	<b>Is the research being conducted in another country?</b>	
	Yes	No
	<p>If you answer <b>YES</b>, please read the following:</p> <p>Where a project is conducted in another country, the researcher should consider if it is possible to obtain ethics review by a local research ethics committee or other relevant body. The outcome of such a review by that institution should be communicated to UREC for formal recording, along with a project outline. To do this complete Form 2.</p> <p>If this is not possible, the project should be reviewed by the University of Winchester, either at Faculty level or Committee depending on the nature of the proposed work, so CONTINUE.</p>	
<b>8.</b>	<b>Does the research involve the use of documentary material(s) for analysis - for example artifacts, papers, historical records, literary works or documents in a public or private archive?</b>	
	Yes	No
	<p><i>Note: Documentary material does not include academic papers or other 'building block' literature in the public /academic domain which is used to inform the research context or rationale for the study. Instead, the documentary material would be the 'data' for the study, therefore literature reviews or literature critiques are not considered documentary research.</i></p> <p>If you answer <b>YES</b>, you need to formally register your project with UREC, along with a project description. To do this complete Form 2. Where materials are in a private archive or closed collection, please include details of the nature of the private archive /closed collection and provide evidence of permission to use this material for research purposes. Please also consider if there may be outcome ethical implications e.g. the subject matter may have a negative impact on those still connected to the materials.</p>	
<b>9.</b>	<b>Does the research involve live vertebrate animals?</b>	
	Yes	No

	<p>If you answer <b>NO</b>, CONTINUE.</p> <p>If you answer <b>YES</b>, you need to formally register your project with UREC, along with a copy of the relevant licence (if required). To do this complete Form 5.</p>	
10.	<b>Does the research involve environmental interventions?</b>	
	Yes	No
	<p>If you answer <b>NO</b>, CONTINUE.</p> <p>If you answer <b>YES</b>, you need to formally register your project with UREC, along with a copy of the relevant licence (if appropriate). To do this complete Form 2</p>	
11.	<b>Does the project pose any potential or actual conflict(s) of interest for the researcher and /or stakeholders?</b>	
	Yes	No
	<p>If you answer <b>YES</b>, please ensure you provide information on the form you complete.</p>	
12.	<b>Does the data you will collect contain any information that could be linked back to participants or that might identify them (e.g. name, address, photo, voice, email)?</b>	
	Yes	No
	<p>If you answer <b>NO</b>, you need to formally register your project with UREC. To do this complete Form 2.</p> <p>If you answer <b>YES</b>, CONTINUE.</p>	

Reaching the end of these questions, either you will have been directed to complete a specific additional form or you should continue to section 2.

If you are still unsure whether you need ethics review or not, please re-read The Policy and email your query to [ethics@winchester.ac.uk](mailto:ethics@winchester.ac.uk) with details of your project.

**SECTION 2****DETERMINING THE LEVEL OF ETHICS REVIEW REQUIRED**

	<i>Please mark with an <input type="checkbox"/> as appropriate</i>	YES	NO
1.	Does the research involve individuals who might be considered vulnerable?  <i>For example: vulnerable children, over-researched groups, people with learning difficulties, people with mental health problems, young offenders, people in care facilities, including prisons. For a note on research with children, see Appendix 2 of the Policy.</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.	Does the research involve individuals in unequal relationships e.g. your own students?  <i>Please note:</i> 1. <i>students recruited via SONA are not considered 'your own students.' If you intend to recruit widely across the University or your Faculty (e.g. through snowball sampling or a mail shot) you do not need to consider such students as your own, even if some participants may be students you are directly involved with. Only tick "yes" if you are targeting your own students specifically.</i> 2. <i>if you are an undergraduate or postgraduate student carrying out research with children in either a school or early years setting, these DO NOT come under the category of your 'own students.'</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.	Will it be necessary for participants to take part in the study without their knowledge and consent at the time?  <i>For example: covert observation of people in non-public places, use of deception. See Appendix 2 of the Policy.</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.	Will the study involve discussion of sensitive or personal topics?  <i>For example: (but not limited to) participants' relationships, emotions, sexual behaviour, experience of violence, mental health, gender, race / ethnicity status or experience, political or religious affiliations. Please refer to the Policy.</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5.	Is there a risk that the highly sensitive nature of the research topic might lead to disclosures from the participant concerning their own involvement in illegal activities or other activities that represent a threat to themselves or others which may need onward reporting?  <i>For example: sexual activity, drug use, illegal activities or professional misconduct.</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6.	Might the research involve the sharing data or confidential information beyond the initial consent given?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7.	Might participant anonymity be compromised at any time during or after the study?  <i>For example: will the research involve respondents using the internet, social media, or other visual /vocal methods where respondents may be identified?</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8.	Is the study likely to induce severe physical harm or psychological distress?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9.	Does your research involve tissue samples covered by the Human Tissue Act (2004)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

10.	Is there a possibility that the safety of the researcher may be in question? <i>For example: research in high-risk locations or with high-risk groups.</i>		<input type="checkbox"/>
11.	Does the research involve creating, downloading, storing or transmitting material that may be considered to be unlawful, indecent, offensive, defamatory, threatening, discriminatory or extremist? <i>If you answer YES to this question, you must also contact the Director of Library and IT Services, who must provide approval for the use of such data.</i>		<input type="checkbox"/>

Answering **NO** to *all* these questions means your project is eligible for Faculty level ethics review. You now need to complete Form 3.

Answering **YES** to *any* of these questions means your project will require Committee ethics review. You now need to complete Form 4.

**Appendix F: University of Winchester Ethics Form 3**



**ETHICS FORM 3**

**FACULTY REVIEW**

**GUIDELINES**

**This form is for staff and doctoral students. It will help you set out the ethical aspects of your project that need to be reviewed. Before completing it, you need to:**

1. Read *The University Research Ethics Policy*.
2. If you are a student, discuss the ethical aspects of your project with your supervisor.

It is your responsibility to follow the University's Policy on the ethical conduct of research and to follow any relevant academic guidelines or professional codes of practice pertaining to your study when answering these questions. This includes providing appropriate information sheets and consent forms and ensuring confidentiality in the storage and use of data.

The questions in this proforma are intended to guide your reflection on the ethical implications of your research. Explanatory notes and further details can be found in the Policy document.

**If any aspect of your project changes during the course of the research, you must notify the Chair of UREC.**

**SECTION 1**

<b>YOUR DETAILS</b>			
1.1.	Your name: <b>Ethan Smith</b>		
1.2.	Your department: School of Creative Performance and Production		
1.3.	Your Faculty: Education and the Arts		
1.4.	Your status:		
		<b>Undergraduate Student</b>	Staff (Professional Services)
		Taught Master	Staff (Academic)
		Research Degree Student	Other (please specify below)
1.5.	Your university email address: <b>e.smith7.23@unimail.winchester.ac.uk</b>		
1.6.	Your telephone number: <b>+44 7564 552435</b>		
	<b><u>For doctoral students only:</u></b>		
1.7.	Your degree programme:		
1.8.	Your supervisor's name:		
1.9.	Your supervisor's department:		
1.10.	Your supervisor's email:		

## SECTION 2

YOUR PROJECT			
2.1.	Project title: <b>Learning in Play: Investigating the Effects of Reward Systems on learning in Entertainment-focused Games</b>		
2.2.	Start date: <b>November 21, 2025</b>		
2.3.	Expected completion date: <b>January 5, 2025</b>		
2.4.	Expected location of data collection: (e.g. school, workplace, public place, University premises etc.)		
2.5.	Has funding been sought for this research?		
	Yes		No
2.6.	If so, where have you applied for funding?		
2.7.	Has the funding been granted?		
	Yes	No	Pending
2.8.	Is the research collaborative? (e.g. co-investigators from another institution, at or with another organisation or colleagues in another department)		
	Yes		No
	If yes, which?		
2.9.	Is Disclosure and Barring Service clearance required for your study?  <i>It is your responsibility to contact the Disclosure and Barring Service (DBS) to confirm whether or not clearance is needed prior to commencing recruitment or data collection. More information <a href="#">here</a></i>		
	Yes		No
2.10.	Is a risk assessment required?  <i>It is your responsibility to contact the Health and Safety Office at the University to confirm whether or not a risk assessment is required prior to commencing recruitment or data collection.</i>		
	Yes	No	Pending
2.11.	Will your research be informed by guidelines from a professional association or specific, agreed standards of practice?		
	Yes		No
	If yes, which?		

### SECTION 3

#### PROJECT DESCRIPTION

*Please provide a brief description of your project in non-technical language (between 500-1000 words). This should include details of the research rationale, aim(s), research question(s), context (linking to some relevant literature), and methods (including details of participants, data collection (including examples /descriptions of any audio or visual stimuli to be presented to participants), data analysis) to be used. You should state any ethical issues that you have identified and how these will be dealt with. This overview should contain sufficient information to acquaint the reader with the principal features of the proposal. A copy of the full proposal may be requested if further information is deemed necessary.*

*Please use this section to list documentation that may be relevant to your application and append it to the submission (e.g. consent forms, information sheets, questionnaires etc.).*

This project explores the link between game reward systems and players' implicit learning. It looks to understand how skills, knowledge and or problem-solving can be acquired without explicit instruction. The study doesn't intend to address explicit teaching in games; instead, it looks at knowledge gained through interaction and feedback provided by games. The research question that drives this project is: How do reward systems in entertainment-focused video games facilitate players' implicit learning of real-world concepts? The rationale for the study is to understand the psychological connection between games and learning, highlighting the skills development and education they can provide, even when learning isn't the primary goal. This study will help educational games better retain audiences and create a link between educational games and entertainment games.

The aims of the study are:

- To determine and examine implicit learning mechanisms used by entertainment-focused video games and their influence on players' knowledge and skill acquisition.
- To explore the various types of reward systems, such as points, achievements, in-game progression, or narrative feedback, and how they influence the implicit learning process.
- To connect gameplay learning outcomes to players' problem-solving abilities, consider how experiences in games translate into practical or cognitive skills outside the game.

The study's methodology will employ a mixed-methods approach to primary research, including gameplay sessions, interviews, and surveys. Participants may include those within and outside the University of Winchester, targeting avid gamers between the ages of 18-25. The study aims to collect both qualitative and quantitative data, which could include observational notes, screen recordings, and post-session interviews. All participants will be required to complete a post-session survey if they participate in any gameplay session.

Participants will be required to provide informed consent to participate in this study, and they will be made aware that they can withdraw from the study at any time. If a participant withdraws, all data collected from them will be discarded from the study and disposed of immediately. This study doesn't intend to collect personal data; all data collected will be anonymised and stored in the cloud in a secure Google Drive. Participants are likely not to be exposed to games with mature themes, but if they are to be exposed to these, they will be declared before the gameplay session, and the participant will be allowed to withdraw.

Relevant Literature includes:

- Park, J., Kim, S., Kim, A. and Yi, M.Y. (2019). Learning to be better at the game: Performance vs. completion contingent reward for game-based learning. *Computers & Education*, 139, pp.1–15. doi:<https://doi.org/10.1016/j.compedu.2019.04.016>.
- Tyni, Janne, Turunen, Aatu, Kahila, Juho, Bednarik, Roman, Tedre, Matti (2023). Reward Types in Popular Recreational and Educational Mobile Games | *IEEE Journals & Magazine | IEEE Xplore*. [online] Available at: <https://ieeexplore.ieee.org/document/9998542>.
- Zapata-Cáceres, María, Martín-Barroso, Estefanía (2021). Applying Game Learning Analytics to a Voluntary Video Game: Intrinsic Motivation, Persistence, and Rewards in Learning to Program at an Early Age | *IEEE Journals & Magazine | IEEE Xplore*. [online] Available at: <https://ieeexplore.ieee.org/document/9529183>.

The above literature looks at several factors in game learning, varying from intrinsic motivation vs Extrinsic motivation, Reward types, Completion contingent rewards, etc. They all give insight into the psychological effects games have on learning, key information to completing this study.

To Summarize, this study intends to research the learning potential of entertainment-focused games. This is often an overlooked area that may improve educational game design moving forward. This study aims to examine the reward systems commonly found in games and how they affect learning, bridging the gap between engaging gameplay and the acquisition of skills and knowledge implicitly.

**SECTION 4****REFINING THE LEVEL OF ETHICS REVIEW REQUIRED**

<i>Please mark with an <input type="checkbox"/> as appropriate</i>		<b>YES</b>	<b>NO</b>
1	Does the research involve members of the public in a research capacity as co-researchers? (I.e. as in participant research where involvement extends beyond data collection)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Is there a risk of over-disclosure that may put the participants at risk or cause them any anxiety?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Will tissue samples (including blood) be obtained from participants?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Will the study require the co-operation of a gatekeeper for initial access to participants? (E.g. to students at school, to members of self-help group.)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Is the right to withdraw from the study withheld at any time, or not made explicit?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Is there any reason participants may feel obliged to participate in the study against their will?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Will the research involve administrative or secure data that requires permission from the appropriate authorities before use?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
10	Will financial inducements (other than reasonable expenses and compensation for time) be offered to participants?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11	Are there payments to researchers /participants that may have an impact on the objectivity of the research?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12	Is there any cause for uncertainty as to whether the research will fully comply with the requirements of the General Data Protection Regulation (GDPR) (2018)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
13	Does any part of the project breach any codes of practice for ethics in place within the organisation in which the research is taking place?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
14	Are drugs, placebos or other substances (e.g. food substances, vitamins) to be administered to the study participants? Please note: for fast track review, it is expected that the study will not involve invasive, intrusive or potentially harmful procedures of any kind.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
15	Is pain or more than mild discomfort likely to result from the study?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
16	Could the study induce psychological stress or anxiety or cause harm or negative consequences beyond the risks encountered in normal life? (E.g. involve prolonged or repetitive testing.)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17	Does the project pose any potential or actual conflict(s) of interest for the researcher and /or stakeholders?	<input type="checkbox"/>	<input checked="" type="checkbox"/>


If you answer **YES** to *any* of these questions, please use the next section to indicate which question you have said yes to, describe the ethical issue in the context of your study and how you will address it. If you have answered **NO** to all questions, complete section 6.

**SECTION 5**

**ADDITIONAL INFORMATION AND AMENDMENTS**

*Use this space to address ethical issues highlighted by the checklist in section 4, or to amend an original submission.*

**SECTION 6**

<b>DECLARATION</b>	
<p>I have read and understood the University of Winchester Research Ethics Policy and confirm that adequate safeguards in relation to the ethical issues raised by this research can and will be put in place. I am aware of and understand University procedures regarding Health and Safety. I understand that the ethical aspects of this project may be monitored by the University Research Ethics Committee.</p> <p>I understand my responsibilities as a researcher as described in the University of Winchester Research Ethics Policy.</p> <p>I declare that the answers above accurately describe the research as presently designed and that a new application will be submitted should the research design change in a way which would alter any responses given in Form 1 or here.</p>	
<p><input type="checkbox"/> I confirm that if a Risk Assessment is required, I will complete it and have it co-signed by my Supervisor or Head of Department before data collection takes place.</p>	
<p><input type="checkbox"/> I confirm that, if DBS clearance is required for my project, then I will seek it before the start of my project.</p>	
<p><input type="checkbox"/> I confirm that my research does not include risks that might cause it to be excluded from coverage by the University's insurers.</p>	
<p><input type="checkbox"/> I confirm that I have appropriate insurance for this research.</p>	
<p>Researcher's signature:  Date: 11/13/2025</p>	
<p>In addition, for <b>students</b> (research):</p> <p>The student has the skills to carry out the proposed research. I undertake to monitor the student's adherence to the relevant research guidelines and codes of practice.</p>	
<p>Supervisor's signature: _____ Date: 11/13/2025</p>	

**Please submit this form along with Form 1 to your nominated Ethics Lead.**

*Please remember to append any forms or documents that may be relevant to your application (e.g. consent form, information sheet, questionnaire(s) etc.). Your form cannot be considered unless it is submitted with the required supporting documentation. Omitting to do so will delay the ethics review process.*

**Appendix G: Participant 1 Discussion**

Video Link: <https://youtu.be/bcsZTt5NW3c>

## **Appendix H: Participant 2 Discussion**

Video Link: <https://youtu.be/Jh8kUI90ZKo>

## **Appendix I: Participant 3 Discussion**

Video Link: <https://youtu.be/xz7dosVLOfQ>

## **Appendix J: Participant Play Test First and Final Session Recordings**

Video Link:

<https://drive.google.com/drive/folders/1ssiJ6wWvMZm0Ga2MkhSEDU05yg2EWaUH?usp=sharing>

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