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ABSTRACT

The premise that “good” games embody sound pedagogy in their designs, even if incorporation was not deliberate, suggests that commercial entertainment games may also hold surprising educational potential. However, there is limited research exploring the potential learning experiences that entertainment games can provide, as well as how such unintended experiences could influence players’ everyday lives. In this paper, we present an exploratory study surveying thirteen university students to understand their perceived learning experiences from entertainment games, how they applied these experiences to their lives, and why they believed the experiences were personally impactful. We found that participants believed they learned (1) practical skills of collaboration and planning, and (2) a wide range of everyday knowledge and educational content. Additionally, we found all reported experiences were relevant and meaningful to players’ lives outside of the game. Lastly, we utilize findings to inform the design of games beyond entertainment, identifying potential areas for improved educational game design.

Keywords

Entertainment Games, Educational Games, Relevance, Meaningfulness, Learning

INTRODUCTION

Commercial entertainment games have been found to successfully incorporate learning theories, often unintentionally, while keeping their audiences engaged and even inclined enough to spend time and money on their product (Becker 2007). Therefore, while commercial entertainment games may not commonly be seen as educational, they are an engaging tool (Abbasi et al. 2017) with great educational potential (Griffiths 2002). For example, previous work has highlighted how video games can contribute to analytical, strategic and logical thinking, psychomotor skills, and enrichment of players’ knowledge bases (Fabricatore 2000). Furthermore, individual studies have found that even commercial entertainment games can teach knowledge and soft skills. Namely, *Portal 2* has been found to facilitate learning physics (Pittman 2013; Trindade and Trindade 2018) and spatial cognition skills (Adams and Mayer 2013), while *StarCraft 2* teaches collaboration, leadership, and teamwork (Poling 2013).

Nevertheless, while the broad range of potential learning experiences within commercial entertainment games has been theorised (Becker 2007; Gee 2007), few studies have empirically explored these experiences and how they affect players' everyday lives—with notable examples being (Chappin et al. 2017; Osmanovic and Pecchioni 2016). As such, we aim to more holistically understand the impactful learning experiences players have had across a broad range of non-educational video games, identifying designs/experiences that are both relevant and meaningful for players as well as unexpectedly led to perceived learning outcomes. In this paper, we present results from a pilot exploratory qualitative study, surveying thirteen students about what practical skills and educational content/everyday knowledge they believe they learned in commercial video games, how it was applied to their lives, and why it was as personally impactful as it was.

The key findings of our study are that, from a variety of commercial entertainment games, players learned (1) the practical skills of collaboration (communication, teamwork, leadership, and emotional regulation) and planning ahead (budgeting and resource management), and (2) the everyday knowledge/educational content of English vocabulary, geography, music, and game design. Furthermore, all of these video game learning experiences were found to be relevant and meaningful to players' everyday lives. While previous studies have shown how vital relevance and meaningfulness are with respect to learning more generally (Goldman et al. 2017; Priniski et al. 2018; Nehari and Bender 1978), we take a deeper look at the role they played in our participants' perceived video game learning experiences. Lastly, we provide a set of suggestions for improving the design of future educational games based on these findings.

BACKGROUND

Learning Experiences in Video Games

Prior work has highlighted that “good” video games are naturally and implicitly comprised of learning theories and activities that help players learn how to successfully play the game (Becker 2007; Fabricatore 2000; Gee 2007). In general, this can also translate into learning information other than just gameplay (even for purely entertainment games) (Gee 2007), and can even have a positive effect on preclass learning outcomes when used in conjunction with classrooms (Ye et al. 2018). Multiple studies have been done to look at some of these learning experiences throughout various video games. For instance, Griffiths (2002) summarizes many of these experiences by looking at multiple case studies in which both educational and entertainment video games benefited its players: entertainment games helped groups with special needs develop language, math, reading, and social skills (Demarest 2000); and educational games helped children with diabetes improve their self-care skills and engagement in medical practices (Brown et al. 1997), children with attention deficit disorders by linking to brain-wave biofeedback (Pope and Palsson, n.d.), and adolescents enhance their perceived self-efficacy in HIV/AIDS prevention programs (Thomas et al. 1997).

Other researchers have utilized qualitative, quantitative, and experimental studies. E.g., using a quantitative instrument and qualitative interviews, Poling found that *Starcraft 2* influenced players attitudes and perceptions around team cohesion (Poling 2013). Similarly, Chen found that playing entertainment adventure video games can enhance reading, listening, vocabulary skills and learning motivation in foreign languages (Chen and Yang 2013).

However, despite their learning potential, video games—particularly educational ones—are not always effective in teaching as they can fail to embed the educational content in the game while attempting to be an attractive game for players (Söbke et al. 2013). In this paper, we take a closer look at entertainment video game experiences that succeed in doing this, and how relevance and meaningfulness were vital to making these learning experiences impactful.

Defining Relevance and Meaningfulness

Following the definitions used by Foster (2008), we employ the definitions of relevance as the experience in which an activity satisfies one’s personal needs and goals (Reigeluth 2013), and meaningfulness as an experience that fits into a “larger cultural context” (Turner et al. 1998). Establishing relevance can be a matter of demonstrating the implementation of theory into practice, finding applications in local events and current issues, or relating knowledge to everyday experiences in one’s life (Kember et al. 2008). Meanwhile, meaningfulness is established through providing purpose and understanding of life (Oliver and Raney 2011), occurring when one is compelled, interested, or has found value in an experience (Weise 2004). However, despite their distinctions, we acknowledge that meaningfulness is partially dependent on relevance (Przybylski et al. 2010)—creating overlap between the definitions (Priniski et al. 2018)—and therefore may create overlap in our results.

Relevance and Meaningfulness in Learning

Relevance and meaningfulness (Goldman et al. 2017; Priniski et al. 2018; Nehari and Bender 1978) are a vital part of learning for people across multiple generations and countries (Seemiller et al. 2020). This is because of an increase in engagement through relating to personal interests and previous experiences, which creates a desire to achieve some goal through learning (Willis 2014). In a traditional educational setting, this translates into teachers prioritizing information so that the material is directly applicable to students’ lives, explaining why students are learning the material, and allowing for students to learn independently (Willis 2007).

Relevance and Meaningfulness in Gaming

In the context of video games, relevance and meaningfulness are known to motivate student learning (Foster 2008). Although not directly stated as relevance in other studies, many of the learning principles found in video games maintain relevance by providing information only when absolutely necessary: right when players need it, or when the player can make good use of it—not at an unrelated time or out of context (Gee 2007, 2003). Likewise, video games were found to be meaningful when they provided insight to the human condition, or deep connections to other players and characters within the game (Rogers et al. 2017). However, despite these findings, few studies have directly tied learning experiences to its player relevance and meaningfulness, or looked at how these can purposefully be implemented into video games, particularly with serious games.

METHODS

Study Procedure

This study was approved by the Institutional Review Board at the University of California, Santa Cruz (a Tier 1 research university). For the study, we utilized an internal undergraduate research pool to recruit a convenience sample of students from a large public university

and conducted 30 minute online surveys. In order to be eligible for participation, participants were pre-screened to confirm they had prior learning experiences with non-educational commercial video games. After consenting to participation, participants were asked to reflect upon unexpected learning experiences from playing a commercial entertainment game not intended for educational purposes (e.g., Final Fantasy, Mario, Zelda, Pac Man). The survey was split into two main sections, asking about (1) practical skills (such as spatial reasoning, organization skills, collaboration skills, and so forth) and/or (2) educational content or everyday knowledge (such as math, history, vocabulary, how banks work, and so forth). Students could choose between answering both sections—referencing either the same game or different ones across sections—or simply selecting one. Upon completion, students were awarded extra credit toward their grade in the course that directed them to the research pool we recruited from.

Each section asked three main guiding questions:

1. *Please describe this learning experience. What [skills/knowledge] did you learn from it?*
2. *How did you apply this learning experience in your life?*
3. *Why do you think this video game experience impacted you as much as it did?*

Participants

Our study surveyed thirteen participants ranging from ages 20 to 28 ($M = 22.38$, $SD = 2.17$; 30.8% women), who had learned practical skills and/or educational content/everyday knowledge from playing commercial entertainment video games. All participants were university students who roughly played an average of 15.15 hours ($SD = 7.88$) of video games a week. Participants' preferred video game genres via *Metacritic* (*Metacritic* 2001) varied from 3D Platformer and Action-adventure to Role-playing games (RPGs) and First-person shooter (FPS)—see Table 1 for the complete list of games and genres.

Analysis Procedure

The first author coded and analyzed the survey results in two core phases, following Saldaña's guide on qualitative research using grounded theory (Saldaña 2021). Additionally, to provide rigor and reliability in these codes, the second author applied peer analysis checking (Harding, Whitehead, et al. 2013) on the data analysis and code interpretations throughout the study.

The first pass was exploratory and utilized initial, in vivo, value, and process coding (Saldaña 2021). These codes were grouped together through affinity diagramming in order to search for any emerging themes that could provide insight on the unintentional learning experience participants had. This pass through resulted in finding themes within the skills and knowledge reported in our study.

Once these themes were established, a second pass was made to explore themes surrounding the general learning experience such as values, causes, effects, applications, and feelings

Participant	Video Game(s) Reported	Game Genre(s) for Reported Games	Preferred Video Game Genre(s)
P1	League of Legends, VALORANT, Minecraft	Role-Playing (RPG), Strategy, Action Role-Playing Game (ARPG), Real-Time, Multiplayer Online Battle Arena (MOBA), Action, Shooter, First-Person, Tactical	OBA, Real-Time Strategy (RTS), First-Person Shooter (FPS), RPG
P2	World of Warcraft, Witcher 3	RPG, Massively Multiplayer Online Role-Playing (MMORPG), Fantasy ARPG, RPG	MMORPG, RPG
P3	Among Us	Party, Social Deduction	Any
P4	Tetris	Puzzle, Stacking, General	Fantasy, Open-World, Simulation
P5	Genshin Impact	RPG, ARPG	MMORPG, RPG
P6	GTA V, Zoo Tycoon 2	Action-Adventure, Modern, Strategy, Tycoon, Management, Business	RPG, Action-Adventure, FPS, 3D Platformer
P7	Assassins Creed, Civilization 5	Action-Adventure, Open-World, Strategy, Turn-Based Strategy, Historic, 4X	FPS, Open-World RPG
P8	Osu!	Action, General	MOBA, Battle Royal, MMORPG, FPS
P9	League of Legends	RPG, Strategy, ARPG, Real-Time, MOBA	MOBA, Battle-Royal
P10	League of Legends	RPG, Strategy, ARPG, Real-Time, MOBA	Role-Play, Turn-Based, Multiplayer, Adventure
P11	Animal Crossing	Simulation, Virtual, Virtual Life	MOBA
P12	Elder Scroll Online, Maplestory	RPG, MMORPG	RPG, Action, Third-Person Shooter (TPS), Survival
P13	God of War, Call of Duty	Action, Shooter, FPS, Tactical	Most game genres

Table 1: The study participants, video games that participants reported having learning experiences from, the corresponding genres via *Metacritic* (2001), and participants’ overall preferred video game genres.

(Saldaña 2021). While organizing these groupings, we identified larger themes of relevance and meaningfulness made up of these smaller sub-categories—see Table 2 for example excerpts from our coding. Upon further study, we additionally found that relevance and meaningfulness were correlated to our second and third main guiding questions, respectively.

RESULTS

Practical Skills Learned

The practical skills we found players learned from video games fall into two main categories of collaboration and planning ahead. One player’s response nicely summarizes these overall survey results:

“The best things that I have learned from [League of Legends] is how to build teamwork,

Code Category	Code Sub-Category	Example Code
Practical Skills	Leadership	“it is important... to make sure everyone is doing the right thing and nobody is falling behind or not being as useful as they could be.”
Knowledge & Educational Content	English (Vocabulary)	“I learned a lot of random words from the Witcher, and I found myself saying weird words a lot after playing it.”
Relevance	Applications	“I have applied most of these skills in group projects or team exercises. Also, when I work with other people, these skills have allowed me to understand them better through communication and build better rapport.”

Table 2: Examples of how the data was coded.

have better communication, [and] become a better leader. Another thing that I was able to pull from the game is big picture thinking” (P1).

Collaboration

Of the 13 participants, 8 identified and discussed multiplayer games specifically (see Table 1). Based on the 8 participants who wrote about their learning experiences on multiplayer games, one of the core themes that emerged from our survey was that video games build collaboration skills (n = 6), particularly communication (n = 3), teamwork (n = 2), leadership (n = 3), and emotional regulation (n = 2). These video games allowed for a platform where players could learn to communicate in a “*more appropriate way,*” (P10) as well as “*understand [others] better... and build better rapport*” (P1) with others. As P1 explains,

“Minecraft has allowed me to build my teamwork skills as when my friends and I play, we share resources with each other and ask each other for favors.”

Likewise for P2, this meant learning that:

“it is important to be clear and concise in your directions to make sure everyone is doing the right thing and nobody is falling behind or not being as useful as they could be.”

This response not only speaks to how video games can improve communication skills, but also teamwork and leadership skills. Additionally, building on these skills, players also learned emotion regulation skills such as to “*not be too mad [at] other players*” (P9) and to “*self adjust [their] mood when [their] mood is bad*” (P13). As P13 explains,

“There are a lot of TRASH PLAYERS in the [world] (Cheaters, those who like to mock and criticize other players). You need to adjust your own mood if you want to keep playing the game.”

Planning Ahead

Similarly, another core theme that emerged in our survey was that video games teach planning skills (n = 6). For some participants (n = 5), this was due to video games requiring players to engage in “*big picture thinking*” (P1). Players “*learned how to plan a [long]*

time in advance and budget,” (P7) through multitasking (n = 1) and managing resources (n = 4). As P5 explains,

“I have learned to mentally organize weapons because I have different stuff for different characters. [Through this,] I have learned to multitask [and] organize.”

For other players, managing resources included budgeting by “saving money to buy things, but keeping a good amount at all times” (P6). P6 describes this learning experience with the following anecdote:

“I liked playing GTA with my friends, and they had lots of cheap things that were cool, but I had a couple really nice things and I enjoyed that more.”

Overall, having limited resources forced players to evaluate what they needed to accomplish their goals, and “make a plan based on the [resources available]” (P13).

Knowledge and Educational Content Learned

While the everyday knowledge and educational content learned from video games varied immensely depending on the game, many participants (n = 9) reported some form of these learnings in their surveys. Individual results ranged from recognizing the “general location [of monuments in Rome] in relation to other important monuments” (P7), to learning “beat and rhythm in music” (P8), and to “guid[ing] players through a game-space in an enjoyable and easy to understand way [when designing video games]” (P6).

Furthermore, a common theme of learning English vocabulary (n = 4) did emerge in our survey results. For P12, *Maplestory* taught them “to communicate in English with vocabularies [they] picked up from the game,” as they “did not understand or speak English at the time.” Similarly, P11 “learned how to read” from frequently playing “an extremely text heavy game... [when] extremely young.” Meanwhile, P2 found “it was fun to learn random new words” even though the words were “weird sounding old timey,” and not necessarily everyday vocabulary.

Relevance

Every participant in our study applied their video game learning experiences to their real lives in some way. For most participants, these were applied in environments that required collaboration and communication (n = 7). Participants felt that they were able to implement these skills/knowledge when “leading small groups of people, and organizing events” (P12), working “in group projects or team exercises” (P1), being required to “treat people patiently in real life” (P9), having to be “more confident to have a conversation with others” (P10), and needing to become “more clear with [their] communication during group projects which helps a lot with getting things done” (P2).

For some participants (n = 2), the video game learning experiences were applied to resource management. For P6, this meant budgeting their real money:

“I don’t go spend a lot of money on small things, and instead I spend money on larger things that I will enjoy for a long time.”

Similarly, P13 explains it as,

“Whenever I started a project, I would check the [resource] I currently have and do some calculation about the [resource] I need and the resource I would probably have later. Then I would make a plan based on the [resource].”

Lastly, for some participants (n = 2), the skills/knowledge learned from video games were applied to participants’ careers. Specifically, P8 *“started to play the drums because of Osu! and now [they] get paid to play at gigs,”* while P6 *“built on what [they] learned and [is now] a 3D Level Designer.”*

Although these players may not have become experts in these skills/knowledge, playing these video games gave them the experience, and consequently the confidence, to apply some of their learning experiences to their real lives.

As P1 explains,

“The leadership qualities that I have learned through playing the game has not been quite effective as I am a naturally introverted person, but it has allowed me to become a more confident leader when needed.”

Meaningfulness

When asked about why this video game experience was so impactful, participants focused on the community aspect (n = 7 out of the 8 participants who identified multiplayer games) and how the video game helped make improvements to their daily lives (n = 9). They enjoyed playing with *“the people that [they] talked to in the game”* (P12) because they were *“in a great guild with friendly and chaotic people”* (P12) and were able to *“just [hang] out with friends”* (P1). For some, this was fostered through the non-competitive nature of a game. For example, P2 states,

“I think [World of Warcraft] has a really great community and it’s inspiring to be a part of a non-competitive group of people who are all trying to help each other. Being part of a guild is also a very important thing to me, and it’s reassuring to know that if I go online at any time of day or night there will usually be someone online who wants to talk or play.”

On the other hand, P1 felt that the competitive nature of *League of Legends* improved their learning experience:

“I generally played this game with my friends who were also competitive so it accelerated the development of the skills that I had mentioned above. The more we won games, the better we felt, so naturally the skills followed as we got better at the game. I think that playing the game with a focused mindset of improving allowed us to develop these skills rather than playing with a lax mindset blaming each other for mistakes. It allowed us to take responsibility for our own mistakes and come up with ways to overcome them as a team.”

Apart from an impactful community, participants learned important life lessons that they were able to apply outside of the video game, as these games were *“perfectly suited”* (P6)

for them. For P5, they “*unconsciously applied [the skill of multitasking] to [their] everyday life*” after “*playing for a while and [getting] used to [the skill in gaming].*” P4 thought Tetris “*was so satisfying and... played it a lot when [they were] anxious because of that,*” while P11 found reading in Animal Crossing “*an essential life skill [that] made [them] a better reader overall,*” and P1 found that “*Minecraft allowed [them] to be more expressive by building new things.*” More abstractly, P2 felt that learning better communication “*just made it more obvious to [them] that it is ok to say what you mean and not try to silently do all the work, or be ‘nice’ and not ask for help when you need it.*”

DISCUSSION

Expanding Research on Learning in Entertainment Games

There is no questioning the potential of video games in education (Griffiths 2002); yet there is very limited research on how this may already implicitly occur throughout non-educational commercial games. In our study, participants learned collaboration and planning skills, and general knowledge—including geography, music, game design, and English vocabulary. Notably, these results provide empirical evidence to reinforce the research and theories posited by Griffiths (2002), Fabricatore (2000), Becker (2007), and Gee (2007) on how learning is innate to successful video game experiences. I.e., the goal of these reported video games was not explicitly to provide learning experiences, and yet our results indicate that players perceived learned skills and/or knowledge that was relevant and meaningful to their lives outside of the game—leaving lasting impressions on them. Furthermore, these results also expand upon the work done by Griffiths (2002), Fabricatore (2000), and Poling (2013) by discovering new video game learning experiences for players of commercial entertainment games and exploring how and why these video games experiences were so impactful to players, i.e., what led to relevance and meaningfulness (see below).

Importance of Relevance and Meaningfulness for Learning Through Games

Although relevance and meaningfulness have been explored in other domains for education, previous work in the game research domain has presented a theoretical view for learning in video games but lacked much needed empirical evidence to support it (Foster 2008; Gee 2007). Our study not only provides some of this evidence, but also builds upon this view. In his work, Gee writes about how being able to relate academic concepts to familiar activities helps with learning new material (Gee 2007)—e.g., exploring the concepts in Portal can supply players with the language to learn and understand physics (Gee 2008). Our results imply that the reported video games provided a space to familiarize oneself with and practice various skills/knowledge, which were then applied outside of the game. Essentially, the game experiences provided a means to ground and develop players’ learning in such a way that it could then easily apply to the world outside of the game (i.e., contribute to relevance and meaningfulness).

Implications for the Design of Educational Games

Although the focus of this work was on “unexpected” perceived learning experiences from commercial entertainment games, some of our findings may provide useful implications to educational game designers as well. Specifically,

1. **Incorporating resources/resource management** in educational games may be especially valuable for the development of collaboration and practical planning skills as limited resources are the key aspect driving the use of both in the entertainment games we surveyed.
2. **Designing for collaborative play** in educational games may contribute to community building and collaboration skills, and may make the game experience more meaningful. E.g., almost all (7 out of 8) participants who mentioned multiplayer games in the study reported these skills and meaningfulness.
3. **Relevance and meaningfulness are critical for learning experiences in educational games** (as mentioned above). Therefore, educational video games should center desired learning around experiences that players can relate to their lives both inside and outside of the game.
4. **Games can be a safe and comfortable space for players to build and develop the confidence necessary to attempt employing the skill(s)/knowledge in the real world after playing**—rather than just increasing interest or engagement as is commonly known/explored in existing work, e.g., (Grasse et al. 2021; Grasse et al. 2022; Kao and Harrell 2017; O. Keehl and E. Melcer 2019; O. G. Keehl and E. F. Melcer 2021; Melcer and Isbister 2018; Melcer, Grasse, et al. 2020; Melcer, Ryan, et al. 2020). Thus, actively designing spaces where players can freely practice, implement, and explore skills/knowledge in the game without fear of failure could prove to be beneficial. For instance, taking more of a constructivist design approach (Zuallkernan 2006; Rooney 2012).

LIMITATIONS AND FUTURE WORK

We note that our pilot exploratory qualitative study had a few limitations. First, our sample size was on the smaller side ($n = 13$), and only contained participants from a specific age range (ages 20 to 28; $M = 22.38$, $SD = 2.17$) due to being conducted through a university research pool. Second, our participants played an average of 15.15 hours ($SD = 7.88$) of video games a week, which is significantly higher than the global average of approximately 8.5 hours per week (Combs 2021). Therefore, our results may not generalize as well to a larger, more diverse population. Lastly, our data on participants' video game learning experiences is self-reported and therefore can only rely on the perceptions of learning from participants rather than through empirical measurement to verify learning. This opens up the possibility of biases, such as selective memory and exaggeration. The self-reported nature of the data could also inadvertently exclude some external factors that could have influenced participants' learning.

Furthermore, the games in our study were not designed with any learning objectives in mind, and participants did not play these games with the intention of learning the skills that they did; indeed, they may not have even played if those learning objectives were proclaimed as a focus of the game. While our findings provide support for the importance of relevance and meaningfulness in video game learning experiences, we cannot predict how relevant or meaningful any video game aspect may be for any specific player without additional controlled experiments. Therefore, understanding these successful experiences is only the beginning of being able to potentially implement these findings into future educational games.

As Becker explains in an analogy comparing video game design to film production, “We can often elaborate on why great movies are so great... but we still have not come up with a formula for generating them” (Becker 2007). There is still much needed research around how games can be designed to incorporate more specific educational content without taking away from the appeal of the game, and how purposefully centering desired learning around relevant and meaningful experiences in video games affects player learning outcomes. Once we can gain a deeper understanding of how to create successful learning experiences in video games through relevance and meaningfulness, we would be better suited to create successful educational and entertainment game designs influenced by them.

CONCLUSION

Despite their educational potential, limited research has been conducted on the broader range of unexpected learning experiences in commercial entertainment games and how/why these experiences are relevant and meaningful to players. In this paper, we provided results from a pilot exploratory qualitative study to more holistically understand the impactful learning experiences players have had across a broad range of non-educational commercial video games. Our results found that players learned (1) the practical skills of collaboration (communication, teamwork, leadership, and emotional regulation) and planning ahead (budgeting and resource management), and (2) everyday knowledge/educational content such as English vocabulary, geography, music, and game design. Importantly, all of these video game learning experiences were found to be relevant and meaningful to players’ everyday lives. Furthermore, these findings highlight that educational games may similarly benefit from incorporating resources/resource management, facilitation collaborative play, creating relevant and meaningful game content for players’ lives beyond the game, and providing spaces for players to practice and safely build confidence in their skills.

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