Learn to Play: From Knowledge to Repeated Gameplay

Gen-Yih Liao
Chang Gung University
gyliao@mail.cgu.edu.tw

Tzu-Ling Huang
National Central University
emily109emily@yahoo.com.tw

Hsin-Yi Huang
Soochow University
hyhuang@scu.edu.tw

Alan R. Dennis
Indiana University, Bloomington
ardennis@indiana.edu

Yu-Ting Huang
Chang Gung University
ng153240@gmail.com

Ching-I Teng
Chang Gung University
chingit@mail.cgu.edu.tw

Abstract

Online games are popular computer applications around the globe. Games are frequently designed to require extensive in-game knowledge to attain in-game goals, so it may be central to continued gameplay. Little is known about how players seek knowledge, internalize knowledge, and subsequently use it to attain in-game goals. We used theories of flow and learning to build a theoretical framework and examined it by using responses from more than four thousand players. We found that encouraging players to seek and internalize in-game knowledge is an effective strategy to increase gameplay. Interestingly, learning satisfaction was more important than knowledge internalization in predicting goal progress, showing a novel insight for game providers to nudge their players in their knowledge searching. We concluded that asking players to search and internalize in-game knowledge may be a more effective strategy than creating their focused immersion to encourage repeated gameplay.

Keywords: learn, knowledge, gameplay, survey, focused immersion, knowledge searching

1. Introduction

Around the world, online games garner billions of game players and billions of revenues (Statista, 2023), with revenues increasing dramatically (Statista, 2023). Many new games emerge in the market to create strong competition and trigger huge changes in market shares. Game providers strive to know how to encourage repeated gameplay, and prevent players from defecting to play other games.

Previous online game research indicates that repeated gameplay may be due to many reasons, e.g., heightened enjoyment (Hamari et al., 2020), lifted self-efficacy (Esteves et al., 2021), cohesive team cooperation (Pham et al., 2023), increased user engagement (Rapp, 2022), strong emotional attachment (Hsiao & Tang, 2021), and attaining achievements (Kwak et al., 2022; Teng et al., 2022b). Among these factors, achievements have been widely verified as a major motivation for repeated gameplay (Lin et al., 2015; Yee, 2006). Attaining achievements enables players' progress toward attaining the goals, i.e., goal progress (Teng, 2017; Teng et al., 2022b), indicating the importance of goal progress for ensuring repeated gameplay.

Most games include content that requires specific knowledge and skills to overcome challenges (Liao & Teng, 2017; Perron, 2006). Hence, learning should be a key element of gameplay that is central to progressing toward goals (Lin et al., 2015). However, we do not know the role of learning in facilitating players' goal pursuit and obtaining achievements. Understanding the role of learning is important to researchers building theories to explain game loyalty and to game developers deciding how to allocate their resources to design games to increase repeated gameplay.

We argue that searching for knowledge should be the first step before learning knowledge. Moreover, we theorize that concentration during gameplay (i.e., focused immersion, similar to flow, Csikszentmihalyi, 1975; Csikszentmihalyi & Csikszentmihalyi, 2014) should directly help learn knowledge. Therefore, our research aims to examine how knowledge searching and focused immersion help players progress toward their in-game goals, thus motivating repeated gameplay. To achieve this aim, we collected 4,197 responses by using an online survey. The analytical results supported all the hypotheses.

This research makes three contributions. First, it built and examined the theoretical mechanism, underlying how knowledge and learning facilitate players' in-game goal progress and thereby repeated gameplay. Second, it offered the pivotal elements within the mechanism, offering game providers insights to better design their games. Third, the model explained more than half of all the endogenous variables,

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indicating its power in explaining the mechanism and players' repeated gameplay.

2. Literature review

People play games for various reasons, including social, immersion, and achievements (Xi & Hamari, 2019; Yee, 2006). Achieving in-game goals is widely mentioned as an important motivator (Lin et al., 2015; Teng, 2017; Teng et al., 2022b). To achieve in-game goals, players read posts in online game communities to learn gameplay knowledge, e.g., world map information, tricks, and successful gameplay strategies, which foster player growth in gaming knowledge (Liao et al., 2023). Such knowledge enables players to better understand the in-game mechanics, which are key to attaining in-game achievements (Xi & Hamari, 2019).

Broadly speaking, knowledge offers power to individuals, organizations, and communities, as knowledge enables better decision-making (Holsapple, 2001). Hence, knowledge sharing is an examined topic, either in the online community or online game contexts (Kimmerle et al., 2017; Liao et al., 2023; Teng et al., 2022a). Knowledge sharing refers to the action of offering knowledge to others (Kimmerle et al., 2017). On the other hand, knowledge searching refers to the active exploration of possibly useful knowledge. Knowledge searching is actively seeking knowledge, and showing enthusiasm for learning (Hwang et al., 2018). Combining knowledge searching and knowledge sharing creates a complete loop in knowledge exchange (Kankanhalli et al., 2005). As our research is an individual-level one, we first focus on knowledge searching, as whether other players share their knowledge may be a community-level issue.

Knowledge searching and exchange were examined in online community contexts. Specifically, the theory of knowledge exchange in online communities can go beyond organizational borders (Chen & Hung, 2010). Online communities also enable users of varied backgrounds to exchange their knowledge (Khansa et al., 2015), thus solving problems for community users (Chiu et al., 2006).

Knowledge searching frequently takes the form of asking others questions, with the aim of obtaining answers. The answers provide value in helping knowledge seekers solve their problems (Gubbins & Dooley, 2021). In our research context of online games, specific knowledge can be applied many times in many similar in-game situations. Hence, it is important to know whether knowledge searching can result in the learned knowledge deeply rooting in memory and therefore become highly accessible. Such a process has been termed knowledge internalization (Hastie, 1981); knowledge internalization is the degree to which individuals incorporate acquired knowledge to guide their subsequent behaviors, motivating us to include knowledge internalization into our model.

Knowledge searched can take the form of others' thoughts, suggestions, or answers to specifically asked questions (Rafaeli & Raban, 2005). Either of them may satisfy knowledge searchers' need for learning, i.e., feeling satisfied by knowing what others think or know. Hence, our study included learning satisfaction in the model.

Past research on knowledge searching has explored how to foster knowledge searching (e.g., Nevo et al., 2012; Yang et al., 2017), in varied contexts, such as online communities (Tseng et al., 2017) and professional exchange societies (Lai et al., 2014). However, knowledge searching is not well understood in online gaming contexts. Research findings from online communities may not be applicable to online gaming contexts, for two important theoretical reasons. First, for many users, the primary motivation for participating in online communities is to acquire and share knowledge (Phang et al., 2009), whereas the primary motivation for many users of online games is to have fun (Yang & Liu, 2017). Second, the technology contexts are strikingly different; gaming contexts are characterized by multimedia and often include intensive real-time interaction among users or game elements, whereas online communities often lack multimedia and few include intensive real-time interaction. Hence, we still need a study in online gaming contexts to examine how knowledge searching can foster players' goal progress and maintain their repeated gameplay.

Online gaming contexts are unique in that focused immersion is a major reason for online gameplay (Rheinberg, 2020). Focused immersion is a psychological state that describes a sense of total absorption and engagement in a particular task (Pham et al., 2022). Focused immersion has been shown to predict game loyalty (Huang et al., 2022; Suh et al., 2017), for both heavy and light players (Pham et al., 2022). Focused immersion is defined using total concentration (Pham et al., 2022), which is important for long-term memory to internalize knowledge into individuals' problem-solving mental presentations (Ramey et al., 2022). On the other hand, focused immersion was not observed to affect interest in learning in serious games (Bachen et al., 2016), indicating that there is no consensus on whether and how focused immersion affects learning in gaming contexts. The mixed results motivate us to investigate whether focused immersion may result in knowledge internalization and satisfactory learning experience in the online game contexts. Thus, we included these relations in our research model.

3. Hypotheses

Players can leverage knowledge from other players without having to learn by trial-and-error, thus more effectively achieving in-game tasks, upgrading gaming skills (Tsai & Kang, 2019), and leveling up avatars (Liao & Teng, 2017). That is, learning from others brings various positive benefits for players. Knowledge internalization (Hastie, 1981) is the process by which players take knowledge from others and use it to perform the desired activity. The use and practice of this knowledge internalize it and make it their own. This is consistent with the literature on online information seeking behavior, which shows that active seeking behavior is related to the absorption of information (Ivaturi et al., 2017). Practicing knowledge can help individuals to better understand the knowledge and integrate it into their mental models. They can use their actions to facilitate the knowledge retrieval process, i.e., making the knowledge highly accessible. So we theorized:

H1: Knowledge searching increases knowledge internalization.

Knowledge searching should result in more knowledge obtained. For example, players can consult peers of the same interests (or similar game world locations). This resembles the connectivity concept in online game communities, which could foster players' growth (Liao et al., 2023), implying substantial learning obtained. When there is more knowledge obtained by a player, the player must more likely form a belief of learning completed, a definition of learning satisfaction (Caspi & Blau, 2008). Accordingly, increasing the amount of knowledge obtained would better satisfy players' need for learning (Teng, 2018), building the rationale for our H2. So we developed:

H2: Knowledge searching increases learning satisfaction.

When playing online games, players may find themselves fully engrossed in the game's attractive features (Xi & Hamari, 2019), heightening their concentration on gameplay. Heightened concentration would facilitate players to acquire new knowledge (Veldkamp et al., 2022), which could be internalized into long-term memory. Such long-term memory would have a significant impact on players' subsequent behavior, representing one core element of knowledge internalization (Ramey et al., 2022). So we developed:

H3: Focused immersion increases knowledge internalization.

In the game context, the specific activities leading to focused immersion should be completing game tasks. Through completing several game tasks, those players with high concentration may more likely find patterns and regularities within the game, i.e., one kind of gaming knowledge. Accordingly, concentration could assist players to acquire new knowledge, which could then stimulate players' curiosity (Wu, 2016). Curiosity would enhance positive emotional engagement and promote active learning (Lee et al., 2022). Learning strategies would bring players a sense of accomplishment and believe that they are able to upgrade their gameplay skills and knowledge levels, the core definition of learning satisfaction (Alqurashi, 2019). So we developed:

H4: Focused immersion increases learning satisfaction.

Individuals could improve their performance and consequently obtain increased experiential value. An increased experiential value would facilitate knowledge exchange (Weretecki et al., 2021). This allows knowledge to be shared across boundaries and further enhances knowledge integration capabilities (Acharya et al., 2022). Knowledge integration may ensure knowledge quality as individuals can obtain more complete content (Zhang et al., 2019), which further enables individuals to acquire more knowledge to develop their competencies and thereby enhance their self-efficacy (Dissanayake et al., 2019). Perceived self-efficacy plays an important role in goal-setting and attainment (Wong et al., 2021). Moreover, gaming self-efficacy could trigger players to achieve their gaming objectives (Teng et al., 2022b). Setting gaming goals and striving to achieve them is one core element component of goal progress (Teng et al., 2022b). So we developed:

H5: Knowledge internalization increases goal progress.

Learning satisfaction escalates a user's skill and knowledge (Alavi et al., 2022). Increased skill and knowledge make players' striving and efforts more effective when they aim to conquer in-game challenges and accomplish in-game tasks. In-game challenges and tasks are designed as significant stages along the way toward achieving the final victory. Hence, conquering challenges or accomplishing tasks are key to progress toward the final victory, i.e., increasing player-perceived goal progress (Lu et al., 2022). So we developed:

H6: Learning satisfaction increases goal progress.

Past research has shown that goal progress predicts players' need satisfaction and repeated gameplay (Kwak et al., 2022; Teng, 2017; Teng et al., 2022b). We include this relationship for completeness:

H7: Goal progress increases repeated gameplay.

4. Methods

4.1. Sample and data collection

We utilized a web-based questionnaire, which should be well-suited for gathering data about the use of

online environments (Jia et al., 2022). Online participation is also suitable for collecting user responses to technologies (Hibbein et al., 2017). As online environments include video game universes, this utilization should be proper for our study. We disseminated invitations across a variety of well-known online platforms (e.g., www.gamer.com and ppt.cc) to attract a large number of potential participants and prevent the sampling bias resulting from a single source of participants. The invitations targeted all gamers, and were not limited to any specific game types.

Our invitations stated that we aimed to investigate players' goal perception within online games. Interested participants were asked to complete the informed consent. Those who completed the study would be entered in a lottery, which had a modest award of approximately US$7 for each of the 50 winners to express our gratitude. The modest value of the lottery was unlikely to unduly influence participants' decision to take part in our study, thus minimizing potential self-selection bias (Jia et al., 2017).

We collected over 4,942 responses to our web-based questionnaire. To filter out invalid data and ensure data validity, various criteria were used. Specifically, if participants did not nominate an existent game or pass our attention check, their responses were regarded as invalid. We also checked whether participants' ages were greater than 18 years, whether they provided a unique email, or whether they had gameplay experience of more than one month. Ultimately, 4,197 valid responses were retained for further analyses. We tested non-response bias using the previous literature's guidance (Yu et al., 2015), i.e., comparing the first quarter of responses to the last quarter. We did not observe significant differences (p>.21), implying that non-response bias should not be a substantial issue.

Female respondents were less (24.6%) than male ones. This fits the local player population (GNN, 2016). Most respondents were 35 years of age or less, attending colleges or above, and earning an annual income equivalent to US$30,000. All these fit the local player population. The respondents nominated many games, while 52.9% of them were MMORPG or RTS.

4.2. Measurement

Knowledge searching had measures modified from those by Phang et al. (2009), e.g., "I look for the knowledge of this game regularly". Focused immersion had measures modified from those by Agarwal and Karahanna (2000), e.g., "When playing this game, I spend ___% of my time in full concentration". The responses have a range between 0 and 100, urging us to rank normalized them. Knowledge internalization had measures we developed by referring to the words on knowledge internalization (Abbot-Smith & Tomasello, 2006; Kleider et al., 2008), e.g., "I internalize the knowledge of this game into my memory, which affects my gaming behavior". Learning satisfaction had measures modified from those by Teng (2018), e.g., "Playing this game satisfies my craving for learning". Goal progress had measures modified from those by Teng (2017), e.g., "I am progressing toward attaining the in-game achievement-related goals I want to attain in this online game". Players' repeated gameplay had measures modified from those by Teng and Chen (2014), e.g., "I am willing to tell others about the positive aspects of the online game". Most measures had a five-point scale, indicating strongly disagree (coded as "1") to strongly agree (coded as "5").

Besides the main study constructs, eight control variables were also included in our model. These control variables were gender, age, education degree, income, months of gameplay, hours of gameplay, and whether the game type is an RTS (i.e., real-time strategy) game, and whether the game type is an MMORPG (i.e., massively multiplayer online role-playing) game.

All the measures we used in the study demonstrated sufficient reliability, with Cronbach's α values greater than .83. Besides, all indicator loadings were greater than .68, demonstrating convergent validity. Regarding discriminant validity, we checked the square roots of the average variance extracted values and found all of them were larger than the associated correlation coefficients. We computed loadings and cross-loadings by using an exploratory factor analysis. We found that cross-loadings are markedly smaller than the loadings, displaying a clear pattern supporting the validity. Table 1 lists the distributions and correlations of each scale.

Our constructs had correlations of .61 or smaller, suggesting little CMB (i.e., common method bias). To formally test CMB, we first applied Harman's test, and found the first factor had less than half of the variance.

Table 1: Correlations and Distributions

	1	2	3	4	5	6
1.KS	***.87***					
2.FI	.24*	***.88***				
3.KI	.59*	.28*	***.86***			
4.LS	.61*	.28*	.60*	***.85***		
5.GP	.54*	.23*	.54*	.57*	***.89***	
6.RG	.48*	.28*	.47*	.49*	.53*	***.75***
M	3.49	60.97	3.64	3.55	3.58	3.88
SD	0.92	22.74	0.78	0.81	0.77	0.67
No.	3	3	4	3	4	5

Note. KS=knowledge searching; FI=focused immersion; KI=knowledge internalization; LS=learning satisfaction; GP=goal progress; RG=repeated gameplay; M=mean; SD=standard deviation; No.=number of items. *p<.05. Bolded and italicized numbers on the diagonal are positive square roots of the AVE values.

Second, we used the willingness to receive further research invitations as the marker variable, which on average had a small correlation (<.06) with other measures. Third, we gauged CMB by using the second smallest correlation. This CMB was applied to adjust correlations (Lindell & Whitney, 2001). No significant results changed after correlation adjustments. In sum, we concluded that CMB was not a major issue.

5. Results

5.1. Hypothesis testing

Figure 1 shows the analytical results. The research hypotheses were tested using LISREL, software for covariance-based structural equation modeling, one of the recommended techniques (Gefen et al., 2011). This structural model had a good fit with the data, i.e., NNFI=.98; CFI=.99; IFI=.99; and RMSEA=.02. The entire model explained 50% to 67% of the variance of the modeled constructs. These are large effect sizes.

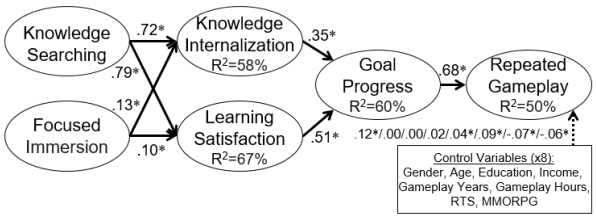

Figure 1. Analytical Results.

We found that knowledge searching increases knowledge internalization and learning satisfaction (β=.72 and .79, p<.05), supporting H1 and H2. Focused immersion increases knowledge internalization and learning satisfaction (β=.13 and .10, p<.05), supporting H3 and H4. Knowledge internalization and learning satisfaction increase goal progress (β=.35 and .51, p<.05), supporting H5 and H6. Goal progress increases repeated gameplay (β=.68, p<.05), supporting H7.

With an aim to further explore the results, we used Sobel tests to additionally test and consequently verify that some factors (i.e., knowledge internalization, learning satisfaction, and goal progress) indeed are moderators (p<.05).

We further compared the impact of knowledge internalization and the impact of learning satisfaction on goal progress. We compared the path coefficients of H5 and H6. The results indicated that learning satisfaction had a significantly stronger impact on goal progress than knowledge internalization (p<.05). Such finding could provide game providers valuable guidance on resource allocation, i.e., if game providers have limited resources, they should prioritize satisfying players' desire for learning to enhance their gameplay usage.

We also tried to clarify which factor, knowledge searching or focused immersion, had a larger impact on eventual repeated gameplay. To address this, we compared their total effects and found that knowledge searching has a larger total impact (p<.05). This finding challenges our current understanding, which suggests that focused immersion is one of the most powerful determinants of players' further gameplay. Instead, our finding suggests that knowledge searching may be a stronger one. This provides insight for future studies to explore how to encourage players to seek out more knowledge within the game world.

5.2. Robustness tests

We conducted several robustness tests. First, to alleviate potential doubts regarding the role of repeated gameplay, i.e., whether repeated gameplay could be the driver of our model, we tested an alternative model in which all paths were reversed. This involved changing the direction of all impact relationships. The testing results of the alternative model showed a significantly worse fit with the data, as evidenced by the values $\Delta df=7$, $\Delta\chi2=903.74 > \chi2(7)=14.07$. Accordingly, the superior fit of our original model compared to the alternative model denies the possibility of reverse causality.

Second, to enhance the robustness of our findings, we performed a sensitivity analysis. Specifically, we checked whether including all control variables would change the results. After comparing the models with and without control variables, we found that the path coefficients differed only marginally (by ≤.06) and both models produced the same testing results, demonstrating that our results were robust to the models with or without control variables.

Notably, survey methods may be questioned for their ability to test causality. Mithas et al. (2022), argue that causality can be viewed from three perspectives and each perspective should consider causality differently. Our study is aligned with the path analytical perspective, which should include alternative modeling, scientific knowledge, and temporal priorities (Bollen & Pearl, 2013; Mithas et al., 2022). Our study included all these elements, supporting that our study fulfilled the method of causal inquiry and "its package of what scholars in that tradition will likely consider reasonable based on the state-of-the-art at the time" (Mithas et al., 2022, p. xiii).

Regarding endogeneity, we employed Bollen's (1996) alternative two-stage least square (2SLS) method. The analytical results of the 2SLS method were consistent with our original testing results. Hence, our testing results are not likely to be affected by endogeneity issues.

6. Discussion

Our study examines an important proposition regarding the influence of knowledge searching and knowledge internalization on players' repeated gameplay. This study examined the impact of knowledge searching and focused immersion on knowledge internalization, learning satisfaction, and goal progress. Such findings indicate that knowledge searching has an important impact on players' learning, while focused immersion helps a bit. Such an explanation sheds light on the effective game design to elevate players' in-game learning and thereby motivate their repeated gameplay. Specifically, games could identify players who struggle to win during gameplay and automatically suggest where to find useful knowledge, e.g., in-game guilds, staffed game managers, or any of the game's official web pages. Such design aspects are important when game designers are considering raising game difficulty to formulate players' focused immersion. Communities exhibit much stronger power than individual players (Huang et al., 2022), either in in-game competition or in knowledge for gaming excellence.

6.1. Theoretical implications

Our study uniquely pointed out the new and important role of knowledge internalization during players' goal pursuit. In the past, we know that goal progress may be facilitated by game-player relationships (Teng, 2017) and players' self-efficacy (Teng et al., 2022b). These imply that players gradually build game-player relationships and cultivate their gameplay self-efficacy. The new driver, i.e., knowledge internalization, could speed up the goal progress, as knowledge internalization can assist players in making the best in-game decisions to effectively push players' goal progress.

Past game research indicated that learning is a topic in serious games (Bachen et al., 2016), while not typical in online games played for entertainment. Our research aims to bridge this divide by including learning and knowledge internalization in online gaming contexts. This initiative should lead to more online game studies to examine the role of learning and knowledge internalization in affecting gameplay experiences or players' community participation.

Our study found that knowledge internalization is as important as learning satisfaction to continued gameplay. This is an important addition to the development of theory and research models. Previously, learning was known to be important to learning outcomes and focused immersion (Alavi et al., 2002; Fu et al., 2009), or game flow (Ermi & Mäyrä, 2005). Specifically, learning satisfaction refers to *how much* users learn, while knowledge internalization refers to *how well* they learn. That is, learning more is important, while learning deeper, thus enabling individuals to quickly retrieve what users learn during real-time reactions is also important for users to make in-game goal progress.

6.2. Managerial implications

In our study, we examined a diverse range of game genres, with MMORPG being the most commonly mentioned by our participants. However, future studies can further refine their focus by concentrating on a specific game genre and delving into its distinctive features. This may provide game providers and game designers with more precise insights.

We recruited participants from a single country, showing the potential value of conducting replication studies in diverse international contexts. Moreover, although our study focused on the context of typical online games, it is noteworthy that our participants evaluated the concept of focused immersion, which is also prevalent in e-learning games (Fu et al., 2009). Accordingly, our findings can be reasonably extrapolated and applied to other related contexts as well.

As team gameplay is a unique design in the gaming world, it would be valuable to investigate how gaming teams can motivate players to actively seek knowledge, leading to the development of knowledge internalization. This research direction also holds great potential for game providers, i.e., facilitating teamwork may foster and enhance players' engagement in repeated gameplay.

Our study also suggested that game providers could offer transmission capabilities and processing capabilities, which could formulate synchronicity (Dennis et al., 2008), task completion (Sarker et al., 2010), or facilitate connectivity (Liao et al., 2023). Both of them are helpful for players to learn in-game knowledge during their gameplay.

Based on our findings, game providers could have a clear direction to develop actionable strategies and build strong connections with their target audience. Specifically, we found both knowledge searching and focused immersion could improve knowledge internalization and learning satisfaction. To attract gamers to search for game knowledge, game providers should ensure the quality of knowledge by contributing game tips in online gaming forums and monitoring the content shared by gamers in those knowledge repositories. Game providers could implement chatbots with humorous interactions to immerse users to invoke their focused immersion.

We found knowledge internalization and learning satisfaction could increase goal progress. To help facilitate knowledge internalization, game tips can be displayed in gaming to help gamers recall, integrate, and apply knowledge to address game tasks. Moreover, game providers could adopt gamification strategies. This includes providing quizzes to test gamers' knowledge and offering leaderboards, which would help gamers experience focused immersion and further promote learner satisfaction.

We further found that learning satisfaction can exert a stronger impact than knowledge internalization in escalating goal progress, thus more effectively encouraging repeated gameplay. Accordingly, we would suggest that game providers focus more on increasing in-game knowledge and offering in-game hints to help players "learn more", rather than designing complex in-game challenges that require or stimulate players to internalize in-game knowledge to have prompt responses, or "learn deeper". This is a novel insight for game providers. Specifically, game providers can use forms of "paratexts" (e.g., game guides and videos), which are known for increasing players' game knowledge (Consalvo, 2017). Moreover, many other design means can be taken, e.g., in-game tutorials, incremental information provided when leveling up each time, small challenges, audio/visual cues, pop-up hints, or links to online game forums (Dalvi, 2021; Francis, 2021; Ghozland, 2007).

We argued that our study met the criteria of causality in survey research methods. However, future studies could adopt experimental designs to confirm causality, as done by Hibbein et al. (2017).

6.3. Future Research Possibilities

The ludic knowledge models indicate that in-game learning may benefit gameplay for a specific game, other games in general, and even outside gameplay (e.g., in daily life) (Howell, 2016). This is an interesting future research direction, which can further our research by examining whether in-game knowledge internalization can better facilitate gameplay in other games, or outside gameplay.

The iterative and contextual view can be useful in human knowledge searching. Future studies could take this view to further examine how players may search for knowledge in an iterative and contextual fashion and its impact on the study findings.

This study adopted a quantitative research design. Future research could consider replicating our study while employing a mixed-methods approach to attain additional corroborative evidence.

7. Conclusions

We find new insights for game providers to design their games, thus effectively keeping their players and strengthening their intention of repeated gameplay. First, it is important to encourage players' knowledge searching, while it is more important to encourage players' knowledge internalization. To say, players do not only desire more in-game knowledge, but also want to quickly apply them to make better in-game decisions, thus creating more positive gameplay experiences.

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