

Learning Social Skills and Accruing Social Capital through Pervasive Gaming

Sampsa Rauti¹, Samuli Laato^{1,2}, and Tarja Pietarinen²

¹ Dept. of Future Technologies
University of Turku, 20014 Turku, Finland
sjprau@utu.fi

² Dept. of Teacher Education
University of Turku, 20014 Turku, Finland

Abstract. There are several implicit benefits to formal school education. One the most important is the learning of social skills i.e. how to behave, interact meaningfully and form social bonds with other people. However, there are multiple situations where the learning of social skills can be disrupted, e.g. bullying or the recent COVID-19 pandemic that forced schools to transition into distance education. In this work, we investigate the potential of pervasive games (PGs) to teach social skills and help acquire social capital. Using the theoretical viewpoints of affordance lens and Pierre Bourdieu's theory of capital, we argue that PGs are able create meaningful activities that not only help learn social skills, but can scaffold social bonding and increase social capital. We identify six social affordances in the PG Pokémon GO and show the game teaches a wide variety of social skills ranging from negotiation and bartering to group interaction. Our findings have implications on designing educational pervasive games that teach social skills and accrue social capital.

Keywords: pervasive games, implicit learning, social capital, social capital theory, social skills.

1 Introduction

Pervasive games (PGs) transform the real world into a playing field [33]. As such, they fundamentally differ from movies and video games, which portray a fictional world, disconnected from the paramount reality, through a screen [22]. Because of the unique characteristics of PGs, they offer several natural opportunities for education that are not present in other types of games [20]. The focus of this study is on the learning of social skills, which PGs have been found to support through common goals and activities [4, 10, 33, 36]. As a novel perspective, we further argue that playing multiplayer PGs can increase players' social capital.

The learning of social skills is crucial for human development, and societies need to focus constant attention on ensuring the youth are learning these skills. Currently, youth in several developed countries have been reported to increasingly suffer from severe social withdrawal [34]. In addition, the recent COVID-19 pandemic has forced schools to shut down and switch to distance learning solutions, impairing students' interaction options with each other [13, 18]. Addressing the current lack of social learning opportunities for the youth and preparing for similar future scenarios is crucial. Third, in the increasingly polarized and ideologically stratified globalized world, understanding others and getting along with people that have widely different opinions is ever important. While previous work have suggested that PGs such as Pokémon GO may help with some of these issues [34], more detailed discussion on the topic is missing. We contribute to this field of research by demonstrating that PGs can be used for two distinct but connected purposes that help with social withdrawal: (1) learning of social skills; and (2) acquiring of social capital. Accordingly, we formulate two research questions:

- **RQ1: What affordances do PGs offer for learning social skills?**
- **RQ2: How can these affordances lead to acquiring social capital?**

The rest of this study is structured as follows. First, we introduce the theoretical lens of the current work. Second, we briefly describe our research process before continuing to analyzing social affordances of our selected case PG. Then, we demonstrate how the identified affordances can be used to acquire social capital. We conclude our work with discussing the limitations of our study and future work.

2 Theoretical lens of the current study

2.1 Affordance lens

Affordances refer to interaction opportunities that a certain object offers. The word was originally introduced by James Gibson in 1977 [11], but was later adapted to the human-computer interaction (HCI) context by Donald Norman [25]. Norman slightly varied Gibson's definition of the term, conceptualizing affordances to concern perceived interaction opportunities, not all interaction opportunities as originally proposed by Gibson. By doing so, Norman tied affordances to the individual characteristics of the human actor [25] and this conceptualization has been widely adopted to use in HCI research. In this work we focus on affordances as defined by Donald Norman.

Affordances can be divided further into sub-categories, one of which is social affordances. Uyanik et al. define social affordances as "affordances whose existence requires the presence of humans" [35]. Bringing this to the context of PGs, social affordances can be conceptualized to be game mechanics which require other players to work. For example, player vs player battles (PVP) or cooperative game mechanics fit this criteria. By definition, the social affordances can, however, be more than just game mechanics [25]. Most importantly, as PGs are played in the real world, the games facilitate face-to-face interaction and encounters with people who are not playing [10]. As such, almost any task in PGs, which takes players to areas where there are other

people, can be conceptualized to have the social affordance of facilitating encountering other people.

2.2 Bourdieu's theory of capital

Social affordances can be seen as tools to gather capital. In his book *The Forms of Capital* [6], Pierre Bourdieu distinguishes between social capital, economic capital, and cultural capital. According to Bourdieu, the notion of capital refers to sums of specific assets that have been put to productive use. Seen from Bourdieu's point of view, learning social skills and making use of social affordances is a deliberate construction of sociability in order to accrue social capital. While Putnam and other authors [28,24] often stress social networks and connections among individuals, we adopt Bourdieu's approach that emphasizes more individualistic view of social capital. In our view, this reflects individual player's natural desire to gather achievements in pervasive games, compete with other players and gain respect from their peers.

In this study, we argue that several social affordances in PGs directly affect the player's social capital, and players actively (subconsciously or not) seek to increase their capital by making use of these affordances related to both game mechanics and voluntary social interaction between players.

3 Previous work on the social affordances of pervasive games

Recent scholarly work on the social features of PGs has been profiled mainly by research on two global-scale location-based games: Ingress [33] and Pokémon GO [16]. An intervention study by Ruiz-Ariza et al. [31] on Pokémon GO showed players to have better social relationships than non-players. Furthermore, players preferred to play in social groups when given the choice. Another recent study on Ingress and Pokémon GO found players to form social in-groups that are impacted by their team choice [16]. Pokémon GO can facilitate group formation processes also in the short run through game mechanics such as raids [4]. Ewell et al [10] demonstrated how playing the Pokémon GO was associated with increased vitality and life satisfaction. Most importantly, playing increased interaction and conversation with both friends and strangers [10]. Based on Kim et al., the positive impact of PGs on social interaction and community belonging may be amplified by the feeling of presence while playing [15].

Another interesting aspect about PGs such as Ingress and Pokémon GO is that they give players the opportunity to practice contributing to society in the form of crowdsourcing. PGs have been used for crowdsourcing, for example, in the following ways: (1) the collection and validation of land cover data [2]; (2) photographing urban architecture [26]; (3) detecting open parking slots and informing other people about them [23]; and (4) the developing a database of virtual points of interest (PoIs) which correspond to real world objects [19].

Ingress player communities have been shown to be altruistic towards perceived in-group members [30] and foster negative feelings towards perceived outgroup members

[16]. The stratification into social subgroups is caused by an artificial divide of players into static teams [16]. Ingress players can get together for small events such as item farms or for large operations that require planning in advance such as creating big fields [33]. Ingress teams (factions) have been shown to also collaborate with one another, for example, in creating field art or meeting up at large events called anomalies [33]. Because of the ingroup and outgroup setup that Ingress provides, members of the same faction are more likely to form social bonds with one another [19]. This demonstrates how PGs may increase social interaction by implementing a competitive setup and challenges which require cooperation to complete [4, 30].

In addition to social skills, PGs can naturally support the learning of other skills as well. For example, PGs which feature a real world map based navigational interface can naturally teach cartography, navigation and geography [8,20]. If the game further features virtual PoIs that are connected to real world objects, the game can direct players to learn about these objects [19, 17]. With regards to exercise, the games have been shown to foster mild exercise in the form of walking from place to another to complete in-game tasks [1]. Overall, PGs hold the potential to naturally facilitate social interaction, exercise and the learning of cartography [20] and can have holistic positive effects on players' social connectedness, quantity of social interaction and well-being [10, 15, 36]. However, the specific affordances, game mechanics and related processes through which these are achieved require further investigation.

4 Methodology

Methodologically our study follows ethnographic research [12]. As participant observation research, ethnography relies on researchers actively following, and sometimes also participating in, the observed activities [12]. This enables researchers to obtain an inside view into the observable phenomenon in a real world environment - an advantage over laboratory environment experiments, where participants' actions are influenced by their knowledge of them being tested. On the other hand, ethnography has been criticized for lacking rigor and being susceptible to bias [21]. This may be countered to a degree by supplementing the research with interviews, surveys and other methods [14]. Nonetheless, ethnography remains one of the best methods for studies requiring participant observation research, specifically because it allows longitudinal observations in a real world environment. Prasad confirms that ethnography may be harnessed to study information technologies and their users as well [27]. Accordingly, ethnography is a suitable method for the current study [27].

Among available PGs such as Orna, Ingress and Pokémon GO [36], we focus in particular on Pokémon GO and its players, due to the game's popularity both among players and among researchers. The social aspects of the game have already been studied (e.g. [4, 36, 16]), and this body of research can be used to support ethnographic findings.

The authors of this work cumulatively participated in over 1500 social raids, have all played Pokémon GO since launch in July 2016 and have reached the max level (40)

in the game. In addition, the authors actively participated in social activities and discussions about the game with players. From this standpoint, we focus on evaluating how the game can enable players to (1) learn social skills; and (2) accrue social capital. We analyze our observations of in-game interaction opportunities from the perspective of the social capital theory [6] with supplementary reasoning derived from the affordance theory [25].

5 Ethnographic findings

5.1 Social play in Pokémon GO

Our initial focus was on all multiplayer game mechanics in Pokémon GO, as they fit the criteria of what can be considered a social affordance [35]. These mechanics include trades, sending gifts, raids and battles, as they all enable players to directly interact in the game world with other trainers. In addition, there are indirect ways to interact such as through observing other players in gyms or lures they have placed - these can even be used to follow or stalk other players [29]. In trades, players exchange pokémon. The more connections (i.e. friends) players have, the more possibilities they have for obtaining rare pokémon and regional species through trading. In raid battles [4], the most powerful Pokémon (such as the legendary or mythical ones) are impossible to defeat individually, nudging players to cooperate with each other. Battles are about a combat and a competition between the pokémon trainers, and about showing the quality of each trainer's collection of pokémon. These social features have led to the creation of special social groups among those players, who are connecting with other players in order to gain knowledge as well as practical benefits in-game. Unofficial battle league competitions have been arranged around the globe. After the introduction of the PVP battle league, trading has also been increasingly connected to battling, as pokémon can be traded with other players to strengthen the battling team. In early 2020, some new pokémon were added as a battle rewards to the PVP league, making trading and battling elements even more intertwined than before. These kinds of connected motivations where players benefit from social interaction at multiple levels are commonplace in Pokémon GO. In addition to the discussed game mechanics, there are "external" social elements related to and supported by Pokémon GO. One such example are community events where players get together to play the game and participate in discussion about it. GO Fest is a series of annual events around the globe, when players are gathered in a specific real world location to play together with other trainers. The events give participating players rare pokémon and memorable moments. In 2020, the global pandemic turned these events as one global virtual GO Fest that is available for all players around the globe at their home.

Since its launch in 2016, Pokémon GO has shifted, at least partially, from a child or family oriented game towards a more serious and organized constitution of adult players and player communities. Pokémon GO have gathered players together in many social channels such as Facebook, Twitter and Instagram, and there are countless groups related to local as well as global communities in various communication channels e.g.

Discord, Telegram and WhatsApp [16]. These communities serve as information exchange channels related to issues concerning Pokémon GO, uniting players of all ages and social backgrounds. As Pokémon GO draws heavily on the main Pokémon franchise [9], it is already familiar and hence approachable for many. This easiness might be one of the reasons why the game has become so popular, along with the pervasive game elements. Thus, Pokémon GO connects in its social affordances to a wider franchise context [9] as well as past experiences of players.

5.2 Social play in Ingress

Compared to Pokémon GO, Ingress had at the time of the study significantly less active players. The game differs from Pokémon GO in many ways even though the two share several similarities [16, 32]. Ingress has its own unique backstory and lore which connects the game world to the real world. The features that encourage interaction and social bonds between players can be summarized as: (1) resource gathering (i.e. farming) and item exchange; (2) operations aimed at building large control fields over a certain area in order to gain multiple Mind Units (MU) either local or more global; (3) controlling territory and (4) social events, First Saturdays, Anomalies and Mission Days. Resource gathering and territory control can be regarded as the most basic in-game goals, and while these can be done alone, it is much more efficient to do so in a group. A group of players can upgrade portals (i.e. PoIs) to yield better resources. Thus, unity and cooperation benefit all members of the same faction. Resource exchange assists in combat against agents in the opposite faction. Operations for building large control fields gathers players together. Defending against these big operations can be organized and shared as well.

In addition to the main game, Ingress includes decoding challenges, solving of which requires cooperation and intense knowledge of the game. Due to the COVID-19 pandemic, the global decoding challenge "Tessellation" of 2020 turned into a virtual decoding challenge, uniting players virtually through the internet. Due to the special composition of Ingress, the game attracts a different set of players than Pokémon GO. Based on our observations, several of the players interested in Ingress lore and participating in Anomalies and the decoding challenges are also interested in things such as science fiction and information science. Unsurprisingly, there is a proportion of Ingress players who never take part in these external game-related activities.

5.3 Categorizing the social affordances in PGs

As Bhattacharya et al., demonstrate, the social affordances in PGs are complex and facilitate not only the primary social activity, but also related activities [4]. We found that Pokémon GO, and by extrapolation other PGs, can nudge people towards social interaction, enabling interaction also outside the game context. One useful way to think about these affordances is to place them on the axis of synchronous versus asynchronous. Synchronous affordances are such as trading or raiding where people need to be in the same place at the same time, while asynchronous affordances are those where players have temporal freedom i.e. they interact but not necessarily at the same time

(e.g. online chats). Furthermore, it is useful to separate between location-based and non-location-based (dimensional freedom) social affordances. For example, GO Battle League and online group chats can be accessed regardless of location, but most other types of gameplay require being in a specific physical location. Using this kind of a categorization, the social affordances of Pokémon GO are sorted and displayed in Figure 1.

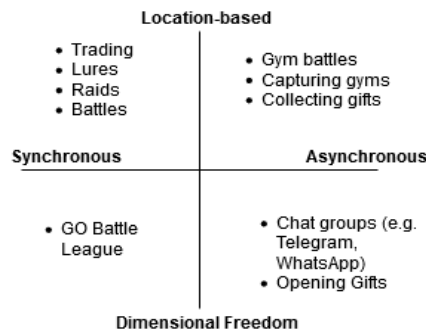


Fig. 1. Displaying the social affordances of Pokémon GO

The main difference between the social affordances of Ingress and Pokémon GO is that Pokémon GO contains a higher number of synchronous location-based social affordances. Yet, this does not mean that the magnitude of social interaction facilitated by the game would automatically be greater. Below we list seven social affordances of Pokémon GO, and next we discuss how each of these can be used to accrue social capital.

1. Trading (synchronous, location-based)
2. Raids (synchronous, location-based)
3. Encounters with people (synchronous, location-based)
4. Lures (synchronous, location-based)
5. Sharing achievements (asynchronous, dimensional freedom)
6. Teamwork/planning (asynchronous, dimensional freedom)
7. Crowdsourcing/contributing to society (asynchronous, location-based)

6 Learning Social Skills and Accruing Social Capital by Pervasive Gaming

In this section, we go through the social affordances identified in the previous section using the theoretical lens of Bourdieu [7]. We look at how these affordances can be used for two purposes: (1) the learning of social skills; and (2) accruing social capital.

Trading. Introduced with link cables already in 1996, trading pokémon is an important part of the Pokémon franchise [3]. In Pokémon GO, trading pokémon often happens face-to-face and improves barter and negotiation skills as players try to reach

an agreement on a reasonable trade. Players may also gain respect and increase their social capital by distributing rare pokémon to others through trades.

Raiding. In raids, where trainers team up to fight a powerful raid boss, players learn group formation and social skills [4]. Raids are generally a good place to get to know other players. Helping other to take down tough raid bosses and giving advice on the vulnerabilities of the raid boss increases the player's social capital.

Lures. Lures benefit all players by attracting pokémon and often help players to find and meet each other, increasing communication between players. Setting up lures helps players gain respect, as these items cost money in the in-game shop. This also shows how economic capital can be transformed into social capital with the help of social affordances in the game.

Random encounters. Random encounters with other trainers also regularly lead to social interaction and verbal communication between the players, as they may exchange information about the game and achievements or engage in in-game activities together. For example, giving tips about location of rare pokémon or sharing experiences in general can boost player's social capital.



Fig. 2. A screenshot of an exemplar Pokémon GO achievement which players share to chat groups.

Sharing achievements. Especially high achieving players often share screen captures of their achievements to local chat groups. For example, Figure 2 shows a screenshot from a player who has managed to complete 1337 raids. This image was received in the chat and several other players congratulated the player and acknowledged his

achievement. Pokémon GO also shares many achievements between the players automatically, which prompts comparison between players and also explicitly makes part of the accrued social capital visible to everyone.

Teamwork. The three teams (Mystic, Valor and Instinct) present in Pokémon GO encourage the players to engage in teamwork. This also prompts the players in the same team to build groups, plan actions together and work for a common goal. By working for the group and making sacrifices for the team, recognition and social capital is gained.

Crowdsourcing. Ingress and Pokémon GO offer players the opportunity to contribute to their games by submitting and reviewing portals. Players may accrue social capital by creating new in-game PoIs for other players to enjoy.

Additional examples. Above, gaining social capital has in many cases been depicted through altruistic acts. It is worth noting, however, that Bourdieu often presented social capital in negative light, explaining how it expedites segregation and formation of different classes in society [5]. In the same manner, high achieving players with social capital can create groups that exclude and dominate other players. Consequently, some players may be prevented from accruing social capital and learning social skills effectively. Still, as we have seen, game mechanics encourage teamwork and social interaction with anyone.

Finally, the identified social affordances in Pokémon GO and the skills they scaffold are summarized in Table 1.

Table 1. Social affordances in Pokémon GO and what skills they scaffold.

Social affordance	What does it teach	How to gain social capital
Trading	Barter, negotiating, arguing	Distribute rare pokémon to others
Raids	Group formation, group interaction	Help others take down the raid boss
Encounters	Verbal communication	Share rare spawns and experiences
Lures	Verbal communication	Set up lures
Achievements	Acknowledging others	Share achievements
Teamwork	Group interaction	Work and make sacrifices for the team

7 Conclusions

7.1 Limitations

We used two theoretical approaches, the affordance lens and Bourdieu's theory of capital to understand how PGs can scaffold the learning of social skills and boost social capital of their players. As the work was theoretical, empirical verification will be needed to confirm our conceptualization. However, there are also limitations that need to be taken into account in our analysis. First, the social affordances of PGs were not

searched for systematically, but instead, were obtained through a combination of observing extant academic literature and ethnography. Second, we did not estimate the magnitude or outcomes of the affordances, merely their potential for teaching interaction skills and accruing social capital.

7.2 Alternative Viewpoints and Comparison to Previous Work

Our findings slightly deviate from previous work. Vella et al. [36], identified three main social outcomes of playing Pokémon GO: (1) strengthening ties; (2) being an icebreaker in social conversations; and (3) sense of belonging. They showed shared passion, integration of the game to the real world and outdoor playing to lead to social connectedness [36]. Our findings support this analysis, but provide additional evidence of how PGs can be used to connect with other players and accrue social capital. Bhattacharya et al. [4], focused on an individual group-based game mechanic raiding, and used the theory of small groups as complex systems to understand how group formation processes in Pokémon GO operate. Our study adds to this literature by conceptualizing accruing social capital as a motivation for players to socialize and engage with cooperative features. Social capital helps to explain both behavior of players and its ramifications when it comes to social affordances.

7.3 Future Work and Outlook

Bourdieu's theory of capital introduces two forms of capital which we did not look at in this study: (1) economical; and (2) cultural. As both are relevant for PGs, future work can expand by analyzing the role of these in pervasive gaming. Our argument that PGs are used not only for learning social skills, but for accruing social capital, has broad implications for the social nature of games and learning. Instead of focusing solely on the teaching of skills, educational institutes could bring more attention to social capital and other forms of non-tangible assets that go beyond learning and cognition. We posit that PGs show enormous potential for uniting people for meaningful interaction and they deserve the attention of both scientists and practitioners.

References

1. Althoff, T., White, R.W., Horvitz, E.: Influence of pokémon go on physical activity: study and implications. *Journal of medical Internet research* 18(12), e315 (2016).
2. Baer, M.F., Wartmann, F.M., Purves, R.S.: Starborn: Towards making in-situ land cover data generation fun with a location-based game. *Transactions in GIS* 23(5), 1008–1028 (2019).
3. Bainbridge, J.: 'it is a pokémon world': The pokémon franchise and the environment. *International Journal of Cultural Studies* 17(4), 399–414 (2014).
4. Bhattacharya, A., Windleharth, T.W., Ishii, R.A., Acevedo, I.M., Aragon, C.R., Kientz, J.A., Yip, J.C., Lee, J.H.: Group interactions in location-based gaming: A case study of raiding in pokémon go. In: *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. pp. 1–12 (2019).

5. Bourdieu, P.: *Distinction: A social critique of the judgement of taste*. Harvard university press (1984).
6. Bourdieu, P.: The forms of capital. In: *Handbook of Theory and Research for the Sociology of Education*. pp. 241–258. Greenwood Press (1986).
7. Bourdieu, P., Wacquant, L.: *An Invitation to Reflexive Sociology*. University of Chicago Press (1992).
8. Carbonell Carrera, C., Saorín, J.L., Hess Medler, S.: Pokémon go and improvement in spatial orientation skills. *Journal of Geography* 117(6), 245–253 (2018).
9. Elza, C.: We all live in a pokémon world: animated utopia for kids. *The Japanification of Children's Popular Culture: From Godzilla to Miyazaki*, edited by MarkWest. The Scarecrow Press, Inc (2009).
10. Ewell, P.J., Quist, M.C., Øverup, C.S., Watkins, H., Guadagno, R.E.: Catching more than pocket monsters: Pokémon go's social and psychological effects on play-ers. *The Journal of Social Psychology* 160(2), 131–136 (2020).
11. Gibson, J.J.: *The theory of affordances*. Hilldale, USA 1(2) (1977).
12. Hammersley, M.: *Ethnography*. The Blackwell encyclopedia of sociology (2007).
13. Islam, A.N., Laato, S., Talukder, S., Sutinen, E.: Misinformation sharing and social media fatigue during covid-19: An affordance and cognitive load perspective. *Technological Forecasting and Social Change* 159, 120201 (2020).
14. Jackson, P.: *Urban ethnography*. *Progress in Human Geography* 9(2), 157–176 (1985).
15. Kim, J., Merrill Jr, K., Song, H.: Probing with pokémon: Feeling of presence and sense of community belonging. *The Social Science Journal* 57(1), 72–84 (2020)
16. Laato, S., Inaba, N., Paloheimo, M.: The effect of team choice in Ingress and Pokémon go for players' social circles and attitudes towards game slang. In: *Proceedings of the 53rd Hawaii International Conference on System Sciences* (2020).
17. Laato, S., Laato, A.: Augmented reality to enhance visitors' experience at archaeological sites. In: *World Conference on Information Systems and Technologies*. pp. 349–358. Springer (2020).
18. Laato, S., Laine, T.H., Islam, A.: Location-based games and the covid-19 pandemic: An analysis of responses from game developers and players. *Multimodal Technologies and Interaction* 4(2), 29 (2020).
19. Laato, S., Pietarinen, T., Rauti, S., Laine, T.H.: Analysis of the quality of points of interest in the most popular location-based games. In: *Proceedings of the 20th International Conference on Computer Systems and Technologies*. pp. 153–160. ACM (2019).
20. Laato, S., Pietarinen, T., Rauti, S., Paloheimo, M., Inaba, N., Sutinen, E.: A review of location-based games: Do they all support exercise, social interaction and cartographical training? In: *Proceedings of the 11th International Conference on Computer Supported Education - Volume 1: CSEDU*, pp. 616–627. INSTICC, SciTePress (2019). <https://doi.org/10.5220/0007801206160627>
21. LeCompte, M.D.: Bias in the biography: Bias and subjectivity in ethnographic research. *Anthropology & Education Quarterly* 18(1), 43–52 (1987).
22. Liberati, N.: Phenomenology, pokémon go, and other augmented reality games. *Human studies* 41(2), 211–232 (2018).
23. Morschheuser, B., Hamari, J., Maedche, A.: Cooperation or competition - when do people contribute more? A field experiment on gamification of crowdsourcing. *International Journal of Human-Computer Studies* 127, 7–24 (2019).
24. Narayan, D., Cassidy, M.F.: A dimensional approach to measuring social capital: Development and validation of a social capital inventory. *Current Sociology* 49(2), 59–102 (2001).
25. Norman, D.A.: *The psychology of everyday things*. Basic books (1988).

26. Prandi, C., Rocchetti, M., Salomoni, P., Nisi, V., Nunes, N.J.: Fighting exclusion: a multimedia mobile app with zombies and maps as a medium for civic engagement and design. *Multimedia Tools and Applications* 76(4), 4951–4979 (2017).
27. Prasad, P.: Systems of meaning: Ethnography as a methodology for the study of information technologies. In: *Information systems and qualitative research*, pp.101–118. Springer (1997).
28. Putnam, R.D.: *Bowling alone: The collapse and revival of American community*. Simon and schuster (2000).
29. Rauti, S., Laato, S.: Location-based games as interfaces for collecting user data. In: *World Conference on Information Systems and Technologies*. pp. 631–642. Springer (2020).
30. Riar, M., Morschheuser, B., Hamari, J., Zarnekow, R.: How game features give rise to altruism and collective action? Implications for cultivating cooperation by gamification. In: *Proceedings of the 53rd Hawaii International Conference on System Sciences* (2020).
31. Ruiz-Ariza, A., Casuso, R.A., Suarez-Manzano, S., Martinez-Lopez, E.J.: Effect of augmented reality game pokémon go on cognitive performance and emotional intelligence in adolescent young. *Computers & Education* 116, 49–63 (2018).
32. Söbke, H., Hauge, J.B., Stefan, I.A.: Long-term engagement in mobile location-based augmented reality games. In: *Augmented Reality Games I*, pp. 129–147. Springer (2019).
33. Söbke, H., Hauge, J.B., Stefan, I.A.: Prime example ingress reframing the pervasive game design framework (pgdf). *International Journal of Serious Games* 4(2) (2017).
34. Tateno, M., Skokauskas, N., Kato, T.A., Teo, A.R., Guerrero, A.P.: New game software (pokémon go) may help youth with severe social withdrawal, hikikomori. *Psychiatry research* 246, 848 (2016).
35. Uyanik, K.F., Calskan, Y., Bozcuoglu, A.K., Yuruten, O., Kalkan, S., Sahin, E.: Learning social affordances and using them for planning. In: *Proceedings of the Annual Meeting of the Cognitive Science Society*. vol. 35 (2013).
36. Vella, K., Johnson, D., Cheng, V.W.S., Davenport, T., Mitchell, J., Klarkowski, M., Phillips, C.: A sense of belonging: Pokémon go and social connectedness. *Games and Culture* 14(6), 583–603 (2019).