Vladimir Geroimenko *Editor*

Augmented Reality Games I

Understanding the Pokémon GO Phenomenon

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This pioneering two-volume research monograph is dedicated to future generations of augmented reality game designers and players.

With sincere gratitude to the British University in Egypt (BUE), an excellent place to work, teach and write books.

Preface

This book is unique in two main respects: it is the first-ever research monograph on the subject of augmented reality (AR) games, and also it has been published in two separate and rather substantial volumes. In Volume I, the phenomenon of the Pokémon GO game is analysed in theoretical, cultural and conceptual contexts, with emphasis on its nature and the educational use of the game. Volume II explores the most important and challenging issues that have been raised by the use of the augmented reality approach and technology in the gamification of education, health care, medicine and art.

The two-part monograph has been written by a team of 70 leading researchers, practitioners and artists distinguished by their specialist expertise, significant publications and ongoing projects. The books' co-authors are from 20 countries all around the world: Australia, Belgium, Brazil, Denmark, Egypt, Finland, Germany, Hungary, Italy, Malaysia, The Netherlands, Romania, Slovenia, South Korea, Spain, Sweden, Switzerland, UAE, UK and USA.

The two comprehensive volumes provide a thorough and multifaceted research into the emerging field of augmented reality games and consider a wide range of its major issues: the concept and nature of augmented reality games, the lessons learned from the rise of Pokémon GO, and the practical use of this novel type of games in education, health care, medicine, art and related fields. This is why these two books can be essential reading not only for researchers, practitioners, game developers and artists, but also for graduate and undergraduate students, and all those interested in the rapidly developing area of AR games.

It was difficult to make this two-volume book happen, because research on augmented reality games is still in its infancy, and there are therefore relatively few 'publishable' materials available. We owe a debt to our contributors who have managed to produce this two-part monograph in the face of these difficulties.

These two books can also be considered as part of a trilogy, a series of three pioneering monographs published by Springer on the same subject of augmented reality and with the same book editor:

- Augmented Reality Art: From an Emerging Technology to a Novel Creative Medium. Geroimenko, V. (Ed.), 1st Edition: Springer, 2014—314 p; 2nd Edition, Revised and Updated, Springer, 2018—384 p.
- Augmented Reality Games I: Understanding the Phenomenon of Pokémon GO. Geroimenko, V. (Ed.), Springer, 2019.
- Augmented Reality Games II: The Gamification of Education, Medicine and Art. Geroimenko, V. (Ed.), Springer, 2019.

The content of Volume I is arranged as follows. You can read chapters in sequence or randomly.

Chapter 1 "Waiting for the Augmented Reality 'Killer App': Pokémon GO 2016" enquires why, despite the commercial success of Pokémon GO, a large popular audience for augmented reality experiences has not yet gathered. Drawing a comparison to the quick and massive popularity of cinema at the turn of the last century, the author considers what audiences desire from this ever-emerging medium. To delve into this question, the chapter redraws definitions of the augmented reality medium and reflects on its unique potentialities. The central question of the chapter is an analogy: if, in 1903, *The Great Train Robbery* established the cinematic montage form and inspired the creation of massive cinema audiences and venues, what could be *The Great Train Robbery* of AR?

Chapter 2 "Characteristics of Game Transfer Phenomena in Location-Based Augmented Reality Games" explores sensory perceptions, cognitive mix-ups and slips of actions associated with augmented reality technologies, such as in location-based AR games. The research on Game Transfer Phenomena (GTP) has demonstrated that playing video games in AR and non-AR can induce sensory perceptions, manifested as seeing images overlaying physical objects (e.g. seeing power bars above people's heads or maps in the corner of the eye), hearing sounds coming from game-related objects, and perceiving physical objects as distorted or having misperceptions (e.g. confusing birds with aeroplanes), as well as cognitive mix-ups and slips of actions when confusing virtual content with real objects. The aim of this chapter is twofold. The first is to provide an overview of the GTP research conducted on location-based AR games. The second is to highlight the peculiarities of GTP in AR games. While a broad variety of the GTP reported in non-AR games has also been found in location-based AR games, the key characteristic of these games is that the gameplay occurs through interactions in the physical context. The physical context is part of the game by means of (i) the overlaying of game images on the physical context and (ii) the game being played through interactions in the physical context. The key peculiarities of GTP in these games are (i) the temporal manifestation of GTP while/after playing, (ii) the two-way transfer of effects from the virtual to the physical and vice versa, (iii) the increased chances of the occurrence of certain forms of GTP (e.g. the urge to do something related to the game, misperceptions of physical stimuli, tactile sensations) and (iv) the GTP triggered by the outputs from a multipurpose device.

Chapter 3 "The Concept of the Magic Circle and the Pokémon GO Phenomenon" begins with a statement that when Johan Huizinga in 1938 published *Homo Ludens,* he had no idea the book would father a future research field: *ludology* or game studies. In that respect, inspirations from Huizinga run deep in game studies and many researchers have since tackled questions like: What is play? What is a game? And perhaps most notoriously how should we understand Huizinga's description of 'the magic circle'. This chapter revisits Huizinga's thinking on play, games and his concept of the magic circle. Subsequently, it investigates how the magic circle performs in relation to 'traditional' computer games, how it is challenged by 'meta-referential' games and is expanded by augmented reality games, such as Pokémon GO. The authors present three understandings of the magic circle: (1) expression of a specific physical place, (2) metaphor for player experience and finally (3) as a mix between the two. They regard and equate the magic in the magic circle with play. Juxtaposing magic as play and the magic circle as relating to physical space, player experience and its mixed combinations to Pokémon GO result in a multilayered expansion consisting of player experiences, social interactions with other players in a playing field that is close to engulf the entire planet.

Chapter 4 "Mediation Theory Between Pokémon GO and the Everyday World" aims to study the effects of augmented reality on the everyday world. Many studies already highlight the relations between digital and real by showing how digital objects affect our perception of the everyday world. However, they focus on these effects as if there was an everyday world from which to start and to which add these digital objects. The chapter focuses on a different perspective by showing how the meaning given to the everyday world is already founded on the use of these technologies. The values we find in our everyday experience emerge from the possible interactions with new technologies. The use of Pokémon GO then does not merely shape our everyday world by providing new digital elements in it, but it also reshapes the way we live and the way we think of our lives in the everyday world even when we do not use that technology.

Chapter 5 "Augmented Reality, Games and Art: Immersion and Flow" assumes that all forms of augmented reality—including games—have common features. According to the authors, the two most important are immersion and flow. The phenomenon of AR is closely related to technology: the optics, sensors and HD displays are requirements. With the use of applications, digital information can be projected on the real world, while it becomes interactive. Most of AR games are smartphone related. In 2018, smartphones are ubiquitous devices. Their developers' attention is focused on usability and experience—the goal is to make it as intuitive as possible and not to block the immersion of users into the games. Without the right speed or resolution, games simply do not work, but flow gives the necessary edge. The chapter is built on the theory of Mihály Csíkszentmihályi, who, in his discourse on flow, draws attention to the peak experience that occurs when an individual is deeply involved in an activity. This perfect instantaneous real momentum is the flow that is the unity of joy and creativity, something the most popular AR games provide.

Chapter 6 "Motives for Playing Pokémon GO and Their Associations with Problematic and Health Behaviors" provides an overview of empirical studies that aimed to explore a wide range of motives that drive players to use and reuse the Pokémon GO game. Overall, 14 studies have been identified, and 8 main motives were classified based upon them: social, physical/outdoor activity, nostalgia, fun/enjoyment, competition/achievement, exploration/curiosity, boredom and trendiness. In addition, players were motivated to collect all Pokémon species, experience the advantages of AR games and escape from reality. The associations of these motives with adaptive and maladaptive behaviours are also discussed in the chapter, alongside the possibilities for future research.

Chapter 7 "Player Experiences in Location-Based Games: Memorable Moments with Pokémon GO" presents a qualitative survey study (n = 2611) focusing on the Pokémon GO players' memorable experiences from the time when the game's popularity was at its peak and the experiences were fresh in players' minds. The authors analysed the open-ended written responses with thematic analysis, resulting in seven categories with a total of 82 thematic codes. The categories they constructed were 'Game Play & Game Content', 'People & Sociability', 'Location', 'Circumstances & Context', 'Negative Events', 'Feelings' and 'Other Codes'. Through their analysis and findings, the authors provide insights to understand Pokémon GO as a unique social phenomenon as well as a location-based augmented reality game more broadly. In addition to shedding more light on the Pokémon GO experiences and considering the potential for location-based games to engage players within the physical and social context around them, the findings capture what players found most memorable about the massive phenomenon at its peak.

Chapter 8 "I Play, You Play and We Play Together: Social Interaction Through the Use of Pokémon GO" has an objective to observe substantial changes of users, regarding how the social interaction through the use of a mobile game can modify people's lifestyle. The methodology was developed with a qualitative analysis involving a sample with players who were invited to complete an online questionnaire to answer specific questions about lifestyle, healthy choices and social outcomes from the interaction and use of Pokémon GO. The study involved 125 players (84 male and 41 female) in the city of Pelotas (South of Brazil) that have played the game for at least six months. It was possible to observe how users were meeting new people to socialize and making groups to walk or run together, getting an extra motivation.

Chapter 9 "Long-Term Engagement in Mobile Location-Based Augmented Reality Games" identifies the game mechanics of Pokémon GO that lead to the high level of player engagement. The data collection is done with the help of a survey (N = 50). The results are refined by a comparison with the results of a similarly structured study on *Ingress* (N = 131). Both surveys have for the most part gathered players who have been playing regularly since the release of the games. The results of the study are summarized in a set of hypotheses and recommendations for the design of mobile location-based AR games. These findings intend to contribute to an effective design of serious mobile location-based AR games.

Chapter 10 "Health Implications of Augmented Reality Games on Children and Adolescents" explores the relationship between augmented reality games and the health of child and adolescent gamers. Focusing on Pokémon GO, the chapter highlights potential positive youth outcomes of these games in areas such as psychosocial development, physical fitness and experiences during hospital stays, while addressing some of the possible negative consequences and risks to their usage on the mental and behavioural health and safety of players. It further addresses augmented reality's potential and current impact in relevant areas such as education and the medical field. The chapter concludes with a discussion of the responsibilities and roles of parents, clinicians, businesses and regulatory organizations as augmented reality games become increasingly popular.

Chapter 11 "Playing Pokémon GO in a Public Park in Malaysia: A Survey and Analysis" aims to argue the implications of the Pokémon GO phenomenon with regard to the existing physical activities in a public park, namely Taman Perbandaran Tengku Anis (TPTA), Kota Bharu, Kelantan, Malaysia. Site survey and observation have been conducted to measure the frequency of visitors and the use of the facilities provided. The survey demonstrated that there are 38 general activities implemented in this park and observation has shown that the augmented reality game Pokémon GO has merged to become part of the activities in this park where the 'PokéStop' and 'Gym' game elements have been involved in this site. The observation was conducted for a period of one week following the launch day of the game. The game phenomenon drastically increased the number of visitors attracted to the park, although after several months it returned to normal. Several issues related to the local authority and religion also contributed to decreasing numbers of players.

Chapter 12 "A Theoretical-Practical Framework for the Educational Uses of Pokémon GO in Children and Adolescents" states that Pokémon GO has managed to convert the environment that surrounds us into a space used by a video game, thanks to its combination of physical activity and augmented reality. But what does Pokémon GO involve within the educational system? In this chapter, the authors address its impact on those players that were within the educational framework, as well as some practical proposals for its adaptation and use as a didactical tool.

Chapter 13 "Pokémon GO Between Incidental Learning and Frame Analysis: It's the End of the World as We Know It" proposes a reading of Pokémon GO in terms of learning potentiality, trying to describe how learning can occur via the game and which methodological approach fits it better. After a brief literature review about unexpected benefits of the game, especially in terms of health, Schutz's idea of finite provinces of meaning is explored in order to understand how different layers of reality interact in an augmented reality-based game. This background analysis opens the way for investigating the process of restructuration that cognitive frames can undergo when players, for example, go to a PokéStop or to a Gym. Since these moments of knowledge creation are unpredictable, the incidental learning methodological approach is taken into consideration, along with transformative and ubiquitous learning.

Chapter 14 "Augmented Education: Location-Based Games for Real-World Teaching and Learning Sessions" describes and discusses how PokéStop statues in the Pokémon GO game can be used in primary schools' outdoor sessions. A case study was conducted on how fifth-grade students learned about local history, social sciences and humanities during game sessions. Findings suggest that AR could be an inspiring aspect in educational settings if activities are aligned to the surroundings and learning objectives and outdoor gaming activities are followed up in more traditional classroom sessions.

Chapter 15 "Get Gamified: Promoting Augmented Reality and Digital Game Technology in Education" emphasizes that most educators agree it is important to remain current with trends and continue to add fresh, innovative ideas to enhance lessons. This responsibility means that as professionals, educators must continue to seek ways to better understand students so that their unique twenty-first century needs can be met. Children and youth are introduced to the virtual world from a young age, which implies the manners in how they associate with technology innovation may impact the ways in which they learn, and therefore, the production or output of knowledge. For this reason, technology innovation should be a key component in curriculum design. This chapter highlights two main concepts of gaming technology innovation: augmented reality (AR) and digital game technology (DGT). Understanding such phenomenon is necessary to meet student learners where they are. Special attention is given to AR in the field of health and physical education, as this is one discipline where field professionals often disagree on the appropriateness of the use of digital technology. All professional educators, however, must recognize the important role technology plays in the lives of students and seek ways to motivate them while 'talking their talk'.

Lastly, we hope that the reader will not judge the books' editor and co-authors too harshly. We have accepted the challenge of being the first, and we have done our best to bring out this pioneering work on augmented reality games. Just go ahead and read one or both of the volumes. We hope sincerely that you will enjoy it.

Cairo, Egypt Vladimir Geroimenko

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Part I
The Pokémon GO Phenomenon in Theoretical, Cultural and Conceptual Contexts

Chapter 1
Waiting for the Augmented Reality 'Killer App': Pokémon GO 2016

Geoffrey Alan Rhodes

Abstract In this chapter, the author asks why, despite the commercial success of Pokémon GO, a large popular audience for augmented reality experiences has not yet gathered. Drawing a comparison to the quick and massive popularity of cinema at the turn of the century, the author asks, what do audiences desire from this ever-emerging medium? In response, the chapter re-draws definitions of the augmented reality medium and reflects on its unique potentialities. The central question of the chapter is an analogy: if, in 1903, *The Great Train Robbery* established the cinematic montage form and inspired the creation of massive cinema audiences and venues, what could be *The Great Train Robbery* of AR?

1.1 Introduction

> If one considers the dangerous tensions which technology and its consequences have engendered in the masses at large—tendencies which at critical stages take on a psychotic character—one also has to recognize that this same technologization has created the possibility of psychic immunization against such mass psychoses.
>
> — Walter Benjamin

The Augmented Reality medium seems to be forever emerging and never fully emerged. I first encountered AR technology in 2006 through a demonstration of the D.A.R.T. project (the Designers Augmented Reality Toolkit) by Jay David Bolter from Georgia Tech's Augmented Environments Lab. Just a few years before the popular adoption of the iPhone, the impressive DART toolset promised to open up quick development of AR experiences for design creatives. Now, in 2019, Adobe's Project Aero will "realize the potential of this new medium;" they promise AR is now "poised to disrupt the way we learn, work, and play" (Adobe 2018).

ARToolkit (2001), D.A.R.T. (2004), Junaio and Layar (2009), Vuforia (2010), Aurasma (2011), now Project Aero—over the last decade and a half, all of these

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platforms have promised popular adoption of augmented reality. What's going on? Why is AR always poised to arrive but never arrived?

We in the new media design community have awaited the AR 'killer app'—an augmented reality experience so popular that it thrusts the medium into popular acceptance: *The Great Train Robbery* of AR, that would establish the fundamental language of the new medium and inspire augmented reality venues and audiences across the world. …Something to finally make AR emerge.

Why didn't Pokémon GO do this in 2016?

1.2 Blockbusters

To make a comparison: in cinema, at the end of 1895 the Lumiere brothers charge admission for the first short films at the Grand Cafe. By 1903, *The Great Train* robbery plays to popular success. Cinema had found its critical form, filmic montage, within 8 years of the first prototypical movies. By 1917, *Birth of a Nation* is one of the biggest cinema blockbusters of all time. Cinema had completely created its audience just 22 years after its birth.[1]

From *Hollywood Reporter*, describing *Birth of a Nation*'s initial run on its 100-year anniversary:

> Tickets at New York's Liberty Theater, where it played for 44 weeks, topped off at an unheard-of $2.20 ($51.50 in today's dollars). Throughout the silent era, the film was never far from a marquee. "Still the daddy of 'em all!" crowed *Variety* trumpeting a re-release in 1923 (Doherty 2015).

Time magazine:

> Griffith's film is estimated to have earned $18 million in its first few years — the astounding equivalent of $1.8 billion today. In current dollars, only *Avatar* and *Titanic* have earned more worldwide (Corliss 2015).

Pokémon GO was a commercial hit. It was the second place-based AR game by Niantic; the first was *Ingress*, launched in 2012. You could say that in terms of app downloads, *Pokémon GO* is the blockbuster (*Birth of a Nation)* to the earlier proof of concept (*The Great Train Robbery*) game *Ingress*.

Writing at the end of 2016, the *Chicago Tribune* remarks on the game's quick adoption, and also on its dangers, in the article headlined, "Pokémon Go for broke: Gaming sensation of 2016 swept the world, leaving havoc in its wake." "Unveiled July 6, it gathered 45 million players worldwide in its first 12 days," but also 110,000 distracted driving incidents, and then a laundry list of embarrassing incidents of

[1] And it's not just in cinema. In his essay, "Little History of Photography," Walter Benjamin notes, after the presentation of Daguerre's invention in the Chamber of Deputies in 1839, "Things developed so rapidly that by 1840 most of the innumerable miniaturists had already become professional photographers, at first only as a sideline, but before long exclusively" (Benjamin 1999, 515).

virtual distractions meeting real world ramifications: a criminal, busy playing, accidentally wanders into a police station where he is arrested; a gaming couple wander into the tiger enclosure at the zoo; multiple incidents of players stumbling across dead bodies in obscure locations (the article also features widely distributed photographs of a smartphone gamer playing *Pokémon GO* amidst the rubble of the Syrian city of Duoma) (Borrelli 2016). In *Wired*, an article appearing two years after the game's July 2016 launch states, "By every measure that matters, Pokémon Go has been a winner. Since its launch, it has almost never dropped out of the daily top 100 downloaded apps in both the iOS App Store and the Google Play Store, according to app analytics company App Annie. It has been the top-grossing app in the Play Store this entire week. In two years, according to an estimate by app analytics firm Apptopia, it has taken in $1.8 billion in revenue" (Barrett 2018).

And critics talked about the game in popular journalism, gaming and academic publications. In art and media studies, one author called it "technological faddism," and bemoaned the lack of narrative and educational framework (in *Making Publics, Making Places*) (Peacock and MacKenzie 2016, 106). Another claimed, "the game has conclusively demonstrated the power of digital technology to capture imaginations and create an engaging platform from little pieces of information that come together in a digital-physical ecosystem. … the game demonstrates the first successful, large-scale amalgamation of the digital and physical worlds and showcases the 'augmented reality' that we've been talking about for decades." (American Society for Engineering Education) (Johri 2016). For another, it realized Guy Debord's spectacle: "seems to have vindicated Debord's approach to the life vs the spectacle issue. The multiplication of screens even suggests a mise en abyme of the concept as we spend an increasing part of our lives watching merchandise such as smartphones that showcase the world as […] the omnipresent reality of the virtual" (*The Spectacle 2.0: Reading Debord in the Context of Digital Capitalism*) (Frayssé 2017, 67). It was the realization of Walter Benjamin's flaneur (*Performing the Digital: Performance Studies and Performances in Digital Cultures*) (Schipper 2017, 206–7). Even Žižek weighed in, describing it as the perfect semblance of ideology, "a closure that precedes perception" (Žižek 2017, 119). That is to say, academic criticism of *Pokémon GO* rounded up all the usual suspects.

But what didn't happen, was massive public adoption of the AR medium. Working in the field, I still find myself carefully explaining to students and clients what AR is and isn't—because no one really seems familiar with it. Where are all the AR theaters? Why hasn't AR found it's popular audience?

1.3 Not Enough Novelty (Sci-Fi Disappointments)

I have often imagined what it was like for early observers of photographs and films. Walter Benjamin, in his "Little History of Photography," reports the experience of the German painter, Max Dauthendey, on viewing some of the first Daguerreotypes:

> "We didn't trust ourselves at first," he reported, "to look long at the first pictures he developed. We were abashed by the distinctness of these human images, and believed that the little tiny faces in the picture could see us, so powerfully was everyone affected by the unaccustomed clarity and the unaccustomed fidelity to nature of the first daguerreotypes" (Benjamin 1999, 513).

Benjamin describes the uncanny discomfort of subjects' eyes, looking at the camera, staring out at the viewer. For cinema, you can imagine the effect of early film through animations of Eadweard Muybridge's locomotion stills (the internet is full of animated GIFs of them). They are poignant—though not all of them, some seem mere technical examinations of horses and carts and actions, but the expressive figures: a woman dancing, two women smoking cigarettes as if taking a break from their nude modelling work in front of Muybridge's grid and his strange series of photo boxes. When these are animated, the figures come eerily to life. Uncanny. Like the femme of Chris Marker's 1962 film, *La Jetée*. There is a certain memento mori punctum—like Barthes' mother featured in a particular photo that, for him, catches her character—because these subjects are more dead and gone than in any other moving image. We can't see life before 1871 and Muybridge's subjects—beyond that, photo stills, and then the rest of history is "merely somebody's panting prose," as the photographer Hollis Frampton put it (Frampton 1983, 88). Mechanically capturing images was a fundamental shift in the human relationship to the virtual. And, for the early audience, it must have been astonishing.

Are we awaiting such an experience from AR? Benjamin, in the same essay, describes a special, magical quality of the photograph. He terms it the "optical unconscious" of the photograph: the excess of denotation in the photo, capturing everything in front of the lense with an inhuman fidelity, "meaningful yet covert enough to find a hiding place in waking dreams, but which, enlarged and capable of formulation, make the difference between technology and magic visible as a thoroughly historical variable" (Benjamin 1999, 513). Miriam Bratu Hansen, in her analysis of Benjamin's essay, describes this unconscious as "the idea that the apparatus might record and store aspects of reality invisible to the unarmed human eye, or moments of contingency and indeterminacy that were neither perceived nor intended by the photographer but might at some later point be released to the searching gaze of the beholder" (Hansen 2004, 38). In this unconscious, the mechanical nature of the photograph makes it, not cold and inhuman, but uncanny, ghostly, magical. This magical experience of the mechanical seems harder to come by today, outside of science fiction. The imagination of robot driven cars, visualized in films like *Total Recall* (1990), has been realized with the mundane Uber app giving instructions to a contract (human) worker. Virtual Reality, visualized in *Star Trek the Next Generation* (1987) as a magical 'holodeck', has been realized with smartphone-stuffed cardboard visors held to people's faces. Sci-Fi films like *Minority Report* (2002) and, more recently, *Blade Runner 2049* (2017) have pictured augmented reality like a Meliés film—virtual images appearing magically onto (filmic) reality. The realization, in which you see on a smartphone screen the cartoon Pokémon placed onto arbitrary space, feels, as we say in art studio critiques, 'unmotivated'.

Certainly, arbitrary tracking AR is more of a feature in *Pokémon GO*, than a central element. The game is based around a geo-locative scavenger hunt. This is the other stream of AR technology, explored since 1999 and ambitiously realized in *Ingress* and *Pokémon GO* (Arth et al. 2015). It is tricky to compare this GPS geo-locative AR to its imagistic brethren; and I wonder if it is even properly AR. It is an art of maps, and adventurous like that cartographic history. But it is certainly not spectacle. The poster for the *Pokémon GO* experience is the minor feature of the SLAM AR tracking, and it was genius for the game developers to give the visual tracking feature to provide a shareable image of the experience, even if the essence of gameplay is actually geo-locative and not imagistic. Another AR application has risen over the same period—another killer app, or really a killer feature—in which visual tracking-based AR illusion is central: face-tracking to put bunny ears on photos. In Instagram, MeiTu and Snapchat—and more recently to self-create lip-sync videos in the app Musically—visual AR has reached a popular audience like nickelodeon halls showing film loops of 'man standing on a garden hose'.[2] It is a small thing, and popular, and maybe, like the nickelodeon, it is from this vector that the future will come.

Not that other media haven't disappointed. If you read Eisenstein on montage—-particularly his letter beseeching world audiences to not fall in love with sync-sound 'talkies'—it is clear much more was expected of filmic montage than ever arrived. Eisenstein warned against the "fearsome eventuality of meaninglessness and reactionary decadence," and hoped for "unprecedented power and cultural height," probably something like his intellectual montage that would be "the realization of revolution in the general history of culture; building a synthesis of science, art, and class militancy" (Eisenstein 1977, 259, 83). Vertov, in his *We: Variant of a Manifesto*, calls out to a future: "WE believe that the time is at hand when we shall be able to hurl into space the hurricanes of movement, reined in by our tactical lassoes" (Vertov 1984, 9). D. W. Griffith famously predicted libraries of history would be replaced with films: "There will be no opinions expressed. You will merely be present at the making of history. All the work of writing, revising, collating, and reproducing will have been carefully attended to by a corps of recognized experts, and you will have received a vivid and complete expression" (New York Times 1915). And maybe all of this arrived for cinema, in the form of Youtube, Vine, and the History Channel, but not the romantic vision.

And if we have not yet seen the *The Great Train Robbery* of AR—a work that establishes, for popular audiences, what this thing is and how it will work—do we know what we are waiting for?

[2]Lumiere's *Le Jardinier* (1895) is considered one of the first, if not the first, comedy film, and was part of the program at the December 28, 1895, premiere screening at the Grand Cafe (Gaines 2004, 1309).

1.4 What Are We Waiting for?

First, let's call the question—what is AR again? Augmented reality has always had a hard time defining itself. Recently, the term is confused with virtual reality. More than a decade ago, the DART project acknowledged the confusion around defining AR: "Augmented Reality (AR) has been used to describe many different kinds of computer-augmented experiences that augment the physical world with virtual media" (GATech AEL 2004). A current Wikipedia definition:

> Augmented reality (AR) is an interactive experience of a real-world environment where the objects that reside in the real-world are "augmented" by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory, and olfactory. The overlaid sensory information can be constructive (i.e. additive to the natural environment) or destructive (i.e. masking of the natural environment) and is seamlessly interwoven with the physical world such that it is perceived as an immersive aspect of the real environment. In this way, augmented reality alters one's ongoing perception of a real world environment, whereas virtual reality completely replaces the user's real world environment with a simulated one (2019).

This Wikipedia definition overstates things a little. Certainly AR strives for a *semblance* of seamlessness, just as the craft of cartooning seeks a semblance of reality—but the focal point of AR is frequently the specific seam between media of different registers: the pleasure of a known virtual combining with the known real, and all combined together into pixels. As in a magician's trick, without recognition of the disjuncture of the illusion, there is no trick.[3]

More exacting definitions have come from technologists and practitioners.

Azuma in 1997:

> VE [Virtual Environment] technologies completely immerse a user inside a synthetic environment. While immersed, the user cannot see the real world around him. In contrast, AR allows the user to see the real world, with virtual objects superimposed upon or composited with the real world. Therefore, AR supplements reality, rather than completely replacing it. […] AR can be thought of as the "middle ground" between VE (completely synthetic) and telepresence (completely real) (Azuma 1997, 356).

AR researcher Fernandez Alvarez has written, AR's goal "is simply to overcome the difficulties of understanding due to different levels of conceptual abstraction presenting different traditional representation systems" (Prieto et al. 2017, 313).[4] So

[3] I would liken this to the uncanny valley in robotics. A seamless integration of computer generated virtual with real is the goal of cinema special effects. A delineated integration of virtual and real is the realm of AR. And between the two lies discomfort or insult. It is interesting, in regard to the comparisons between photography, cinema, and AR, to note Masahiro Mori's discussion of the effects of movement in "amplifying the peaks and valleys" of this phenomenon in his 1970 essay (Mori 2012, 2).

[4] Translated by J. F. Prieto. The original Spanish: "El objetivo final de todas estas "máquinas de visualización" consiste en superar las dificultades de comprensión debidas a los diferentes niveles de abstracción conceptual que presentan los distintos sistemas de representación tradicionales empleados para comunicar un diseño espacial: planta, alzado, sección, perspectiva, axonometrías y modelos a escala" (Álvarez and José 2010, 114).

Fig. 1.1 AR fiducial (SnapDragonAR 2007/Courtesy of Andrew Roth and Future Stories)

for Azuma, AR is along a spectrum, in between the two 'perfect' similitudes: our experience of reality and a virtual construction of a reality. And for Alvarez, one of the essential possibilities for AR is to combine different representational systems (such as graphics or still photography combined with live viewing).

These definitions leave out one critical element: the computer. A confusion in defining AR, is that casual combinations of virtual and real happen all the time, and have throughout history. In fact, you could say that human history itself is a combination of virtual with real, as are civilization, culture, and language. In a more pedestrian mode: if you and I are both gazing at a landscape, and I tell you a story that takes place in that landscape—a story from my own memories, or completely made up—isn't that an augmentation of real space, presented for an audience? And what about magic mirrors (or mirrors in general), Pepper's Ghost, and other illusions? But in popular usage, 'augmented reality' is a term which refers to new technology, and it is essentially caught up with the idea of humans interfacing with computers. And not interfacing through screens in a normal sense—in fact it is specifically about going beyond the screen. Every day, almost constantly, we augment the real world with computer generated virtual through our own handheld rectangular smartphone screens, and that augmentation is typically contextual, frequently geo-locative, and combines multiple media. Instead of this new smartphone banality, AR is about bringing that virtual computer world into our human space, outside the boundaries of the screen. That is why the image shown in Fig. 1.1 is an icon of AR.

The fiducial. These early robot-vision visual codes, made to be placed into the real world so the computer can register physical reality, are the manifestation of the AR idea: to bring the computer into our real human space, via ways of seeing we cannot understand.[5] In this respect, AR is like photography as described by Talbott in 1839: "From all these prior ones [the Camera Lucida and Camera Obscura], the present invention differs totally in this respect (which may be explained in a single sentence),

[5]This particular fiducial was developed as part of the Pentag system for what would become SnapDragonAR, developed at York University's Future Cinema Lab with Mark Fiala shortly before the iPhone was launched.

viz. that, by means of this contrivance, it is not the artist who makes the picture, but the picture which makes ITSELF." (Talbott 1839). AR is about a computer seeing, and then by itself, through pre-planned computation and processing, creating a picture for us beyond the screen.

The early AR art collective, Manifest.AR, laid out a raison d'être for AR in a 2011 manifesto. An excerpt:

> The AR Future is without boundaries between the Real and the Virtual. In the AR Future we become the Media. Freeing the Virtual from a Stagnant Screen we transform Data into physical, Real-Time Space.
>
> The Safety Glass of the Display is shattered and the Physical and Virtual are united in a new In-Between Space. In this Space is where we choose to Create.
>
> We are breaking down the mysterious Doors of the Impossible! Time and Space died yesterday. We already live in the Absolute, because we have created eternal, omnipresent Geolocative Presence.
>
> In the 21st Century, Screens are no longer Borders. Cameras are no longer Memories. With AR the Virtual augments and enhances the Real, setting the Material World in a dialogue with Space and Time (Manifest.AR 2011).

This was meant to read like Vertov's 1922 kino manifesto—a call to arms for a new digital futurism centered around this technology. Re-reading it now, I am struck by the insistence on a digital space beyond the screen. These AR ambitions have been subsumed in the rise of VR over the last 3 years. The differentiation of AR from VR is important and difficult. In my own work with the Chicago History Museum, creating place-based experiences of historical films and photographs, our technological implementation has ranged from on-site arbitrary AR tracking, to Google Street View, to VR videos and apps—all to provide the same sorts of educational experiences.[6] Often AR and VR can be used towards the same experiential ends: combining pre-programmed content with a sense of place. My own working definition of augmented reality—based on popular semantics, lecturing to students, and working professionally with curators from a range of institutions—is this:

> Whereas 'virtual reality' is a sequence and/or duration of immersive images presented through an interactive display for the purpose of giving a feeling of presence; 'augmented reality' is a type of interactive, spatially aware media in which a live image of the audience's immediate world is superimposed with media from another source—especially media from a different framework of representation, such as still photographs, graphics, maps, cartoons, etc.

And my own diagram to differentiate the media is shown in Fig. 1.2.

[6] *The Chicago 00 Project* comprises a series of new media publications in apps, videos, and VR stills. The first publication was an app-based augmented reality experience at the site of the Eastland Disaster, where a passenger ferry capsized on the Chicago River in 1915. VR panoramas of the site, created as research tools, were shared on Google Street View, and because of their success (over a million views), subsequent projects used VR to share historical photos superimposed on their present-day sites: the St. Valentine's Day Massacre, the 1933 Century of Progress World's Fair, and the 1968 DNC protests. www.Chicago00.org.

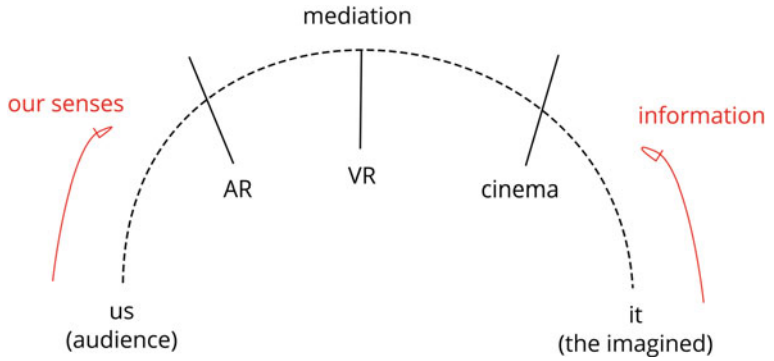

Fig. 1.2 Diagram of new mediation (Rhodes 2018)

In this diagram, AR is far from the seamless 'hot' (alla McLuhan) HD media, and much more about the audience performing a closure across borders. You could add Photography far to the right, and comics far to the left.

1.5 The AR *Great Train Robbery*

If there is to be an AR killer app—something that brings AR to popular audiences—it must demonstrate its essential form. We first have to know the essence of AR, to answer 'Has it arrived?' To ask, 'What is the montage of AR?' should answer the question, 'What is its *Great Train Robbery*?'

Benjamin, in his second version of "The Work of Art in the Age of Its Technological Reproducibility," makes a point of semblance. He famously says this about cinema[7]:

> The most important social function of film is to establish equilibrium between human beings and the apparatus. Film achieves this goal not only in terms of man's presentation of himself to the camera but also in terms of his representation of his environment by means of this apparatus. On the one hand, film furthers insight into the necessities governing our lives

[7]In a footnote, Benjamin writes: "Before film had started to create its public, images (which were no longer motionless) were received by an assembled audience in the Kaiserpanorama. Here the audience faced a screen into which stereoscopes were fitted, one for each spectator. In front of these stereoscopes single images automatically appeared, remained briefly in view, and then gave way to others. Edison still had to work with similar means when he presented the first film strip-before the movie screen and projection were known; a small audience gazed into an apparatus in which a sequence of images was shown. Incidentally, the institution of the Kaiserpanorama very clearly manifests a dialectic of development. Shortly before film turned the viewing of images into a collective activity, image viewing by the individual, through the stereoscopes of these soon outmoded establishments, was briefly intensified, as it had been once before in the isolated contemplation of the divine image by the priest in the cella" (Benjamin 2008, 52). Doesn't this sound like AR on the smartphone?

> by its use of close-ups, by its accentuation of hidden details in familiar objects, and by its exploration of commonplace milieux through the ingenious guidance of the camera; on the other hand, it manages to assure us of a vast and unsuspected field of action [Spielraum].
>
> Our bars and city streets, our offices and furnished rooms, our rail-road stations and our factories seemed to close relentlessly around us. Then came film and exploded this prison-world with the dynamite of the split second, so that now we can set off calmly on journeys of adventure among its far-flung debris (Benjamin 2008, 37).

Throughout the essay, Benjamin returns to the idea that this new technology, through its mechanical nature and quick movement, leaves behind the semblance of still photography, and allows for a media of play. And this is not limited to audiences in the theaters, but allows for modern society to engage with their changing lives filled with all its complicated apparatus. In cinema, it is the stringing together of the changing, unexpected salad of perceptions: a camera which can cut in any moment to another view, another face, another object or setting, as if dreams emerging from the unconscious, and yet we, the audience, are able to endure—and even more, collect these together into a narrative experience. We need something similar of AR: a medium that allows us to play. And that play space is not in the moment of cuts between views, but in the space between the computer and our perception, emanating from its computations reacting to ever-changing surroundings. We can hope, for an experience that gives us a comfort and engagement with the confusing combinations of computer and human that surround us, so we can set off calmly on our journeys.

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Chapter 2
Characteristics of Game Transfer Phenomena in Location-Based Augmented Reality Games

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Abstract This chapter explores sensory perceptions, cognitive mix-ups and slips of actions associated with augmented reality (AR) technologies, such as in location-based AR games. The research on Game Transfer Phenomena (GTP) has demonstrated that playing video games in AR and non-AR can induce sensory perceptions, manifesting as seeing images overlaying physical objects (e.g., seeing power bars above people's heads or maps in the corner of the eye), hearing sounds coming from game-related objects, and perceiving physical objects as distorted or having misperceptions (e.g., confusing birds with aeroplanes). The aim of this chapter is twofold. The first is to provide an overview of the GTP research conducted on location-based AR games. The second is to highlight the peculiarities of GTP in AR games. While a broad variety of the GTP reported in non-AR games has also been found in location-based AR games, the key characteristic of these games is that the gameplay occurs through interactions in the physical context. The physical context is part of the game by means of (i) the overlaying of game images on the physical context and (ii) the game being played through interactions in the physical context. The key peculiarities of GTP in these games are (i) the temporal manifestation of GTP while/after playing, (ii) the two-way transfer of effects from the virtual to the physical and vice versa, (iii) the increased chances of the occurrence of certain forms of GTP (e.g., the urge to do something related to the game, misperceptions of physical stimuli, tactile sensations) including cognitive mix-ups and slips of actions when confusing virtual objects with real objects and (iv) the GTP triggered by the outputs from a multipurpose device.

2.1 Introduction

It is no longer enough to observe events only passively on a screen; today's humans want to explore, live the events, be "inside" the digital images and participate in simulations. This notion dates back to 1997 when comparing TV viewing with the use

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of the Internet (Sánchez 1997). The recent commercialisation of virtual reality (VR) headsets and augmented reality (AR) technologies enables us to actually experience being closer to the digital images progressively with a high degree of realism and via more natural interfaces.

Virtual reality replaces or substitutes for reality by immersing us in the centre of fantasy or real events via inducing sensations of dislocation from our physical bodies and our peripheral world. In contrast, AR technologies overlay digital or computer-generated information (e.g., images, audio, video, haptic sensations) on the physical world, blending the physical and the virtual worlds and enhancing our perception and sense of reality (Kipper and Rampolla 2012).

During the evolution of humankind, we have never been exposed to such a range of sensory information (e.g., a variety of visual effects, sounds with different volumes, sounds with a large range of acoustic properties) (DeSalle 2018) and mixtures of physical and digital artefacts as we have been today. Neither have our minds been put to the test to discriminate between what is real and unreal when what we see is actually the product of a manufactured reality. Researchers from different disciplines have started to study how we respond and adapt to these rapid changes. Today, we have more questions than answers about how interactive technologies are shaping our brains and sense of reality.

The research on Game Transfer Phenomena (GTP) has demonstrated that playing video games in AR and non-AR can induce sensory perceptions manifesting as seeing images overlaying physical objects (e.g., seeing power bars above people's heads or maps in the corner of the eye), hearing sounds coming from game-related objects, perceiving physical objects as distorted and having misperceptions (e.g., confusing birds with aeroplanes), as well as confusing virtual and physical content (Dindar and Ortiz de Gortari 2017; Ortiz de Gortari 2017; Sifonis 2018; Wittek et al. 2016). (See Table 2.1 for a list of forms of GTP identified in various modalities of altered sensory perceptions: visual, auditory, bodily, multisensorial, sensations of unreality, automatic mental processes and automatic actions/behaviours.) In a sense, playing video games does not only enhance our senses and cognitions while playing but also afterwards. Such phenomena are created by "the most powerful machinery never invented, the human mind" (Ortiz de Gortari 2019, p. 1). Some have referred to GTP as the "original AR" (Turner 2016) or consensual hallucinations (Adee 2018) due to their similarity, where AR uses digital images overlaying physical contexts and GTP include pseudo-hallucinations (e.g., seeing images complementing real objects).

Since AR games are played in hybrid spaces (virtual and physical), this fact poses interesting questions regarding GTP, which typically occur when triggered by automatic associations between physical and virtual stimuli.

The aim of this chapter is twofold. The first is to provide an overview of the GTP research conducted on location-based AR games, focusing on several factors, such as demographics, game-related activities, and consequences of playing and their relation to GTP. The second is to highlight the peculiarities of GTP in AR games. The findings presented here come from the research conducted on GTP in the most popular location-based AR games (which are played mostly in mobile phones) launched to

Table 2.1 Summary of main forms of GTP

GTP (sub) modalities	GTP types
Altered sensorial modality	All sensory modalities Across sensorial modalities Multisensory
Visual	Mind visualizations/imagery After-images Visual pseudo-hallucinations Perceptual distortions of objects/environments (shape/colour) Visual misperceptions
Auditory	Auditory imagery Auditory pseudo-hallucinations Inner-speech/monologues Thoughts-out-loud, thought audition (i.e., Gedankenlautwerden) Auditory neural adaptations Auditory misperceptions
Body	Tactile sensations Illusions of full body movement Motoric adaptations (e.g., repetitive movements of limbs) Uncoordinated movements/stiffness Stereotypical body movements Attachment to virtual element (e.g., limbs) Out of body experiences
Subjective experiences of unreality	Derealization like-experiences Depersonalization-like experiences Perceived time or velocity distorted
Automatic mental processes modality	Intrusive thoughts Cognitive bias (e.g., reasoning bias, attention bias) Source monitoring errors Perseverative mental actions Urges to perform something as in the game
Behaviours and actions modality	Verbal outburst Acting out a behaviour or action Behavioural responses toward game-relate cues Involuntary mimicking Involuntary motoric activations toward game-relate cues

date, specifically *Pokémon GO* (N = 1,313), complemented with the findings of a study of GTP on Pokémon GO's predecessor, *Ingress*, both developed by Niantic.

This chapter is structured as follows: Section 2.2 provides an overview of the research on location-based AR games, including the most common GTP and the factors related to GTP in these games (e.g., demographics, game features, immersion). Section 2.3 discusses the peculiarities of GTP in location-based AR games played on portable devices. Section 2.4 explains the interplay between the physical and the virtual worlds and GTP. Lastly, the conclusions, final remarks and future research directions are presented. The chapter is complemented with quantitative data and gamers' narrations about GTP in Pokémon GO.

In this chapter, AR games are understood as including AR functions even though some can be played without using the AR features. Non-AR games are all the others that do not use AR in any way.

2.2 Overview on GTP Research

Research on GTP has focused on examining transient sensory, perceptual, cognitive and behavioural effects of video game playing. The GTP research approach considers the interplay of video game content, experiences while playing (e.g., immersion, trance state, embodiment) and the manipulation of hardware and peripherals as inputs to the game (Ortiz de Gortari 2019, p., n.d.).

2.2.1 Most Common GTP in Location-Based AR Games

The prevalence of GTP in general games (i.e., non-AR games) has been very high (96–99%) (Dindar and Ortiz de Gortari 2017; Ortiz de Gortari and Griffiths 2016; Ortiz de Gortari and Larøi 2018). Regarding location-based AR games, in Pokémon GO, Ortiz de Gortari (Ortiz de Gortari 2017) reports an 82% prevalence, the lowest prevalence of GTP noted to date, while the prevalence is 97% in Ingress (Sifonis 2018). (See Table 2.2 for a comparison on the prevalence of GTP in non-AR and AR games.)

The predominant types of GTP found in Pokémon GO are those that are also primarily reported in non-AR games, such as visualising/seeing images with closed eyes, hearing music from the game, singing, shouting or saying something from the game unintentionally (Dindar and Ortiz de Gortari 2017; Ortiz de Gortari and Griffiths 2016). The least common modality that is typically reported comprises altered bodily perceptions.

The most common GTP found in Pokémon GO are: (i) wanting or feeling the urge to do something in real life after seeing something that reminded the gamer of Pokémon GO when he/she was not playing; (ii) involuntarily singing, shouting or saying something from the contents of Pokémon GO; (iii) visualising or seeing images from

Table 2.2 Prevalence of GTP in non-AR and AR games

Characteristics of the sample	International sample of adults, majority males (Ortiz de Gortari and Griffiths 2016) (N = 2,236) (%)	Turkish sample including minors, majority males (Dindar and Ortiz de Gortari 2017) (N = 1,265) (%)	English/Spanish speaking sample of adults, majority females playing Pokémon Go (Ortiz de Gortari 2017) (N = 1,313) (%)
GTP overall	97	99	82.4
I. Altered perceptions overall	93.9	n/a	64.8
Visual experiences	84.8	82.7	50
Visualized/seen VG images with closed eyes	76.8	74.0	38.8
Seen VG images with open eyes	30.6	29.3	16.5
Seen distorted real-life environments and/or objects	35.7	28.5	8.3
Misperceived a real-life object as something from a VG	45.5	49.7	19.8
Body related experiences	72.7	77.8	27.4
Bodily sensations of movement as if being in a VG	50.9	48.5	7.4
Tactile touch sensation associated with a VG	41.3	43.4	21.9
Perceived time and/or body feeling differently after playing a VG	49.3	56.3	5.3
Felt as though the mind has disconnected from my body after playing	28.5	36.8	7.6
Auditory experiences	85.2	83.5	35.7
Heard the music from a VG when not playing	73.9	70.4	24.3
Heard a sound from a VG when not playing	64.6	52.4	17.8

(continued)

Table 2.2 (continued)

Characteristics of the sample	International sample of adults, majority males (Ortiz de Gortari and Griffiths 2016) (N = 2,236) (%)	Turkish sample including minors, majority males (Dindar and Ortiz de Gortari 2017) (N = 1,265) (%)	English/Spanish speaking sample of adults, majority females playing Pokémon Go (Ortiz de Gortari 2017) (N = 1,313) (%)
Heard a character's voice from a VG when not playing	45.9	50.6	11.9
Misinterpreted a sound IRL as something from a VG	65.3	53.8	17.4
Thought related experiences	87.4	96.0	64
Wanted or felt the urge to do something IRL after seeing something that reminded of a VG	72.3	63.2	52.9
Having experienced still being in the mind-set of a VG after playing	62.8	93.9	33.2
Thinking about using something from a VG IRL	74.6	74.1	19
Having momentarily mixed up VG events with actual RL events	42.5	39.0	10.7
Behaviours related experiences	77.7	81.2	46.0
Unintentionally sang, shouted or said something from a VG IRL	57.9	69.0	41.3
Reflex body reaction associated with a VG	44.2	35.7	5.0
Acted out a behavior or performed an activity influenced by a VG	39.8	53.5	11.3
Unintentionally acted differently in RL situations because of something experienced in a VG	48.8	33.1	7.5

Pokémon GO with closed eyes; (iv) remaining in the mindset of Pokémon GO; (v) hearing music from Pokémon GO; and (vi) feeling tactile sensations similar to those felt when playing.

While similar forms of GTP have been observed in both non-AR and AR games, such as Pokémon GO and *Ingress* that are played mostly on mobile phones (Ortiz de Gortari 2017; Sifonis 2018), it is important to note that certain key features of location-based AR games are more relevant than those of general video games (computer/console) that may facilitate certain types of GTP. For example, as noted by Ortiz de Gortari (2017), the input to mobile games is via the touch interface; gamers play by touching the surface of the screen. Therefore, tactile sensations are among the most common body-related GTP experiences found in Pokémon GO. Many gamers also report that they do not play location-based AR games with sound (Ortiz de Gortari 2017; Sifonis 2018), which reduces the chances of re-experiencing auditory cues from the game. Additionally, visual and auditory cues that are currently implemented in location-based AR games tend not to be as rich or play as crucial a role as in games on other platforms (e.g., high-definition visual effects, surround sound) (Craig 2013).

One study reports that automatic mental processes are the most frequently experienced GTP, while altered auditory perceptions are the least common in the game Ingress (Sifonis 2018).

Interestingly, a cross-cultural comparison between English (EnS) and Spanish (SpS) speaking samples of Pokémon GO gamers (Ortiz de Gortari 2017) finds that while the EnS are significantly more likely to report automatic mental processes, such as wanting or feeling the urge to do something after seeing some game-related cue and thinking about using something from a video game in real life, the SpS are more likely to report behaviours. These trends are also true for players of non-AR games (Dindar and Ortiz de Gortari 2017).

Regarding the level of severity of GTP, most Pokémon GO gamers show low levels (a few forms of manifestation of GTP and a low frequency of experiences), similar to players of non-AR games (Ortiz de Gortari et al. 2016).

2.2.2 Factors Relevant to GTP in Location-Based AR Games

The research to date has investigated the relation between GTP and a variety of individuals and game-related factors. The factors included in this section are game features, immersion, demographics, motivations for playing and game-related activities, dreams and consequences of playing.

2.2.2.1 Playing with Enabled Sound and AR Function

The most intriguing manifestations of GTP in AR games are pseudo-hallucinations, such as seeing game images with open eyes, specifically where images overlay phys-

ical objects (i.e., digitally induced images), as well as visual misperceptions (due to seeing digital images among physical objects) and cognitive mix-ups when gamers confuse virtual with real information (i.e., contents and events).

An investigation on the use of functions, such as playing with enabled sound and AR function (Ortiz de Gortari 2017), shows that playing with sound appears to be more relevant to the occurrence of a large variety of GTP experiences than the use of the AR function.

2.2.2.2 AR Feature

Only 38% play Pokémon GO using the AR function (n = 196). Therefore, the following results are based on this sub-sample. Playing with the AR function enabled in Pokémon GO is not significantly associated with GTP overall or any of the main sub-scales of GTP (i.e., altered visual perceptions, altered auditory perceptions, altered bodily perceptions, automatic mental processes and automatic behaviours). However, significant associations are found among the specific types of GTP, as follows: (i) misperceiving physical objects and sounds as something in the game, (ii) perceiving the body as different after playing and (iii) hearing music or sounds from the game.

The most interesting finding in this regard is that while visualising/seeing images with closed eyes is the most prevalent among GTP visual experiences in both non-AR games (Dindar and Ortiz de Gortari 2017; Ortiz de Gortari and Griffiths 2016) and Pokémon GO, actually playing with the AR function enabled is neither significantly associated with this form of GTP nor with perceiving objects as distorted (i.e., in shape or colour) (Ortiz de Gortari 2017).

The forms of GTP that are found to be associated with playing with the AR function enabled are (i) discriminating errors between physical and virtual contents, specifically misperceiving visual and auditory physical stimuli as something from the game, (ii) perceiving the body differently after playing, (iii) re-experiencing music and sounds from the game and (iv) wanting or feeling the urge to do something in real life, triggered by game-related cues (Ortiz de Gortari 2017).

2.2.2.3 Playing with Sound

More than half (57%) of the sub-sample of Pokémon GO gamers who speak Spanish play the game with the sound on (n = 145). Sound is vital for inducing changes in mood, physiological responses and immersion (Gerra et al. 1998; Tafalla 2007).

Surprisingly, while sound is not a core part of Pokémon GO, it is significantly associated with most sub-scales of GTP (i.e., visual, auditory, bodily, thoughts and behaviours). Those who play with the sound on are significantly more likely to experience altered perceptions in general, altered auditory perceptions and altered bodily perceptions. Furthermore, a closer examination of the GTP types shows that those who play with the sound on are significantly more likely to (i) experience bodily sensations of movement as if playing, (ii) feel the body differently after playing, (iii)

hear music or sounds, (iv) mistake a sound in real life for some sound from the game, (v) think about using something from the game in real life, (vi) mix up video game events with actual real-life events and (vii) experience movements of arms or fingers involuntarily in response to a game-related cue.

2.2.3 Immersion in Location-Based AR Games

Both immersion and GTP are characterised by automaticity: lack of awareness, lack of intention and lack of control (Bayer et al. 2016). Immersion is defined in terms of flow, cognitive absorption and presence (Jennett et al. 2008). One difference from most VR games that aim to make the ambience as realistic as possible to increase immersion is that in AR games, coordinating the interactions between the physical and the virtual contents is more important (Sekhavat and Zarei 2016). The more these interactions occur smoothly, automatically and almost unnoticed, a higher degree of immersion is expected to be experience.

According to Ortiz de Gortari (2017), immersion in location-based AR games is characterised by (i) the lack of temporal awareness, (ii) the lack of awareness of what is happening beyond the screen or the periphery of the hybrid game space, (iii) mix-ups where the mobile screen as a mediator of the digital images disappears, resulting in the search for the digital content outside the screen and (iv) the suspension of disbelief due to the sensation that Pokémon is physically present. Furthermore, analyses regarding the relationship between immersion and sound and AR functions in Pokémon GO show that all variables used to assess immersion are significantly correlated with playing with the sound on, while AR is only significantly correlated with the lack of awareness and mix-ups when looking for Pokémon outside the game interface.

As conceptualised in Pokémon GO by Ortiz de Gortari (2017), immersion has a positive moderate correlation with GTP. Further analyses show that immersion emerges as a predictor of GTP in a model, together with dreaming about the game, positive/negative emotions when capturing Pokémon, positive consequences of playing and problematic smartphone use (Ortiz de Gortari, under review).

2.2.3.1 Demographics

No differences in gender are found among those who experience GTP in non-AR games (Dindar and Ortiz de Gortari 2017; Ortiz de Gortari and Griffiths 2016) or in Pokémon GO (Ortiz de Gortari 2017). However, a study on Ingress finds that females play more intensively than males and are significantly more likely to experience GTP (Sifonis 2018). In terms of age, younger gamers tend to report GTP more commonly in non-AR games (Ortiz de Gortari and Griffiths 2015). One study finds that minors are more prone to experience GTP (Dindar and Ortiz de Gortari 2017); a similar

picture is observed in Pokémon GO and Ingress (Ortiz de Gortari 2017; Sifonis 2018).

2.2.3.2 Motivations for Playing, as Well as Game-Related Activities

The motivations for playing Pokémon GO include curiosity, being a Pokémon fan and wanting to use the AR function (Rasche et al. 2017), doing exercises, having fun, playing for escapism, nostalgia, building relationships and achievement (Yang and Liu 2017).

Regarding GTP in Pokémon GO, the examination of the activities related to the game (e.g., reading tactics, travelling to new places, meeting new people) shows that thinking of stories about the game emerges as the strongest predictor of GTP among the activities/motivations, followed by playing for escapism. Playing for escapism is also found to be a strong predictor of GTP in non-AR games (Ortiz de Gortari and Griffiths 2015).

2.2.3.3 Dreams

The tendency to recall dreams and to dream about the game is shown as highly relevant to the occurrence of GTP. The tendency to recall dreams is a predictor of severe GTP (Ortiz de Gortari et al. 2016). In the case of Pokémon GO, dreaming about the game is a strong predictor of GTP (Ortiz de Gortari 2017), and GTP is positively correlated with the dream intensity scale that measures auto-suggestion and paramnesia (i.e., distorted memory or confusion between fact and fantasy), among other factors (Gackenbach and Trewin 2017). Moreover, dreaming about Pokémon GO is reported as "fun" and includes hybrid elements of fantasy and reality (Gackenbach and Trewin 2017).

2.2.3.4 Consequences of Playing Pokémon GO

Gamers who experience GTP are significantly more likely to report both positive and negative consequences of playing Pokémon GO. Numerous benefits of playing Pokémon GO have been reported (e.g., increased physical activity, feeling of well-being wellness, socialising more) (Althoff et al. 2016; Bonus et al. 2017; Howe et al. 2016; Tateno et al. 2016; Wong 2017; Yang and Liu 2017); however, negative consequences and risks have also been indicated (e.g., trespassing, violence, accidents and injuries) (Joseph and Armstrong 2016; Serino et al. 2016; Wagner-Greene et al. 2017).

Among those who experience GTP, the most commonly reported positive consequences of playing Pokémon GO are feeling less lonely, feeling less anxious to go out and perceiving the world as a nicer place. Feeling less anxious to go out and feeling less lonely are significant predictors of GTP. In terms of negative consequences, more

of those who report experiencing GTP have been involved in accidents and have had arguments and fights due to playing Pokémon GO. However, the most commonly reported negative consequences are neglecting responsibilities due to playing, being deceitful about the amount of time spent on playing, feeling weird or uncomfortable about something that has happened when playing, bumping into or colliding with people or objects when playing, and trespassing to hunt for Pokémon. The tendency to have problems with mobile phone use is also a predictor of GTP (Ortiz de Gortari, under review).

2.3 Peculiarities of GTP in Location-Based AR Games Played on Portable Devices

Based on the findings of the studies conducted on Pokémon GO (Ortiz de Gortari 2017) and Ingress (Sifonis 2018), the GTP in these games are characterised by the following factors:

- **Manifestation of GTP while playing**. Cognitive mix-ups are manifested while playing (e.g., confusion between virtual and physical objects, looking for game elements outside the game interface), in contrast to computer/console games where GTP are more likely to occur after playing (Ortiz de Gortari and Griffiths 2016).
- **Two-way transfer of effects**. Virtual world content/experiences influence the interpretation and the perception of the physical world, but events/objects in the physical world also influence the interpretation and the perception of virtual content.
- **Increased chance for certain forms of GTP such as**:
  a. **Automatic thoughts/urges to do something related to the game when not playing**. Rather than taking place in a simulated space (as is the case with non-AR games), the physical world is the platform of AR games, facilitating associations between game contents/events and physical stimuli related to the game (e.g., location of the game).
  b. **Leads to misperceptions about physical stimuli**. Seeing digital images among physical objects facilitates confusing physical objects with those from the game, as well as misperceiving sounds from the physical world.
  c. **Facilitates tactile sensations**. The input via the touch screen of a portable device, which is also accompanied by vibrations as the output, facilitates re-experiencing tactile sensations.
- **GTP triggered by outputs from the device where the game is played**. This involves playing on portable devices (mostly mobile phones), which contain multiple applications and outputs from calls and messages, consisting of vibrations, sounds or images, which can also be interpreted as outputs from the game and trigger GTP (e.g., thoughts, actions or sensory perceptions).

2.4 Interplay Between Physical and Virtual Worlds and GTP

While a broad variety of the GTP reported in non-AR games has also been found in location-based AR games played on portable devices, the key characteristic of these games is that the gameplay occurs by interacting in the physical context. The physical context is part of the game by (i) the overlaying of the game images on the physical context and elements using the AR function and (ii) the game being played through interacting in the physical context (indoors or outdoors). In location-based AR games the player tend to follow a real-time generated map of the physical world. These special playing circumstances result in peculiar manifestations of GTP, which are largely reflected as automatic mental processes and automatic actions.

In Sifonis' (2018) conceptualisation, hybrid reality (HR)-specific GTP are "manifested as the transfer of thoughts, actions and perceptions from the physical world to the virtual world with players engaging in real world actions to interact with the virtual content" (p., n.d.). Of the participants in Sifonis' study, 18% report what the author calls HR-specific GTP, and correlations with this type of experience are found in the number of hours played per week, but no significant correlations are found regarding the player level and age.

The qualitative data collected from a survey on Pokémon GO, supplemented by a study on Ingress (Sifonis 2018), reveals different dimensions of the interplay between the physical and the virtual worlds. These are (i) events, (ii) actions and (iii) interpretations/conceptualisations of objects from both worlds. For a comparison of transfer of experiences between AR games and non-AR games, see Fig. 2.1.

i. **Events**: Expect external events to affect the virtual or the physical content.

   a. ***Events in the physical world influencing the virtual world***. This involves the belief that events that usually occur outside the gamer's control, such as environmental or similar factors, can affect the virtual content. (Today this is not yet possible, but in the future, sensors would be able to detect certain environmental conditions, and virtual content could actually be affected by physical events). The following are some instances:

      > … Sometimes, I correct for IRL [in real life] side wind in my poke throw in the game… (it doesn't help though)
      >
      > A fire truck was coming down the street, and there was a Pokémon spawned [appeared] in the street. I thought… 'I hope the fire truck doesn't hit the Meowth [Pokémon]'. And then I realized what a strange thought that was. (Ortiz de Gortari 2017, p. 382)

   b. ***Virtual events influencing something in the physical world***. This pertains to the belief that events or circumstances in the physical world can be affected

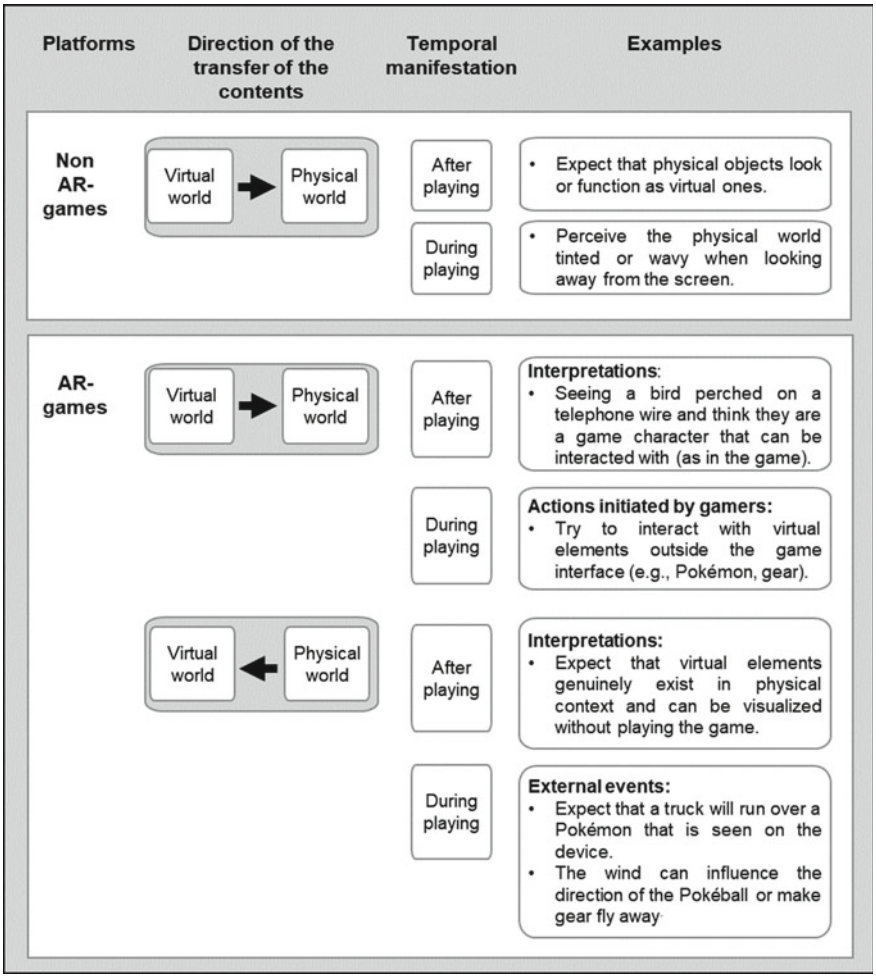

Fig. 2.1 Comparison of transfer of experiences in AR games and non-AR games

as in the virtual world. An example is the belief that using a lure module[1] will increase the chances to catch more fish.

ii. **Actions**: The actions performed in either world influence the other.

   a. ***Actions in the physical world influencing the virtual world***. Expect to be able to manipulate virtual content with physical actions without providing any input via the game interface (e.g., touching the screen). An example is

[1]Lure modules are used to increase the amount of Pokémon that is spawned for everyone who is within the distance of a PokéStop.

the belief in the possibility to hold or move virtual artefacts directly with the hands without any peripheral. The following are some instances:

> Moving another player out of the way so they could pick up dropped gear
>
> …pointing at the ground in the physical area where the virtual gear had been dropped. (Sifonis 2018, p., n.d.)

b. ***Actions in the virtual world influencing the physical world***. This refers to the desire to perform or the actual performance of actions outside the context of the game or after playing as if still playing. The following are some instances:

> I saw a pigeon standing on the street and had a momentary urge to throw something at it [to capture it]. (Ortiz de Gortari 2017, p. 382)
>
> Once I threw a rock at a moose cus [because] I thought it was a Magikar [a Pokémon character that is a fish].

In non-AR games, this happens due to source monitoring errors. For instance:

> Once, I stand at store in the lighting bulbs department trying to remember why I needed to buy one. Then I remember I need it for a room in the video game I was playing. (Ortiz de Gortari 2015, p. 173)

iii. **Interpretation/conceptualisation of virtual and physical stimuli**: From believing that virtual content is real, the physical world and its contents are evaluated based on the logic of the virtual world, or the events that happen with virtual content are also expected to happen in the physical world.

a. ***Conceptualisation of virtual objects/locations as real***. In location-based games, such as Pokémon GO and Ingress, virtual places become materialised via the game interface, and virtual content is found in specific physical locations that are recurrently visited by gamers. This situation has led to gamers' mix-ups when they expect that in-game locations and objects (e.g., gyms, PokéStops, portals) can be seen outside the game interface since they are conceptualised as genuinely existing. The following are some instances:

> I frequently ("many times") have automatic thoughts like, "My friend is going to the grocery store. I should ask them to see what team is holding the gym there." but the person doesn't play the game and, in my mind, I imagine them seeing the Pokémon gym in real life, like it is actually a thing you see outside the game. I frequently ("many times") have momentarily expected to be able to see Pokémon go landmarks, e.g., a PokéStop or gym, in the real world, not just the public real-world landmark.

Interestingly, Pokémon GO gamers have also reported looking for Pokémon outside the game interface as if Pokémon really exists in the physical world while they are playing. The following are some instances:

> Sometimes I'll look up from the game expecting to see a Pokéstop or gym in the air and there will be nothing and I'll be surprised for a second LOL.
>
> While playing the game I will often look up at the landscape as if I would be able to see a Pokémon!. (Ortiz de Gortari 2017, p. 394)
>
> Once when a friend was playing Pokémon Go while I wasn't they excitedly exclaimed a Pokémon was nearby and I was like "where" and looked around for it irl instead of on my phone.

Ortiz de Gortari (2017) argued that these cognitive mix-ups are explained by the modality where the game is played (i.e., playing the game on a portable device that needs to be held in front of the eyes and requiring shifting the view between the screen and the landscape). Two factors appear to be involved: (i) slips of actions due to repetitive activities that become stereotypical (Norman 1981), similar to keep tapping on a non-touch screen after using a touchscreen, and (ii) immersion that makes the gamers believe (while they are playing) that the virtual content (e.g., Pokémon) exists in the physical world. These findings show how the boundaries between the virtual and the physical worlds disappear even when playing via portable devices that do not provide a natural interface, such as AR glasses. In fact, at least 15% of the Pokémon GO gamers report their sensation that Pokémon is physically present.

b. ***Interpretation of physical objects/locations guided by the logic of the virtual world.*** Experiences in the virtual world and the game contents influence or distort the perception of events/objects in the physical world. The following are some instances:

> First few months of game, I would see a bird perched on telephone wires & in my mind think oh look a Pidgey (Pokémon character) to catch. The instant reality check of "it's a real bird" bought a smile to my face. Even though it was a silly mix-up I got a pleasurable feeling from the experience.

> Especially Gyms and PokéStops seem like real world things to me because I frequent them so much. I don't see a park, I see a PokéStops. I don't see a patch of grass, I see a gym.

Other behaviours, such as performing actions or naming physical animals as characters in the game, have also been reported when playing Pokémon GO. For instance:

> Once by mistake I call Butterfly with Butterfree [the name of a Pokémon which is a butterfly].

2.5 Conclusions, Final Remarks and Directions for Future Research

The development of genuine AR technologies is still in its initial phase. Their use will substantially transform the ways that we access, perceive, interact and integrate information (i.e., visual and aural contents) in our everyday routines as virtual environments have done. Virtual content will enhance physical spaces with plenty of information and create new realities. The AR technologies with the correct interplay between virtual and physical contents will challenge our perceptions and conceptualisations of what is real, similar to certain forms of pseudo-hallucinatory phenomena in GTP that sometimes lead to automatic responses (e.g., emotions, behaviours, thoughts). In the back of their minds, gamers are aware that game contents are not real, but for some moments, they feel as if the contents are real.

Research on GTP has found consistency in most of the factors associated with GTP. Non-AR games and AR games have also shown remarkable similarities in the

prevalence of GTP. Nonetheless, it is evident that the absence or the presence of video game features (e.g., playing with the sound on/off, input control—tactile surfaces and gamepads) and the characteristics of the platform where the game takes place (virtual environment or augmented physical environment) are crucial for the forms and the temporal manifestations of GTP. The key characteristics of location-based AR games (e.g., the option of overlay information, being played in urban contexts) bend the rules of GTP (e.g., that GTP are most likely manifested after playing and that the transfer from the virtual to the physical world occurs) (Ortiz de Gortari 2019).

The main characteristic of location-based AR games is that the gameplay takes place by interacting in the physical context, either by (i) overlaying the game images on the physical context (when gamers use the AR function) or (ii) playing the game through interacting in the physical context, supported by GPS technology.

This chapter has provided an overview and identified the peculiarities of GTP in location-based AR games that are played on portable devices. It has envisioned some of the key factors that will also play a role for GTP (i.e., altered perceptions and mix-ups between virtual and digital contents in everyday contexts) in the games where the players wear glasses or lenses or those with mixed-reality technologies. However, it is important to be aware that location-based AR games that have been investigated to date can be played without using the actual AR feature (i.e., this disables the actual overlaying of digital images on the physical context). Future studies on AR games and GTP that will deal with the analysis of GTP experiences and other variables should differentiate between the participants who play the game using the AR function and those who play without the function activated. It is also essential to keep in mind that location-based AR games are played via portable devices that are held in front of the eyes, leading to slightly different ways of GTP manifestations in comparison to AR games or mixed-reality games played via more natural interfaces, such as glasses (or lenses in the future) or headsets. Future technologies with different inputs to the game (e.g., eye-tracking for manipulating digital content) and outputs from the game (e.g., receiving tactile feedback as coming from the virtual world using drones such as in Microsoft's project "tactile autonomous drones" instead of receiving feedback from gamepads) will also change how and what experiences are transferred between the virtual world and the physical world.

There is a significant educational and therapeutic potential of automatic associations between physical and virtual contents and even of perceptual/cognitive errors induced by playing video games (e.g., misperceptions, source monitoring errors, slips of actions) (Ortiz de Gortari 2018). Nonetheless, memory errors, episodic absent-mindedness and uncontrolled responses to digital images and sounds (e.g., pseudo-hallucinatory GTP), especially when performing activities that involve critical decisions (e.g., driving), require deeper investigation and understanding.

Cognitive mix-ups between virtual and physical contents and altered sensory perceptions, already observed in GTP in virtual environments and location-based AR games, may be magnified when technologies provide us with genuine mixed-reality/hybrid experiences of high fidelity, interfaces with natural controls, and significant interactions with digital contents and characters supported by artificial intel-

ligence. For now, GTP in Pokémon GO appear to be less common than GTP reported in games played in other virtually simulated spaces.

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Chapter 3
The Concept of the Magic Circle and the Pokémon GO Phenomenon

Lasse Juel Larsen and Gunver Majgaard

Abstract When Johan Huizinga in 1938 published *Homo Ludens*, he had no idea the book would father a future research field: *ludology* or game studies. In that respect, inspirations from Huizinga run deep in game studies and many researchers have since tackled questions like: what is play? what is a game? And perhaps most notoriously how should we understand Huizinga's description of the magic circle. This chapter revisit Huizinga's thinking on play, games, and his concept of the magic circle. Subsequently we investigate how the magic circle perform in relation to 'traditional' computer games, is challenged by 'meta-referential' games and is expanded by Augmented Reality games such as Pokémon GO. We present three understandings of the magic circle: (1) expression of a specific physical place, (2) metaphor for player experience, and finally (3) as a mix between the two. We regard and equate the magic in the magic circle with play. Juxtaposing magic as play and the magic circle as relating to physical space, player experience and its mixed combinations to Pokémon GO result in a multilayered expansion consisting of player experiences, social interactions with other players in a playing field that is close to engulf the entire planet.

3.1 Introduction

In the foreword to *Homo Ludens*, Huizinga claims that play is essential for nothing less than human civilization which "arises and unfolds in and as play" (Huizinga 2014, foreword). The statement places play at the heart of what it means to be human and as an almost transcendental force at the center of human culture.

Huizinga's understanding of play is closely tied to his famous formulation: *the magic circle*. The magic circle is only mentioned six or so times in *Homo Ludens*. Yet, it has caught attention and brought about many discussions (Juul 2008; Taylor 2008;

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Salen and Zimmerman 2004; Pargman and Jakobsson 2008; Stenros 2014), among which the magic circle may be understood metaphorically, conceptually or literally. The inherent tensions in the magic circle is centered on the relationship between the phenomenon play and the place where it takes place. Is the magic circle bound to the epistemology of play, the experience of being in play, or tied to formalism, as a description of play and where it takes place? Residing inside rests the notion that play most often is understood in relation to games. As such, the magic circle has given rise to discussions addressing the asymmetric relationship between play and game, between the experience of being in play and how any game is organized in a formal or ontological sense. To highlight this asymmetry, we will draw on the game studies research tradition on play and games to outline how selected game cases demonstrate divergent game systems and in a formal sense how they tie into the magic circle. In other words; we shall look at different game formats through the lens of the magic circle to outline how they (each in their own way) create fluctuations in the magic circle. The selected games cover formats from 'traditional' constructs such as mobile multiplayer games as *Clash Royale* (Supercell 2016), 'meta-games' understood as self-referential or postmodern design deliberately drawing attention to themselves represented by games such as *Calendula* (Blooming Buds Studio 2015), *The Stanley Parable* (Galactic Café 2013), *Doki Doki Literature Club* (Team Salvato 2017), *Max Payne* (Remedy Entertainment 2001) and finally we address Augmented Reality games (Klopfer 2008; Dunleavy 2014; Majgaard et al. 2017; Majgaard and Larsen 2017) characterized by their unique relationship to reality. In this case, *Pokémon GO* (Niantic 2016). Before moving on to the game cases we need to take a closer look at how we can understand the magic circle.

3.2 Introducing the Magic Circle

The magic circle has been subject to both criticism and numerous attempts to understand and explain what the phrase entails. If we turn to *Homo Ludens* and an often-cited passage which also happens to be one of the first times the phrase appears, we get a sense of how to understand the magic circle. Huizinga writes: "all play moves and has its being within a play-ground marked off beforehand either materially or ideally, deliberately or as a matter of course. Just as there is no formal difference between play and ritual, so the "consecrated spot" cannot be formally distinguished from the play-ground. The arena, the card-table, the magic circle, the temple, the stage, the screen, the tennis court, the court of justice, etc., are all in form and function play-grounds, i.e. forbidden spots, isolated, hedged round, hallowed, within the ordinary world, dedicated to the performance of and act apart." (Huizinga 2014, p. 10).

It is noteworthy to draw attention to Huizinga's straight-forward claim that play takes place in a location. We have to assume he means a physical place. It is also of interest that there is no *formal* difference between ritual and play in the sense they both take place in a socially negotiated and rule-regulated "consecrated spot" or a

playground. Play, then, takes place in a play-ground *marked off materially, ideally or as a matter of course*. This seems pretty straightforward if we consider a soccer match. The playing field is marked off both materially and ideally and follows a rule-based matter of course (Juul 2003; Elias et al. 2012). A soccer match takes place in a specific location i.e. the playing field and the activities of play find themselves acted out according to a matter of course regulated by rules. Included herein, we assume, we have a negotiated place, number of teams, players and goals, time (begin, pause and end), thrown-in, freekicks, off-side, corners and penalty kicks etc. This more or less material reading of the magic circle outlines a specific place (playground) isolated from, but still existing within the ordinary world not different in form and function from a host of other activities that follows a rule-based matter of course.

Now we have an initial idea of where Huizinga's play takes place and to some degree how, but little do we know of how he understands play. A few pages later Huizinga summarizes his definition of play, as "a free activity standing quite consciously outside "ordinary" life as being "not serious", but at the same time absorbing the player intensely and utterly. It is an activity connected with a material interest, and so no profit can be gained by it. It proceeds within its own proper boundaries of time and space according to fixed rules and in an orderly manner. It promotes the formation of social groupings which tend to surround themselves with secrecy and to stress their difference from the common world by disguise or other means" (Huizinga 2014, p. 13).

Reading Huizinga's definition of play and keeping his thoughts on the magic circle in mind, it is easy to see how they relate. The magic circle constitutes a "consecrated spot" where play takes place as something quite different than ordinary life. Play activities are "not serious" but still they can absorb the player(s) *intensely and utterly*. This formulation points towards the experience of being in play. In doing so, Huizinga unintentionally bridges formal descriptions of play with the epistemology of play. We leave aside the opaque formulation that play promotes social groupings which shroud themselves in secrecy.

Untangling the epistemology from the formal description of play takes center stage in the following section.

3.3 Play—What Is It?

Caillois (2001) dives in and he goes further than Huizinga's understanding play as "not serious" or "unproductive" when he outright describes play as "pure waste" (p. 5). The distinction between lack of seriousness and wasteful play rests on the traditional Protestant dichotomy between work and play (Weber 1958). Stevens (1978) points out that such a distinction is unproductive and as he writes, "a false dichotomy" (p. 17). Stevens claims that the dichotomy between work and play rests on a confused notion of play arising from mixing formal characteristics of play with the experience of being in play or as he writes, "we are taking the behavior for the experiencing of that behavior" (Stevens 1978, p. 21). In Huizinga's definition, as we

have seen, these two aspects exist side by side unexplained and unaddressed even though Huizinga claims that play *utterly* and *intensely* can absorb players. Huizinga never expands on what utterly and intensely means.

Stevens' distinctions broaden the scope for understanding play, from addressing it from a strictly formalistic perspective to an epistemological venue. Especially beneficial is Steven's separation of "play form" and "play experience" (Stevens 1978, p. 20) since it separates the process of experiencing being in play from a formal description of the structure of play (Larsen 2015). Separating "play form" and "play experience" is more or less echoed by Malaby (2007) when he outlines play as "a mode of human experience […] a way of engaging the world whatever one is doing" (p. 100). The dense quotation actually divides play in (1) human experience, (2) engagement with the world. and (3) related to all kinds of activities. Such an approach is somewhat familiar with Sicart (2014) who seems to be inspired by Gadamer's (2013) transcendental understanding of play as a dynamic that cannot be dictated by volition, but "happens" and "grabs hold of its performers" from the "outside" on its own accord without a formal start or endpoint. It is not until after play has ended, the performers can say whether or not they experienced play. Sicart more or less formalize Gadamers phenomenological points when he stresses play as an appropriative dynamic that 1) "takes over" any unfolding activity, (2) reshapes the context as a result of negotiation, and (3) is tied to a specific situation (Sicart 2014, p. 6–11).

This perspective is familiar with Salen and Zimmerman's (2004) understanding of play which they define as "free movement within a more rigid structure" (p. 304). The definition is interesting since it echoes both Huizinga's and Caillois' emphasis on play as "free", and because free movement refers to "interstitial spaces" (Salen and Zimmerman, p. 304) in predefined structures. These interstitial spaces are exemplified as the degrees older steering wheels can move before the wheels begins to turn. Hereafter Salen and Zimmerman present three categories of play.

The *first* category being *game play* which by the way is widely used term very rarely accompanied by a definition (Leino 2012; Costikyan 2002). Here it simply outlines the difference between being in a running game or being out of game. In prosaic terms, there simply is a difference between before, during and after a soccer match. Thus, gameplay refers to the unfolding activities during play i.e. a soccer match.

The *second* category is *ludic activity* understood as the unpredictability in activities such as how a ball is bouncing "against a wall" (Salen and Zimmerman, p. 304). How it moves, its speed and angle are all aspects of free movement inside a system of shooting the ball against the wall. The focus here is on the players handling of unpredictability inside a system. This is similar to Costikyan's (2013) understanding of uncertainty in games when he directs attention to shifting *player actions* as responses to the exact same and repeatable game system. The player always handles and experiences levels in the Mario-series differently even though they never change. What changes is the players' response to the mapped challenges. And opposite take on unpredictability is presented by Burgun (2012) when he defines games as dependent upon choice designed into the game system and not as choices players invent.

The *third* category *being playful* addresses experience or attitude towards an activity as demonstrating free movement while performing trivial tasks such as walking down the street. This perspective is echoed by Malaby (2007) when he determines play as a disposition "characterized by a readiness to improvise" (p. 209).

Placing Salen and Zimmerman's determination of *being playful* together with Malaby's *disposition* as a specific attitude towards an activity and Stevens' distinctions between *experiencing being in play* from a formal description of play and Gadamer's point that play "grabs us" from a near transcendental position, we can tentatively outline play as (1) a phenomenon, (2) and experience or attitude and (3) something larger that takes hold of us. To complicate matters further we have to insert game to the equation. Play is always situated in some sort of context regardless of whether it is understood as a phenomenon, experience or attitude or an "outside" force. Here is that something a game. So, before we can get a 'firm' grasp of the magic circle, we also need to understand what a game is. It should be noted that we don't claim to solve the object-activity tension inherent in the question. The following section will dive deeper into the undercurrents of how we understand what a game is.

3.4 A Game—What Is It?

Is has proven to be difficult to conceptualize what a game is. The contours of the complexity are already present in Huizinga's definition. Here we find a formal game description entangled in an undeveloped epistemological inclusion. The two, for lack of better words, perspectives have been and are tied to the object-activity complexity in determining what a game is, elegantly demonstrated by Stenros (2017) in a recent article that digs through over sixty game definitions. The inherent tension in game definitions springs from viewing games either as *objects* (systemic artefacts) or socially negotiated *activities*. Two perspectives that simultaneously encapsulate a game centric approach addressing game ontology and a player centric approach investigating player epistemology.

Historically, the game centric perspective has been guided by more or less formal definitions of games (Caillois 2001; Juul 2003; Schell 2008; Fullerton 2008; Costikyan 2002; Salen and Zimmerman 2004; Burgun 2012; Suits 2005). From this perspective games are closed rule-based systems, entered voluntary, with variable and quantifiable outcomes, artificial and unnecessary obstacles, clear goals, feedback, endogenous meaning and players. Other scholars, game researchers and designers find themselves moving away from strict formulations to avoid ensnaring definitions. Instead, they point toward games resting on traits (McGonigal 2011; Elias et al. 2012). They see games as genres and experiences not always with overlapping recognizable structures. Games are affiliated with each other through traits. It is a move away from ontology towards epistemology, away from a game centric toward a player centric approach concerned with *how* players experience games, *what* kinds of feelings they get from playing, (Isbister 2017), *which* mental states they achieve

(Chen 2007) or which social awkward situations they generate (Wilson and Sicart 2010), and perhaps which recognitions or insights players achieve about themselves, others, life or the world (Sharp 2015).

Still transgression attempts have been proposed to tackle the object-activity conundrum. Aarseth and Calleja (2015) inspired by Wittgenstein have proposed a super category (cypermedia). It is a descriptive model that takes sign, mechanical system, materiel medium and players into considerations. Games belong to the cybermedia category, but what is most important is that the game category is dependent on players' determinations of games i.e.: *if players say it is a game it is*. This means we are left with a dilemma where our *views* or *perspectives* on games determines our definitions or understandings of games. A position similar to Sutton-Smith's (2001) 7 rhetoric on play, each representing the perspectives of play researchers. The relationship between reality and perception of reality is not an easy problem to tackle. A possible solution to the problem between game determinations and player experiences might be found in an investigation of how play and game relate to the magic circle.

3.5 Analyzing the Magic Circle

The idea of the magic circle is to describe how two different spaces and/or states are separated by a clear boundary. There is an inside of the game, an outside of the game, and a boundary between the two. It is the distinction Huizinga outlined when he wrote about play as separated from ordinary life. This understanding equates 'circle' with the physical space where the game takes place, much like a boxing arena or a soccer field. When the game is in motion game rules apply to the activity and when the game ends normal rules preside again (Zimmerman 2012). It is a formal distinction between game and reality. Transgression of the boundary, moving from being outside to inside, rests on a social contract (Montola 2009). A social contract entered voluntarily as Huizinga and Caillois point out. This perspective represents what has later been called the "strong-boundary hypothesis" (Pargman and Jakobsson 2008). It dictates a strict division between the game on one side and reality on the other. At times, Huizinga, seems to advocate for the "strong-boundary" only to point towards games as socially negotiated. This has made Calleja to critique of the magic circle. Especially what calls the "binary myth" (Calleja 2008) thought to demark what is *in*-side the game and what is *out*-side the game.

We suggest that the "strong boundary hypothesis" or the "binary myth" only works from an ontological naïve perspective where games are conceived as static objects frozen in time. When games are thought of as objects void of activity. It is a perspective cleansed of epistemology.

A further and important complication have been described by Pargman and Jakobsson (2006). They have outlined how the magic in games disappears when players shift attitude from the subjective stance of being in play to regarding the game activity objectively. Doing so transforms play to work. Silverman and Simon (2009) have fol-

lowed this perspective and investigated how work logic impacts gamer subjectivity. They found that work logic applied to gaming created hyperrationalism characterized by disciplined playless desire for control (Golumbia 2009; Malone 2009). Such perspectives are interesting since they unwillingly carve out play as vehicle for the 'magic' in games. The magic, following Gadamer, is "the transcendental grip" that captivates us. If these assumptions are right, then 'magic' has nothing to do with game properties speaking from an ontological naïve position. Instead, it seems, 'magic' has everything to do with play attitude, of experiencing play, being caught by and staying in play. When players drop out of play while interacting with a game, a systemic structure is opened up for hyperrationalization. Every game is exposed to this position.

Summing all this up lead to a perspective where we have games with no magic (no play) and therefore no circle of play. In one stroke the magical circle has disappeared, leaving behind hyperrationalized behavior striving for control and power within in a system game structure. This is, of course, radicalized. Still the perspective serves a pedagogical purpose. Now, it seems, we have an ontological naïve take on games associated with a strict boundary (strong boundary hypothesis) between games and everyday life contrasted by an equally naïve epistemology on games that erases the same boundary.

It should be clear that these distinctions are simplified caricatures serving to explicate far ends of a spectrum. Still they produce insights. First that 'magic' resides in play and not in the formal structure or ontology of the game. Second that player attitude has to be included when addressing the magic circle.

Mixing the two rest on a negotiation between player *and* the game. A social construct which implicitly or explicitly a creates a play contract that Suits (2005) coined the 'lusory attitude'. Only then can players be 'captured' by play (Gadamer 2013). Such play contract also rests on negotiations between players (Copier 2005). But, social negotiations or contracts constitute points for potential fluctuations in the boundaries of the magic circle. Negotiations can take place before, during and after play sessions (Montola 2008) just as it happens in Pokémon GO when the player determine when to play, what to do, and with whom to play. Fine (1983) has elegantly pointed out inspired by Goffman's frame analysis (1974/1986) that the player easily shifts between a reality frame (common sense world), a game context frame (rules and constraints) and a character frame (in-game identity separates from reality). Montola (2008) later refined Fine's frames dividing them in the *social frame* when players lay out the rules and behaviors for playing such as agreeing on rules like: do not speak on your phone while we play Pokémon GO; the *game frame* where players discuss in-game issues such as how much damage can your Pokémon do; the *diegetic frame* dealing with actions either prohibited or allowed according to mythos, topos and ethos (Klastrup and Tosca 2004) and of course storyline of the played adventure such has where are specific Pokémons likely to be found, where do they reside. Movements between frames create possible break points in the magic circle. Too long discussions about when and where to combat gyms populated by Pokémons from an opposing faction, dealing with players not showing up or leaving too early, handling discussions about which Pokémons to fight with, and players

not having enough food to restore "dead" Pokémons in order to retry to take down the gym are all elements that challenge the play contract, lusory attitude and magic circle.

The highlighted social dimension of negotiations points toward a heterogenous and not a naïve epistemology of play in relation to the magic circle and as we shall see they are applicable to a host of different game formats.

3.6 Playing Games Playing with the Magic Circle

Until now we have addressed the magic circle from either an ontological or epistemological naïve point of view, equated the magic with play, and the circle with a physical geographic place. Even though Huizinga's descriptions have been perceived as a metaphor (Juul 2008; Zimmerman 2012). The metaphorical understanding inject epistemology into Huizinga's description of the magic circle. It equates the magic circle with a mental state, a psychological emotion or place players losses themselves to when in play. It is a mix of the games simulated space (Swink 2009), the physical place (Aarseth 2001) and the attitude and experience of being in play.

It then seems as if two understandings of the magic circle emerge. One refers the magic circle to a physical place, a geographical playing field. The other refers the magic circle as a simulated place which player are involved in whether we understand involvement as a mental state or an emotional psychological experience. It is of course troublesome to have two understandings side by side both referring to the magic circle. What makes it even worse: in some cases, the magic circle covers both at the same time and that happens in Pokémon GO.

In Pokémon GO whether the games take place ad hoc anywhere where players seek out Pokémons in the wild or fight Pokémons in gyms equivalent to a ritualized place player enter the magic circle. Often, they also become absorbed by the game activity. The play activity in Pokémon GO aligns itself well with both understandings of the magic circle. Still, seeking out Pokémons in the wild players can, as Fine (1983) pointed out, move between different frames. They can stop and buy a cup of coffee, make a call on the phone, or suffer interruptions from outside sources such as non-player persons getting in the way of the game. All acts potentially threatening the magic circle.

In traditional game cases such as the single player computer game like the renowned *Civilization*-series (1991–) by Sid Meier refers the magic circle to the epistemology of the player experience. Here players experience is stereotypically referred to as a state where players are 'away', 'somewhere else', 'out of reach' or 'not here'. This observation points to the ontological discrepancies between being physically present in the world or subjectively engaged in a game (Salen and Zimmerman 2004) on the screen. When outsiders try to get in contact with engaged players, they often exhibit signs of frustration. The interruption bothers them. Players don't want the magic in the game experience to stop (Schoenau-Fog 2011). In Pokémon GO such interruptions are two-edged: one side interruptions disturb the

magic circle bringing players out of play. On the other side can interruptions service deeper involvement such as when fellow players give each other hints about a just sighted legendary Pokémon. Such hints elevate attention and propels player engagement further deeper into the magic circle.

In multiplayer game scenarios the magic circle fluctuates in a different way. In games such as *Fortnite* (Epic Games 2017) players move around in a simulated space with other players all fighting against each other in an effort to be the last avatar standing. Very different from Pokémon GO where players have to move around physically.

Fortnite share temporal structure with *CS:GO* (Valve 2012), *Team Fortress 2* (Valve 2007). When players die they are pushed out of the continuous play stream. The games don't stop running when the player dies as was the case in older games like *Civilization*. These newer temporal designs are organized in such a way that the game continues without the dead player (they can reenter after a short time span). From a running game-time perspective *Fortnite*, *CS:GO* and *Team Fortress* are different from older single-player games, still they are fairly traditional in the sense that they have a predetermined allotted time frame i.e. 20 min or whatever the players agree on.

These time designs adhere to 'traditional' game design. It upholds an internal reference (Walther 2006) system that creates stable meaning (Costikyan 2002). These games do not challenge the borders of the magic circle. They do not expand beyond their limited temporal frame.

Pokémon GO's in-game time structure is a one-to-one relationship with local time zones. There is no time compression which allows time to follow reality at the location of the player. If it is night outside, it is night in Pokémon GO, if it is daytime, it is daytime in Pokémon GO. The game runs 24/7 year-round. A similar time design can be found in *World of Warcraft* (Blizzard Entertainment, 2004–). Unlike the real world where time and life are stitched together, they are separated in Pokémon GO. The game worlds run independently of the player. Players simply log in and out on their own accord.

Having a one-to-one time structure challenges the epistemology of play. Players can lose themselves everywhere and anytime all the time. There is a significant drawback to this design. Players will never be able to take full advantage of the game possibilities. They are always behind in relation to the games internal clock. It is impossible for players to always keep up in relation to the game. A design choice that creates internal player pressure that forces players to regard in-game progress in relation to other players instead of game dictated goals, storylines or achievements. This time design inherently challenges the magic circle. It goes mostly un noticed since it is "hidden" in plain sight.

Postmodern games are very different that Pokemon GO. They openly challenge the magic circle by making in-game references that shift players attention toward the game as a game. It is play with play itself. To give a few examples: in *Max Payne* (Remedy Entertainment 2001) suspects the main character, Max, in one of the game's graphic novel story pages that he is in-side a computer game. A suspicion triggered by Max's observation that there is a lot of shooting blended with a sensation

of being controlled by outside forces (e.g. a player). He concludes he must be in-side a computer game. Such meta-references unmask the game's coherency and draws attention to the game as a game. It transgresses the play experience and players become aware of themselves as playing (Frasca 2006) a computer game. The same scenario can be found in *The Stanley Parable* (Galactic Café 2013). Here the narrator speaks directly to the player when he or she is searching for the game character Stanley. Especially when the player has to decide whether to follow in Stanley's footsteps or choose a different path through the game world. Such meta-references are concealed in games like *Fortnite* or *CS:GO*.

Meta-games have other means of drawing attention to themselves. It happens when they isolate, single out and manipulate one aspect of what is normally seen as an integral part of a game. In *Calendula* (Blooming Buds Studio 2015) the player tumbles and get stuck in the game menu unable to navigate a way to the 'real' game. At some point the player realizes that 'playing' with and getting lost in the menu actually is what the game is all about. On the surface, the player is hindered from playing. *Calendula* deliberately plays with player expectations. Below the surface *Calendula* is a game that resists its player, works in opposition by not letting the player play as usual. *Calendula* stands up to play by drawing a line in the sand and not allowing 'play' anywhere near the game. Indirectly questioning all kinds of games and play. Making the player think not only about *Calendula*, but all games, their structures and related play experiences.

Similar fluctuations in the magic circle manifest themselves when games address their own 'materiality'. Doing so by pointing to the fact that they are generated by code and files executed on a computer. *Doki Doki Literature Club* (Team Salvato 2017) is such a case. In an interactive anime-inspired story line mixing dating, coming of age with horror elements, the player finds him/herself in distress after the first playthrough that ends with a game character committing suicide. The player finds the young girl hanging from the ceiling of her room. When players try to go back and see if they can achieve a different outcome, they find all the saved files gone. The second-best option is to start the game again, but the character is still dead. She even appears in pixilated glitchy flashes almost as a ghost. The design deliberately draws attention to the game's coherency. At some point the player has to delete files from the computer to manipulate the game content (characters).

Such designs either diminish or enhance the game's playing 'field' depending on the player's perspective. No matter how the player chooses to regard the game, one thing is certain: It provokes the player's attention, challenges the standard conception of games as coherent wholes with solid and working internal structures. Provoked, the player sees the game's 'materiality' and the medium on which it is executed.

Taken together meta-referencing serves as a tool to perforate the magic circle epistemologically by making the player self-aware of the play activity as an activity which in turn directs attention to the ontological state of the game as a game. The same fluctuations, in reverse though, happens when games transgress the 'material' boundary as in *Doki Doki Literature Club*.

Pokémon GO (Niantic 2016) is not a meta-game as *Max Payne* and *Doki Doki Literature Club*. It draws attention to itself by a one-to-one temporal and spatial alignment to the magic circle both understood as a physical place/space.

3.7 Pokémon GO, Augmented Reality and the Magic Circle

Pokémon GO is not only in a one-to-one dialogue and dependence on the local time zones it is also in a one-to-one relationship spatially. The game draws on Google maps. The translation between game and reality is simply: when you walk 100 m down the street in real life, your game character walks 100 m in the game. This design highlight correspondence between the game's temporal and spatial structure and reality as such belongs Pokémon GO to one of the two archetypical ways in which augmented reality games can manifest themselves. They can be picture-based and the location-driven (the last possibility with different time structures).

From the perspective of the magic circle transforms such a design the entire planet into a 'consecrated spot' or playing field, see Fig. 3.1. There is no exclusive playing field since it is everywhere. Pokémon GO spatial and temporally expand the magic circle. It extends and encapsulates everywhere and anywhere and align itself time duration and zones. In other words, it is impossible to escape the temporal and spatial boundaries of Pokémon GO except when we fly above the mobile data grid. It should be pointed out that Pokémon GO's world is 2D. It doesn't account for the height of buildings or sea levels. In that sense, it is flat which means you can catch a Pokémon next to your location whether you are on the ground floor or standing at the top of Empire State Building.

The 'traditional' and 'meta-games' mentioned earlier was limited temporally and spatially. In Pokémon GO is the play experience is not confined to a limited 'consecrated spot' neither in front of a screen nor on a geographical playing field. Players can engage in Pokémon GO on street sidewalks or in the middle of traffic. Engaged players regularly trespass to catch Pokémons transgressing real-world social aspects such as what is allowed or prohibited either by common sense or sanctioned by law. Here players display being "grabbed" by play from something (a game) outside themselves. Still the magic circle can be challenged by non-playing people outside (Walther 2011) the game world who are either passing by, looking at players or accidentally bumping into them. On the other side can the magic circle be reinforced by fellow players creating temporal and spatial pockets of interaction between strangers (McGonigal 2011; Montola 2009). Not only do the player have a shared interest in catching Pokémons, they also help and inspire each other (Majgaard and Larsen 2017). All in all, do interruptions in the real world influence the play experience as well as impacting the game world.

Fig. 3.1 Left and right, Virtual Pokémons on top of physical environment (Photographer: Stig Stasig)

3.8 Informal Communities and the Magic Circle in Pokémon GO

The game mechanics (Sicart 2008; Burgun 2015) and rules (Elias et al. 2012) of Pokémon GO is built to encourage players to explore the game's possibilities. Such a call for player exploration is tied to player types such as explores, socializers, and achievers (Bartle 1996; Yee 2005). In the game this call is explicated by the trainer that tells players to venture out, to seek and find and develop Pokémon's. Turning them into strong and powerful beings. Such effort (Juul 2003) is navigated by walking from PokéStop to PokéStop in order to explore, gather and hunt (Majgaard 2016). Shortly after the game was published in 2016 players gathered in larger groups in areas with many PokéStops. In Copenhagen the beautiful Royal Library Garden became a sanctuary for Pokémon players of all ages, see Fig. 3.2. The narrative among players allegedly was that Pokémons tended to spawn more frequent when there were more players and PokéStops in close proximity. At the time, the Royal Library Garden held six PokéStops within reach of each other. This design meant players did not have to walk as much to catch Pokéballs and Pokémon's. About six month later, most of the Poké Stops were moved to a nearby parking lot in order to restore peace and quit in the old Library Garden. The nearby parking lot never became sanctuary for

Fig. 3.2 To the left, players in the beautiful Royal Library Garden. To the right, a Map from Pokémon GO showing PokéStops with active Lure Modules also from the Royal Library Garden (Photographer: Authors)

Pokémon players. Instead it moved to a new location, a shopping center not far from the Royal Library Garden. The shopping center bought over 20 PokéStops eying an opportunity to capitalize from the game's success by attracting more costumers.

Active Lure Modules on the PokéStops accelerated the presence of Pokémons for 30 min. Such effects affected every player near the PokéStop. Observations in the Royal Library Garden showed all PokéStops to have active Lure Modules, see Fig. 3.2 to the right. The high level of activity afforded by a high number of players and Lure Modules on PokéStops transformed the singular play attitude into a collective play experience where players together could dwell in the game's magic circle while at the same time socialising with fellow players. Here players seamlessly could move between social, game and diegetic frames discussing everyday stuff while at the same time being engaged in catching Pokémons.

Players have since the game's release sought the ability to trade Pokémons. It wasn't until recently this option got implemented in Pokémon GO. It could seem a trivial thing to add a trading option, but it isn't. It forces players to meet up in reality to exchange a Pokémon for Stardust-money thereby accelerating player agency and following engagement with the game. The design change reinforces the game's social interaction among players adding to the collective play experience and recalibrate

the magic circle dual move toward both the game structure and physical reality. Such efforts can also be found in the in-game gym design. It too has undergone several changes since the initial release of Pokémon GO. In the beginning minor groups could conquer a Gym to earn the game currency usable only in the in-game shop. In the initial gym design, players could single handedly conquer a Gym. No assistance needed from fellow players. Later implementations introduced raid battles forcing players to meet up in physical reality and combat gyms. Here players could also join raids with strangers just as in a multitude of online multiplayer games. The goal of joying a raid and combatting a gym was to defeat the powerful Pokémon residing there. If successful, players got a chance to catch the residing Pokémon which often was a rare or legendary Pokémon. This design modification changed player behavior from solitary presence in the magic circle to a cooperative play style (Fullerton 2008). These two developments propelled the physical, virtual and social community around Pokémon GO and added elasticity to players ability to play.

3.9 Virtual Forums Around Pokémon GO as Extension of the Magic Circle

The virtual community around Pokémon GO can be viewed as an extension or augmentation of magic circle. When Pokémon GO was released, Niantic left out a rich game manual or virtual gamer forum. The idea behind this design choice was to promote and appeal to the before mentioned explorative, socializer and achiever player profiles. Considered and deliberate shortcomings opened up opportunities for creation virtual communities such as support sites distributing apps ranging from crowd sensing (Wang 2017), Pokémon spawn sites (Pokémon GO Map 2016), battle advisors (Battle Advisor 2016), and evolution guides on how to evolve Pokémons (Pokémon GO Evolution 2016) to social media platforms such as Facebook, YouTube and Snap Chat where players discuss and share progress and news about the game.

On Facebook, strangers shared meaningful player experiences (e.g. the Danish Pokémon GO Facebook group more than 13,000 participants). The dominant themes were: discussion of how-to development rare Pokémons, the rules associated with evolving Pokémons, game bugs, sharing screen shots of Augmented Reality situations, screenshots of rare and special Pokémons and promotion of personal milestones. In the virtual community, players met up and discuss with peers or experts. The users of the Facebook group Pokémon GO: Denmark can be viewed as a platform for legitimate peripheral participators (Wenger 1998). Newbies learn from experts and gradually become experts themselves. Additionally, the virtual community can be viewed as an extension or expansion of the magic circle adding to the elasticity in player experiences of playing Pokémon GO. The same goes for the opportunity to include fellow players. Gamers seem to need forums to discuss resent game developments, bugs, and to promote achievements among fellow players. This dialectical movement between players in-game reactions as well together with out of game dis-

cussions about the game and the game developer's response demonstrates a spiral shaped propelling the evolution of Pokémon GO and the game's magic and the magic circle.

3.10 Conclusions

In this chapter, we have investigated the magic circle and found not one but three different interpretations, each with its own implication for how we understand playing and gaming. The first understanding of the magic *circle* placed emphasis on a physical place different from everyday life where play unfolds. The second understanding of the magic circle draw attention to the *magic* of the magic circle and the mix between play experience and a more or less static simulated space with no significant reference to physical reality. The third understanding of the magic circle blended the two conceptions exemplified by the Augmented Reality game case, Pokémon GO. Here the one-to-one relationship between game time and real time *and* simulated and real space acted as a guide for understanding the *magic circle*.

Subsequently, we argued that play was the carrier of the *magic* in playing games. In a spectrum ranging from naïve ontology to naïve epistemology we found that naïve ontology sees a clear difference between everyday life and play while naïve epistemology is found in hyperrational game activity dispelling play from the activity equating it with work.

The continued investigation highlighted how game formats ranging from 'traditional', 'meta-referencing', and 'Augmented Reality games' align themselves differently temporally, spatially and socially in relation to the magic circle exposing diverging layers of possible fluctuations in the experience of play. Here Pokémon GO serves an emblematic and special case via its one-to-one temporal and spatial correspondence with reality along with design decisions that meet explorative, socializing and archiver influenced player types and play styles. It demands rethinking the different frame layers and elasticity of the magic circle. It now includes in-game player to player interactions trading Pokémons with friends and strangers live in the playing field and out-of-game discussions in a host of different virtual environments. As such serves provokes and expand Pokémon GO the limits and elasticity of the concept of the magic circle, but also play as a phenomenon in itself.

Ludography

Calendula (Blooming Buds Studio, 2015)
Civilization (1991– MicroProse, Activision, Hasbro Interactive, Infogrames, 2K Games)
Clash Royale (Supercell, 2016)
CS:GO (Valve, 2012)
Doki Doki Literature Club (Team Salvato, 2017)
Fifa (EA Sport, 1993–)

Fortnite (2017, Epic Games)
Max Payne (Remedy Entertainment, 2001)
Pokémon Go (Niantic, 2016)
Team Fortress 2 (Valve, 2007)
The Stanley Parable (Galactic Café, 2013)
World of Warcraft (Blizzard Entertainment, 2004–)

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Chapter 4
Mediation Theory Between Pokémon GO and the Everyday World

Nicola Liberati

Abstract This work aims to study the effects of augmented reality (AR) on the everyday world. Many studies already highlight the relations between digital and real by showing how digital objects affect our perception of the everyday world. However, they focus on these effects as if there was an everyday world from which to start and to which add these digital objects. This work focuses on a different perspective by showing how the meaning given to the everyday world is already founded on the use of these technologies. The values we find in our everyday experience emerge from the possible interactions with new technologies. The use of *Pokémon GO* then do not merely shape our everyday world by providing new digital elements in it, but it also reshapes the way we live and the way we think of our lives in the everyday world even when we do not use that technology.

4.1 Introduction

Digital technologies are becoming pervasive. They are getting into our everyday lives. For example, they start to be directly mounted on us (Bell et al. 2003; Almeida 2015), and they are "always on" (Fredette et al. 2012). Wearable computers and smart textile (Schneegass and Amft 2017) are literally part of our clothes, and the entire idea underlying.

Ubiquitous computing is having "calm" technologies working in the background and in the periphery of our attention constantly connected to us (Weiser 1993, 1996; Liberati 2016).

The presence of digital technologies, however, is not limited to their pervasiveness in the way they are physically present into our everyday activities, but even their products, which are sometimes not "physical" at all, are deeply intertwined into our lives. For example, augmented reality clearly highlights how the digital content is also available in the everyday lives of people as objects visualised in the surroundings.

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Pokémon GO is one of the best examples of an augmented reality pervasively used by society which produces digital objects visualised as part of the everyday world. *Pokémon GO* is an application which enables the users to visualise Pokémon as intertwined in the surroundings. They are trackable through the use of a mobile device thanks to GPS locations embedded into the digital creatures which anchor them to specific locations in the real world. Once they are visualised through the mobile device, they can be captured and collected.[1]

These few elements enabled the game to literally make a consistent number of players walk around, organise special trips, and gather just to find and collect more digital creatures. Therefore, the "real" world and the "virtual" one[2] start to be directly intertwined since digital creatures start to populate specific places on earth and to attract the players "distracting" them from their everyday activities. This intertwinement between real life and digital objects produces concerns from many different angles.

Especially, the opposition between what is real and what is digital founds an entire discourse on how the digital world could "compromise" the real world by giving too much space to the digital elements in our everyday lives. Firstly, it is not clear if these objects can be considered "real" even if they are visualised in the surroundings. Secondly, it is not clear if they have effects on the real world even if they are part of a game, and how much this introduction affects what is "real". This chapter will provide elements to answer these questions using *Pokémon GO* as an example of digital objects over imposed to the real world.

The paper will be structured in two main parts. The first one will focus on the phenomenological approach of the reality produced by the augmented reality game *Pokémon GO*. Especially, this part will analyse the game according to the philosophy of Husserl and Schutz.

The second part will focus on the analysis of the interactions between the world generated by the application *Pokémon GO* and the "real" world. In this part, we will highlight how the "real" world is affected by the presence of these digital creatures, and we will show how what we think of "real" is deeply intertwined with the presence of these digital objects. It will be clear we can overcome the opposition between real and digital world since the digital elements shape what we mean with "real" even if they are "digital."

[1]Through the time, the application developed novel features enabling people to better interact with each other for example by joining their "forces" against powerful Pokémon.

[2]We will use the distinction between "real" and "virtual" according to the famous distinction proposed by Milgram (1994). Even if there are other ways for classifying augmented realities (Hugues et al. 2011), this "classic" distinction provides us with a background to analyse the relation between what is the "real" world before the augmentations and the "augmented and virtual one."

4.2 Phenomenology and Pokémon GO

In order to answer our questions, in this first section, we will introduce phenomenology and especially Husserl's and Schutz's phenomenological approaches.[3] These two approaches allow us to understand what kind of objects the Pokémon are in relation to the everyday world.

Husserl will allow understanding if these objects have the potentiality to be perceived as real objects in the world or if they are confined to be fictions which might be visualised in the everyday world, but which are not like other "real" objects. Schutz will allow us to understand the relations between the two different worlds: the augmented reality where the Pokémon are visible, and the real world. It will help us to see the relations binding the praxes of the subjects in these two worlds and how they are intertwined together.

4.2.1 Looking into Another World Within a Frame

According to Husserl's phenomenology, there is a clear distinction between perceiving objects in the everyday world and fictional objects. The objects perceived in both the cases can be identical in many aspects like in shape, colour, and other details, but the way subjects perceive them is entirely different.

A classic example could be the case of a painting such as Napoleon on a white horse in the painting *Napoleon at the Saint-Bernard Pass*. The moment the subject is in front of the painting, they perceive Napoleon, but that perception does not mean the person Napoleon is alive and riding a horse in front of them as if the person were in front of them in person.

The experience of perceiving Napoleon is wrapped into an "as if" aura which allows the subject to perceive Napoleon even if the real person Napoleon is not in front of the subject. The perceived Napoleon is "fictional" because it is "as if" he were in front of the perceiver instead of being really in person in front of the subject (Husserl 1980; Liberati 2013).

This contrast is highlighted even more in the case of theatre and cinema. In both of these cases, the audience perceives what is happening on the stage of the theatre and on the screen of the cinema. They immerse themselves into the play and have emotions related to it, but, at the same time, they know there is a clear distinction between what is happening on the stage and on the screen and what is happening outside the theatre and the cinema (Casebier 1991; Sobchack 1992). The audience might perceive even a murder happening on the stage and on the screen "as if" it were real, but nobody calls the police since the validity in the real world of such an experience is "suspended" or, as Husserl says, the positional act related to such objects is suspended (de Warren 2010, 2014).

[3] A preliminary analysis of Pokémon Go and phenomenology can be seen in Liberati (2018a).

This kind of "as if" perception is produced by the way people relate to the fictional objects. They do not merely perceive the objects, but before it, they need to be immersed in the world of those objects. They have to "enter" in the fiction in order to accept the objects in it. This process is called by Husserl "seeing-in [*Hineinsehen*]," or, following the translation by Lotz, "looking into" (Lotz 2007). The subject has to "project" himself into the world of fantasy in order to perceive it. The frame of the painting represents a window opening to a different world where these objects are.[4]

The murder on the screen might not be relevant for the real world, but the moment the audience is captured within the world of fiction the actions are perceived as real and effective. The entire body of the audience is affected by the "fiction" they are perceiving. The heartbeat increases in the scenes with pathos, the breath is stopped on specific moments of the plot, in the case of films in 3D the subject could also be tempted to tilt their heads to elude an incoming object, and so on (Liberati 2015a). Therefore, the moment the subjects look into the world of fiction, they start to live in it "as if" that reality were real and effective for them. There are two worlds the subjects have to deal with: the real world, and the world of fiction.

In the cases we took into account, the "frame" or "window" opening to a different world is physical and clearly determined. The painting of Napoleon has the wooden frame which clearly shows the borders of the "window." The screen and the stage are clearly defined and delimited by physical boundaries.

In augmented reality, we do not have such a situation. Augmented objects are designed to be visualised directly in the everyday world and not in a specific place such as on canvas or on a stage. Obviously, the objects around have to be perceived through the screen of a device which allows their visualisation. For example, in the case of *Pokémon GO*, the device is the mobile phone of the users which allow the visualisation of the Pokémon thanks to their screens. However, the locations of the objects perceived are not within the fictional world within the mobile phone, but they are outside in the "real" world as the other objects of the everyday world. Therefore, the augmented objects can be seen as in the surroundings and not merely on a screen or a kind of "digital canvas." They are visualised through the devices, but they are in the surroundings.

For example, in the case of Napoleon in the painting, the entire background of such a vision is a complete world which is other than the real world. The same happens in the case of cinema and theatre. The locations shown in the film and in the theatrical act are not the "real" locations. This does not happen with the case of *Pokémon GO* since its background is the everyday world.

This "simple" modification changes completely the relation with the objects and the way people perceive them. The very idea of "looking into" cannot be applied anymore since there are not two worlds clearly divided and identified by frames. However, this way of being intertwined with the everyday world is not enough to make them real objects as other usual "real" objects.

[4]By entering, the subjects do not merely "accept" the objects and the reality where they are, but they live in the different world "as if" it were real.

4.2.2 *Looking into Another World Without a Frame*

It is possible also to "look into" another world even in the case the frame is not so explicitly given. Theatres provide the stage for the actors which can be seen as a "frame," but there are also actors who do not act within a stage. For example, actors could act in the middle of a street do not use a stage, but they interact directly with people. Therefore, the creation of the "fictional" world is not merely related to the possibility of having a physical frame, even if its presence might help, but it is related to the fact the subjects "look into" a different world. Thus, it is the "simple" action of projection of the subjects into a different reality which is the founding element of fictions according to phenomenology.

Therefore, the fact there is no "physical frame" in the Augmented Reality of *Pokémon GO* does not mean it does not provide fictions. Moreover, the way people access to these digital Pokémon seems to suggest that the subjects have to "look into" the world of Pokémon in order to be able to play with them. Therefore, it seems to suggest these objects are valid only the moment the users "look into" the world generated by the game.

Schutz provides specific elements which enable us to identify the "real" objects, or, as Schutz called them, the objects part of the paramount reality (Schütz 1962; Waltemathe 2014; Ayaß 2016). These elements can be used in our case to understand better if the Pokémon are fictional entities perceived without a frame or real objects. Schutz identifies the "real world" as the paramount reality which is the world founding every other possible experience. A subject might have dreams, or live in a game for a while, but these experiences are founded on the existence of a world outside of it which provides them the point of access. According to Schutz, the objects in the paramount reality have specific elements which make them "real." The objects are "always" present, they are "resistant," they can be "transformed" by people, and people can "communicate" through them (Schütz 1962; Berger and Luckmann 1991; Liberati 2014, 2015b).

Without going into details, we can focus on the first two elements: the "always" presence of these objects and the "resistance" they oppose to the users. Objects of the paramount reality are always present, and the subjects have to deal with them. Moreover, these objects oppose resistance to the subjects, and they cannot be simply ignored. For example, the wall which divide two places is an element of the paramount reality since it is always there, and it does not disappear. The subjects cannot just ignore it because it opposes resistance to their intention to pass it through.

Digital Pokémon do not have these two characteristics. They are not always present since their existence is merely related to the application running on the mobile devices of the users. Moreover, they are not resistant at all since people can simply ignore them by closing the application. Therefore, they cannot be considered in the same way of objects of the paramount reality like a wall between two places. Pokémon are not objects of the paramount reality, but, as Schutz calls them, they are objects of finite provinces of meaning which are worlds generated from the paramount reality and which contain objects which are valid only from their within. These objects are

perceived as fictional because they are simply enclosed into the world produced by the application.

Thus, in the case of *Pokémon GO*, users still have two different worlds in which to live: the real world where they do their usual activities, and the world produced by the application in which they play. Therefore, even if the game does not provide any "frame" because it places the digital objects in the real world, it still provides "fictional" objects and not real ones.

4.3 Multiple Realities and Their Effects

4.3.1 A Phenomenological Approach

Thanks to Schutz, we showed these objects cannot be "real" as other objects even if they are visualised in the everyday world.

However, their "fictitiousness" does not preclude them the ability to change the paramount reality. As we have already highlighted, fictional objects like the ones we can find in films can affect the world and the audience in their bodies by modifying the breath and the heartbeat of the subjects watching the film.

Moreover, it is clear the "simple" fact the *Pokémon GO* application does not have any frame allows the application to affect every location of the world. They are available everywhere and at any time, as far as there are an internet connection and the right mobile device. Thus, it is possible to think of interactions between these two worlds everywhere and at any time.

Schutz clearly highlights the possibility of having interaction between worlds by introducing the possibility of "enclaves" where different worlds intertwine one into the other (McDuffie 1995). Which means subjects can jump from one world to others so quickly that the meanings and actions performed in one reality affects what the subject is doing in the other. An example could be the case of a person playing to a video game. The act of playing to a video game requires the subject to be completely immersed into the reality of that game (Goffman 1974). The player, however, is also part of the paramount reality since he/she acts in it while playing to the game. He/she might also intertwine the actions related to the game with actions related to the paramount reality like sipping a coffee or drinking a glass of water. Therefore, it is possible to pass from one reality to the other easily, and this tight intertwinement between actions in the different worlds yields the different worlds to affect each other. In a game which allows the subjects to intertwine their actions everywhere and at any time like in the case of *Pokémon GO*, the way the worlds affect each other becomes even more prominent since there are no clear boundaries on where the game starts and ends.

A classic example of such effects is the way *Pokémon GO* can shape the path walked by players in their daily routine. By placing specific locations which are important to the game, the subjects could decide to modify their usual commuting

route just to pass through those locations. This simple modification could cause effects in the world which affect other users and even people who do not play at the game. For example, it could allow the players to meet each other in those locations. People who do not play could be affected like in the case of a significant number of players deciding to gather and producing traffic jams in places which were not supposed to support many visitors. Thus, by adding objects in real locations, the game affects the player in their usual activities, and it also affects the people who do not play.

4.3.2 Mediation Theory and Pokémon GO

The worlds are not isolated, but by producing a digital content within a fictional world of a game, it is possible to shape actions, intentions, and activities of the subjects within the real world. This position also assumes a basic distinction between these worlds. One world affects the other, but they are still divided and separated. The "real" world is "merely" affected by the world of the game.

The case of people gathering in one place producing effects in their daily activities and in the activities of the others who do not play to the game clearly shows this element. There is a distinction between the two worlds even if they are intertwined one into the other. The world of the game is "applied" to the real one. It does not change what is real even if it forces the non-players to change their habits in it.

This position leads to many different approaches which attribute a kind of "original value" to a primordial world on which the augmented reality is based upon. The real world is modified by the presence of this new technologies, and such interference can be taken as an "augmentation" or a "corruption" of the real world. This kind of assumption can be detected in many different authors who clearly criticise the "digital" effects of new computer technologies as tools which detach people from the "real" world. For example, Sherry Turkle clearly shows this aspect by highlighting how the introduction of digital ways of being together affects our ability to be together in the real world (Turkle 2011, 2015; Adams 2015).

Pokémon GO, by affecting the "real" world, could be seen as corrupting the values embedded in the real world. For example, it can be pointed out people do not pay attention to the real world anymore and they risk being constantly disconnected from the real world (Joseph and Armstrong 2016; Barbieri et al. 2017).

These positions are based on the presence of a "real" world which, in some sense, pre-exists and which is opposed to the digital one. However, this is just one approach. Mediation theory suggests a different approach which takes into consideration the intertwinement of these worlds from a more fundamental level.[5]

The world is not a pre-existing entity which is "affected" by the technological mediation, but it is an entity which emerges from such an interaction. In other words,

[5]For some application of it see also Liberati (2018b), Liberati and Nagataki (2018), Kudina and Verbeek (2018).

"real" gets its meaning from the presence of the technologies used (Verbeek 2015). Thus, it does not pre-exist to them, and so it is not possible to asses a kind of value to the primordiality of a "real" world without taking into consideration the presence of the technologies and the worlds generated by them.

The classic example is the presence of prenatal technologies like obstetric ultrasound technologies (Verbeek 2008). These technologies allow parents to have a perception of the unborn child who is still an entity which is invisible to the naked eye. The introduction of unborn children visualised by technologies directly modifies the way people live in their paramount reality. The parents need to take care of the unborn children in a novel way, and they are called to take responsibility for some decisions like in the case of genetic problems in the child.

These technologies could be seen as "just" a way of affecting the paramount reality by introducing novel elements in it since they "add" novel way to perceive the unborn children. However, according to mediation theory, these technologies do not merely "add" something, but they re-write the way people think of their position as parents. These technologies do not merely shape the way parents perceive the unborn children by adding their existence and shaping the way parents have to take care of the child, but they re-write what to be a parent means.

To be parents starts to embed new responsibilities and so, in some way, it suggests the paramount reality is not merely affected, but it is re-written by the technologies used. The very idea of what is to be a parent in the "real" world cannot be conceived without taking into consideration these technologies. Thus, it is simply impossible of thinking of a "real" world which is affected as if it were possible to isolate the "real" world in the first place. Once the technologies are introduced, the meanings related to the "real" world are defined by these technologies.

Of course, Pokémon are not unborn children, but what the example on ultrasound technologies shows us is that we need to keep in mind the is no clear division between the two worlds because what is "real" is defined by the presence of these technologies in the first place. Thus, Pokémon, even if they are not unborn children, do not merely affect the paramount reality by being "added" and by modifying the actions of the people living in it, but they have the power to reshape what to be "real" means in the paramount reality.

4.4 Conclusions

In the first part, we showed how the players perceive the augmented reality produced by the game *Pokémon GO*. We showed how these objects are perceived as fictional even if they are not confined within a physical "frame."

In the second part, we showed how it is possible to have "contaminations" among the realities and how one reality can affect the other by modifying the actions of the player and even of the people who do not play to the game. Thus, it is not so important if these creatures are actually perceived as part of a game and as fictional entities from the players because they can still affect the "real" world. For example,

not only the people playing to the game are attracted towards specific locations, but even people who pass from those locations in their everyday routine are affected by it since they will have to interact with the players.

We also showed this interaction is founded on the idea of two worlds where the "real one" pre-exists to the digital one. The digital objects have effects on the real world because they are "added" to it. However, according to mediation theory, we cannot make such a clear distinction as if one were "pre-existing" to the other because they get their meaning and values by the existence of the other. Therefore, meanings and values of what is real are founded on the presence of the technologies. Even in the case we think of the "real" world as wrapped with special meanings and values as opposed to the "virtual" and "digital" world of the game, we still use the presence of the game to define the meanings related to the real world. Thus, even in the case, we think *Pokémon GO* distracts people from their "real" everyday world, the meaning and value of what is real around the subject is founded from the possibility of the existence of the digital creatures. What is clear, even if maybe it is not clear in the details, once *Pokémon GO* are introduced, the real world with its meanings and values is redefined.

These Pokémon might not be part of the world as other "real" objects because they are perceived as "fictions." However, they do define what is real.

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Chapter 5
Augmented Reality, Games and Art: Immersion and Flow

György Molnár and Zoltán Szűts

Abstract All forms of augmented reality (AR)—including games—have common features. According to the authors, the two most important are immersion and flow. The phenomenon of AR is closely related with the technology: the optics, the sensors and HD displays are requirements. With the use of applications, digital information can be projected on the real world, while it becomes interactive. Most of AR games are smartphone related. In 2018 smartphones are ubiquitous devices. Their developers' attention is focused on usability and experience, the goal is to make it as intuitive as possible and not to block the immersion of users into the games. Without the right speed or resolution, games simply do not work, but flow gives the necessary edge. In this study, the authors build on the theory by Mihály Csíkszentmihályi, who in his discourse on flow points out the peak experience that occurs when an individual is deeply involved in an activity. This perfect instantaneous real momentum is the flow that is the unity of joy and creativity, something the most popular AR games provide.

5.1 Introduction

Pervasive and ubiquitous computing (PUC) is the growing trend towards embedding computers in everyday life. The words 'pervasive' and 'ubiquitous' mean 'existing everywhere'. PUC devices are fully connected and constantly online. Today's mobile communication devices have changed people's lifestyles and created new subcultures (Choi et al. 2013). Virtual and augmented reality, 3D visualization, the quest for ultra and pseudo realistic resolution, advanced image recognition, game controlling by movement, always online state are all crucial phenomena of new media (Horvath and Sudar 2018).

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According to the definition, augmented reality is dependent on digital tools: users can perceive virtual content with the bare eye on digital screens. It is a relevant aspect of this question that the phenomena of augmented reality-based information, communication, and convergent media are coming to life in a well-known usability-based system in common everyday use (Katona et al. 2017). While augmented reality entails a variety of meanings and presentation forms, common features can be discerned as well. The most important shared attribute is the real time integration of virtual objects into the physical or material world (Molnár 2013). As a type of mediatized or media-based communication augmented reality is inseparable from the technology making it possible. The respective equipment includes optical devices and other sensors perceiving the external world along with appropriate displays presenting the specific images in high definition. Consequently, via these applications information related to the objective world becomes interactive and digitalized. Thus, the given data being stored and made accessible can complement the real world through forming additional informational layers. This also means that augmented reality is device-dependent, technology-determined and convergent at the same time (Szűts and Yoo 2013). While augmented reality entails a variety of meanings and presentation forms, common features can be discerned as well. The most important shared attribute is the real time integration of virtual objects into the physical or material world. As a type of mediatized or media-based communication augmented reality is inseparable from the technology making it possible. The respective equipment includes optical devices and other sensors perceiving the external world along with appropriate displays presenting the specific images in high definition. Consequently, via these applications information related to the objective world becomes interactive and digitalized. Thus the given data being stored and made accessible can complement the real world through forming additional informational layers. This also means that augmented reality is device-dependent, technology-determined and convergent at the same time (Azuma 1997).

Augmented reality is real-time and marker-based. Its medium is hypertext; it can be displayed using digital tools, it demands interactivity and a proactive user behaviour, and it lays an emphasis on true-life experience. Technology based on augmented reality has come into general use recently due to the fact that users are surrounded by digital tools on a daily basis, such as smartphones, tablets, and game consoles. These tools can access high-speed Internet; have sensors like a GPS, a gyroscope, an advanced camera; and are provided with high-resolution displays. Thus, these tools are suitable for a kind of true-life construction of augmented reality technology.

5.2 AR and the Path to It

Communication technologies created by computers changed the arts when they came into being. In 1985, Jean-François Lyotard at the Centre Pompidou in Paris came up with an idea and then curated a substantial exhibition: *Les Immatériaux*. The exhibi-

tion occupied the whole fifth floor of the museum. It took two years to plan and was the most expensive exhibition ever staged by the Pompidou (McDowell 2014). Visitors had to wear headphones as they walked around, navigating a labyrinthine maze of grey-metal mesh screens. These headphones would then pick up various sounds and noise. Every visual display was paired with an audio text, from Antonin Artaud and Frank Kafka to Paul Virilio, but not only literature and theory were represented; advertising jingles and noise could also be heard. Summarizing the exhibition, Gere points out that *Les Immatériaux* aimed to present the contemporary cultural effects of new information and communications technology (even though at that time the term 'information and communications technology'—ICT—was not used). The 'subject' of the exhibition, says Gere, "was how the existence of 'new materials', or rather, 'immaterials', mostly generated by computer and electronic technosciences, mediates and effects human activity and indeed the idea of the human" (Gere 2016a).

Augmented Reality is deeply embedded into new media. As communication and media processes involve the World Wide Web and digital technology, we use the concept of new media more and more often. Manovich (2001) has argued in favour of this conceptual definition as well. In *The Language of New Media*, he described new media as an encounter of two formerly different phenomena in terms of their historic development, that is, computer technology and former media technologies. According to Manovich (2001), new media makes possible new combinations of graphic, film, sound, and text, and all of them are represented in games.

An idea developed in a book by Charlie Gere entitled *Art, Time and Technology* is concerned with this issue as well. In his work, Gere focuses on the role that art and games play in real-time digital systems. He understands these systems as information, telecommunication, and media systems which are part of the everyday user's life and have a greater and greater role in it. Our present digital (or 'techno')—culture is based on these real-time computer systems (Gere 2006b).

New media art is a genre that incorporates work of art created with digital technologies and emerging online technology platforms. It includes both computer graphics and animation, virtual and online art, and video games. It is digital, interactive, and interconnected, often augmented and created in real time. New media art distinguishes itself from traditional art by deriving cultural objects. Video games, digital maps, and web cameras used for observation, as well as smartphones and GPS systems, become means of art. However, the technology which operates them is developing and thus continuously undergoing transformations; their technical parameters do not determine the use of them as a means of art.

Despite the tremendous variety of augmented reality-based applications, such programs have shared features as well. All the applications function in real time, and are supported by multimedia and interactivity besides being presented by digital devices. Other common characteristics include being marker based, using community generated content, and requiring proactive user conduct along with interactivity. The real time aspect's primary difference from contents stored in a non-real time manner (picture, video, text) is that it provides the experience of actual presence or participation to the user. The success of participatory media utilizing the activity of

the user community underlines the importance of such hands-on experiences (Molnár et al. 2017).

5.3 AR Games

Augmented Reality is related to hypermedia. The first hypermedia system was the *Aspen Movie Map*,[1] developed by Andrew Lippman in the framework of the MIT Architecture Machine Group in 1978. "By encoding the cameras to fire every ten feet as the car drove around (the distance measured by a sensor attached to a bike wheel attached to the car), the team was able to set up the base portraits for every sector of the city. They placed that footage into specific sectors on a laserdisc in order to correlate with the city's map, a feat considering that lasederdics still stored only analog video" (Mead 2012). The system made it possible for users to roam over the whole territory of the city of Aspen on their screens just like in recent FPS video games.

If we take an almost 30-year leap in time and land in 2018, we can say that the newest generation of new media video games, which may be understood as artworks, is based on greater and greater degrees of interaction on the part of users and on the technology of augmented reality as a means of achieving this. WonderBook—where, thanks to AR, printed books also converge—are an obvious example of representing interactivity and content projected onto real space. WonderBook, developed by Sony, is a kind of printed book where markers are placed on pages. These are not QR codes; they blend into the illustrative environment of the book. Readers perceive them as illustrations and machines perceive them as markers.

The point of WonderBook is that while users read a book, a Sony Eye PS3camera system reads the markers and displays a picture of the user on the screen at the same time. As it recognizes different markers, different content is displayed. Following the recognition of particular markers, the virtual content projected on the environment of the user is displayed on the screen and thus an interaction with the characters of the book is created. In certain cases, letters come to life, pages are covered by dust, or well-known characters of the Harry Potter universe appear. Users interact with virtual characters via a Move controller. Events are displayed dynamically and in high resolution so the demand for true-to-life experience is fulfilled as well.

Pokémon was an extremely successful video game produced by the Japanese company Nintendo in the middle of the 1990s. The role play game originally designed for a portable Game Boy console reached a sales figure of 155 million in 10 years. The new version launched in 2016 shows no major differences from the original. While it is freely accessible and can be considered a hobby, Nintendo realizes income via purchases generated by the game itself. The game calls for the user to collect and capture the virtual figures by a Poké Ball, then to train them in Gyms and send them

[1] http://www.youtube.com/watch?v=Hf6LkqgXPMU.

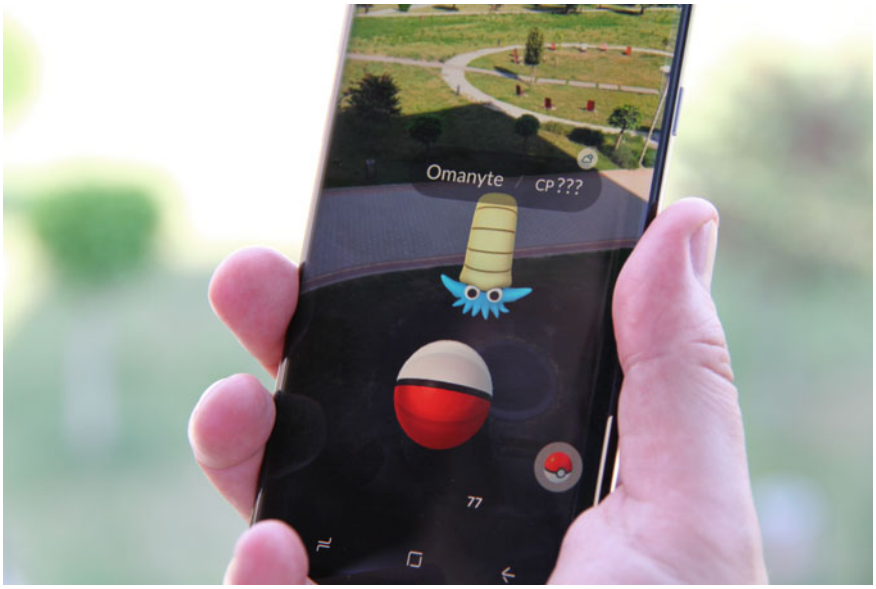

Fig. 5.1 Pokémon GO in action on mobile phone

into battles or raids against the figures of other players, while building alliances along the Gyms.

The success of Pokémon GO is based on the simplification of a complex yet spectacular technology and the promotion or enhancement of the user experience (see Fig. 5.1). The enhanced experience includes not only walks in a virtual space, but for example physical discovery of cities and abandoned factories. In addition to a purified and simple surface and easy usability its most important feature is its ability to display pictures embedded in texts thereby enabling the user to enjoy a significantly enhanced participatory experience via multimedia applications.

5.4 Success of Augmented Reality in Games: Flow and Immersion

One of the consequences of media convergence nowadays is that on all of our screens (whether it be a computer, television, smartphone, or tablet) we can access the same content in the same way, thereby merging the features of media which have hitherto existed parallel with each other. It is unquestionable that there are no sharp boundaries between multimedia and games. We consider a borderline phenomena as examples of this. For example, a video game based on narration in which the physical body of the player is projected onto the virtual world, and the other is a virtual museum in a digital

environment. Video games thus exceed the boundaries of the entertainment industry and spill into the discourse of arts. New media includes both computer graphics and animation, virtual and online art, and video games. It is digital, interactive, and interconnected, often augmented and created in real time. As Grau (2003) states, computer graphics, animation, and the interpreting strategies of interactive online visual arts will receive a greater and greater space in discourse concerning visual culture in general. At the same time, Grau points out that (the category) of the observer (user) located in virtual space has its antecedents; there were similar renderings in antiquity, in ancient Roman villas and in 3D and storyworld video game trials—which has the receiver and the spectacle acting within the same system. Mitchell says that it is obvious that the age of video, cyber technology, and electronic reproduction has brought into being a new toolbar of visual simulation and illusionism which had never been experienced before (Mitchell 1994; Komlódi et al. 2012).

Real time, however, occurs in the desire for the immediate feedback made possible by the World Wide Web and new media. A player who immerses himself deep in the story will get involved and will transport himself into the middle of it. In this way in his mind he will face the exact dangers and share the same sadness as the characters of the story. But the reception of new media works—that are interactive and multimedia, that is, they combine text, picture, video, and sounds—is a different experience.

The lack of digital thinking hinders the flow. The foundation of the internet is the sense of experience, which is only provided at the right bandwidth, without which the use of the network is cumbersome, unpalatable and ultimately pointless. The same can be said about augmented reality games. If the resolution or the FPS of a game is low, the flow does not happen. Mihály Csíkszentmihályi's flow theory (2014) focuses on the peak experience. This peak experience occurs when the individual is very deeply engaged, immersed in an activity. This is the perfect moment of real time outflow, the flow of joy and creativity (Csíkszentmihályi 2014). Since the individual perceives time in the course of the flow and falls into the activity, it seems obvious to apply the theory also in the augmented reality game environment. Interactivity in games allows users to exercise control over creations and content, and to some extent over flow, invariably defining peak and deep, but also cathartic and flow points. Hypermedia works of art are brought to life by interaction; immersion is almost impossible due to the fact that readers/users are expected to take an active part in the process of the reception of the content on the screen.

5.5 Conclusion

The new form and user interface of interactivity in augmented reality not only avoids the obstacles of language but culture-dependent symbols as well. Computer-Generated Imagery (CGI) in augmented reality places virtual elements into real space. New media artworks do the same in real time since they have to provide the possibility of interaction with the content to users. Video games are a kind of

borderline case, falling somewhere between CGI and new media artworks, as they generate virtual elements dependent on the interaction of the user. According to the definition, augmented reality is dependent on digital tools; users can perceive virtual content with the naked eye, not (yet) in real space but on digital screens. It is a relevant aspect of this question—as we pointed out in this chapter—that the phenomena of augmented reality-based information, communication, and convergent media are realized in well-known usability-based systems in common everyday use. Augmented reality is real-time and marker-based. Its medium is hypertext; it can be displayed by digital tools, it demands interactivity and a proactive user behaviour, and it lays an emphasis on true-life experience. Technology based on augmented reality has come into general use recently due to the fact that users are surrounded by digital tools on a daily basis, such as smart phones, tablets, and game consoles.

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Part II
The Nature of the Pokémon GO Phenomenon and Lessons Learned

Chapter 6
Motives for Playing Pokémon GO and Their Associations with Problematic and Health Behaviors

Ágnes Zsila and Gábor Orosz

Abstract Pokémon GO has been increasingly popular since its first release in July 2016. Due to the massive success of this game, a growing body of research has accumulated in recent years investigating the motives for playing Pokémon GO. This chapter provides an overview of empirical studies that aimed to explore a wide range of motives that drive players to use and re-use this popular augmented reality game. Overall, 14 studies have been identified, and 8 main motives were classified based upon this literature: social, physical/outdoor activity, nostalgia, fun/enjoyment, competition/achievement, exploration/curiosity, boredom, and trendiness. In addition, players were motivated to collect all Pokémon species, experience the advantages of AR games, and escape from reality. The associations of these motives with adaptive and maladaptive behaviors are also discussed in this chapter, alongside with the possibilities for future research.

6.1 Introduction

After its first release in July 2016, Pokémon GO has become the most popular smartphone game in a short period of time (Dorward et al. 2017). Indeed, this augmented reality (AR) game, in which players can capture and collect virtual Pokémon species in their real environment (Boulos et al. 2017), has been played by 21 million smartphone owners within one week following its first release (Dorward et al. 2017). The massive success of this game has shifted the attention of scholars towards the investigation of key elements that might play an important role in the escalation of this hype and that could possibly make an important contribution to the launch of another waves of popular AR games in the future. Consequently, a growing number

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of studies have focused on one central question in relation to the use of Pokémon GO: why have players become so dedicated to this game? Scholars have attempted to address this question from largely varied approaches: some studies sought answer to the question of why players are engaged in the world of Pokémon (e.g., Yang and Liu 2017; Zsila et al. 2018), while others raised the question of what gratifications can be gained during the gameplay (e.g., Hamari et al. 2018; Vaterlaus et al. 2018) and how players can benefit from this experience (e.g., Kaczmarek et al. 2017; Loveday and Burgess 2017). However, from another perspective, the central question of these investigations may be "what motivates players to play Pokémon GO"? This chapter provides an overview of empirical studies that aimed to address this question by using different methodologies and theoretical background, and attempts to synthesize the key findings of these studies by offering a comprehensive picture of the main motives for playing Pokémon GO and their associations with problematic and health behaviors.

According to the definition by Gerrig et al. (2011), motivation is "the process of starting, directing and maintaining physical and psychological activities; includes mechanisms involved in preferences for one activity over another and the vigour and persistence of responses" (p. 409). Previous research on gamers has indicated that players with a different motivational background may experience the gameplay differently (Király et al. 2015; Yee 2006). In a similar vein, Hamari et al. (2018) found substantial differences among players who enjoy different aspects of AR games in terms of in-game behaviors and attitudes (e.g., interactions, in-game purchases). For instance, players who perceived Pokémon GO as enjoyable, challenging, nostalgic, and could use the game outdoors without technical difficulties were found to be more likely to continue playing and increase their AR interactions (Hamari et al. 2018). Another study by Marquet et al. (2017) indicated that physical benefits derived from playing Pokémon GO largely vary across different player groups. More specifically, players who were motivated to increase their physical activity by playing Pokémon GO reported of higher physical activity levels compared to those players who started playing due to their curiosity or social reasons. These findings suggest that gameplay experience can be diverse among players with different personal motives and expectations, as was proposed by Marquet et al. (2017). Furthermore, Caci et al. (2018) pointed out that use characteristics can also influence players' motives. Overall, these results highlight the importance of investigating motives underlying the use of Pokémon GO in order to gain a more nuanced understanding of how players with different motives and expectations can benefit more from their gameplay in several social and individual aspects (e.g., friendships, visual skill development). Besides, a more advanced knowledge on the personal motives of players can possibly contribute to the development of future AR games that can satisfy the needs of different audiences in a more targeted way (Hamari et al. 2018; Kaczmarek et al. 2017).

The following section of this chapter elaborates on the motives for playing video games in a broader context. Earlier and more recent theoretical approaches are presented in the context of offline and online gaming behaviors. Following this brief overview, the key motives for playing Pokémon GO are described based upon several empirical studies that investigated the range of motives by applying diver-

gent research methods. These motives are described in the association of positive and negative psychological and physical correlates. Motives for continuing or quitting the game are also discussed. Finally, the last section of this chapter summarizes the key findings of studies that aimed to explore the motives for playing Pokémon GO, and elaborates on the implication of these findings.

6.2 General Motives for Gaming

Motives for playing video games have been investigated since the early 1980s (Malone 1981). Malone (1981) identified three categories of intrinsic motives that made players enthusiastic about video games: challenge and achievement, visually appealing effects, and novelty. In the early 2000s, Lazzaro (2004) offered a more nuanced picture of motives by pointing out that adult players enjoyed the challenge, appreciated the opportunity to leave work- or school-related duties behind and escape from reality, and felt motivated to test their abilities. Participants also enjoyed doing new things (e.g., riding a motorbike), and found the exciting and relaxing aspects of their gameplay appealing. Finally, immersion, overcoming boredom, curiosity, and social interaction were also mentioned by participants as motives to play video games.

Considering the growing number of youth playing online games, there has been a considerable research interest in the motives for playing online games since the mid-2000s (Demetrovics et al. 2011). Drawing on the theoretical concept of Bartle (2003) who described four different gamer types based on their playing styles (i.e., achievers, explorers, socializers, killers), Yee (2006) classified three motives: achievement, social, and immersion. These categories included motives for attaining certain goals within the game, initiating social interactions with other players, and discovering the virtual environment. Cooperation with others and escapism were mentioned as key motives for playing online games in the study by Frostling-Henningsson (2009), alongside with the motive of seeking the sense of flow experience. This latter motive also appeared in the categories identified by Hsu and Lu (2007) that could influence customer loyalty, alongside with the motives of fun, entertainment, curiosity, and exploration. More recently, Demetrovics et al. (2011) provided with a comprehensive categorization of motives for playing online games by identifying seven motive dimensions such as social, escapism, competition, skill development, fantasy, recreation, and coping. The majority of these motives reflected those identified by prior studies in the context of both offline (e.g., Lazzaro 2004) and online gaming behavior (e.g., Yee 2006).

Drawing on these findings, it can be concluded that players are motivated to play video games for several reasons and there are considerable individual differences in terms of preferences as was pointed out by Demetrovics et al. (2011) and Király et al. (2015), which can result in that players with different motive patterns may differ in their perceptions and experiences associated with their gameplay (Király et al. 2015). However, a considerable proportion of players report of similar psychological

benefits: they enjoy exploring new worlds, communicating with other players who share the same enthusiasm for this activity, and seeking the opportunity to challenge others and themselves, and hence, develop their skills. In addition, some players are motivated to immerse in a virtual universe where they can forget about their real-life problems. Finally, some of them consider their gaming activity as a safe confine for relaxation and recreation, whereas others seek excitement, entertainment, and the sense of flow in their gameplay.

Pokémon GO shares several similarities with other online games in some aspects (e.g., provide players with an opportunity to challenge other players, achieve certain goals, develop their skills) (Dorward et al. 2017), which suggests that some gaming motives that have been identified by prior studies may be generalizable to this specific game (Zsila et al. 2018). However, due to the long history of the Pokémon franchise, which started in the mid-1990s (Dorward et al. 2017; Katsuno and Maret 2004), and considering the AR-specific features of Pokémon GO, it seems inevitable to extend the range of motives that have been explored in prior studies by adding Pokémon GO-specific components to the previously tested motivational models when exploring the motives for playing this AR game. The following chapter provides an overview of empirical studies published between 2017 and 2018 that aimed to investigate the motivational background of playing Pokémon GO. This overview, however, fails to meet some criteria of a systematic literature review (e.g., systematic searching in a broad range of search engines, assessing the quality of the extracted data), and hence may not be an exhaustive collection of all empirical studies with the same aim. Despite that, this overview may help drawing a more nuanced picture of the motives for playing Pokémon GO and their associations with positive and negative outcomes.

6.3 Empirical Investigation of Motives for Playing Pokémon GO

6.3.1 An Overview of the Main Characteristics of Empirical Studies

When searching for relevant studies in Google Scholar, using the key words ‘Pokémon GO’ and ‘motivation’ or ‘motive’, 15 empirical studies were found that aimed to explore the motives for playing Pokémon GO. One of these studies (i.e., Orosz et al. 2018) was excluded from further analysis as this study focused on the investigation of playing motives with personality correlates without the intent of exploring new motives that have not been identified in prior studies (i.e., Zsila et al. 2018). Therefore, 14 empirical studies were considered as a basis for further analysis. The list of studies and their main characteristics (i.e., research design, sampling, assessment of motives, and key findings) are presented in Table 6.1.

Table 6.1 Selected characteristics of studies investigating the motives for playing Pokémon GO

Study	Sample characteristics	Research design	Assessment	Motives	Main associations with motives
Caci et al. (2018)	Italian Pokémon GO players ($N = 560$); 64.3% male, $M_{age} =$ 24.6 years, $SD = 7.2$	Online survey—quantitative, cross-sectional	Pokémon GO Motivational Scale (PokeGOMS; Caci et al. 2018)—11 items (3–4 items per factor)	Personal needs, social needs, recreation	Introvert players with high recreational motivation and less agreeable players with strong personal motivation spent more time playing Pokémon GO
Hamari et al. (2018)	Pokémon GO players from Canada, Finland, Malta, Philippines, Singapore, Sweden, UK, USA, and other countries ($N = 1190$); 58.7% male, 73% between 16 and 35 years of age	Online survey—quantitative, cross-sectional	Constructed items based on the theoretical framework of uses and gratifications (Katz et al. 1973) and its recent expansion to AR/VR (Rauschnabel et al. 2017)—39 items (3–6 items per factor)	Gratifications: enjoyment, challenge, competition, socializing, outdoor activity, trendiness, nostalgia; inhibitors: ease of use, privacy concerns	Players who perceived the game as highly challenging, enjoyable, nostalgic, and enjoyed playing outdoors with no usability problems were more likely to increase their AR interactions, while players who also derived gratifications from its features that allow for competition and socialization were more likely to make in-game purchases

(continued)

Table 6.1 (continued)

Study	Sample characteristics	Research design	Assessment	Motives	Main associations with motives
Kaczmarek et al. (2017)	Polish Pokémon GO players ($N = 444$); 50.7% male, $M_{age} =$ 23.4 years, $SD = 5.8$	Online survey—quantitative, longitudinal	Online Gaming Motivations Scale (Yee et al. 2012) with adding one Pokémon GO-specific motivational factor (i.e., health)—15 items (3–4 items per factor)	Social, immersion, achievements, health	Players with strong health, immersion and social motives spent more time outdoors. Players with strong health motivation were more physically active
Liu and Ligmann-Zielinska (2017)	Pokémon GO players from California and Michigan ($N = 47$); 53% male, $M_{age} =$ 28.7 years, $SD = 5.9$	Online survey—quantitative, cross-sectional	Constructed items—4 items	Socializing motivations (3 items), exploring the real world while playing Pokémon GO just for the sake of exploring it	Not investigated
Loveday and Burgess (2017)	Australian Pokémon GO players ($N = 202$); 36.6% male, $M_{age} =$ 29.3 years, $SD = 8.7$	Online survey—qualitative, cross-sectional	Open-ended questions, thematic analysis	Achievement, nostalgia, entertainment	Players' flow experience was predicted by nostalgia motive, game level achieved, and playing with family and alone

(continued)

Table 6.1 (continued)

Study	Sample characteristics	Research design	Assessment	Motives	Main associations with motives
Marquet et al. (2017)	US college students—all Pokémon GO players ($N = 47$); 51% male, $M_{age} =$ 19.1 years	Online survey—quantitative, cross-sectional	Constructed items—9 items (2–5 items per factor)	3 groups with different motivational background based on subsequent factor analysis: pokémon and video game fans, physical activity seekers, curious & social	No significant difference was found between groups in demographic characteristics. Physical activity seekers started playing much later than the other two groups. The curious and social group reported of more advanced neighborhood and facility awareness, improved mood and social interactions, and enjoyed discovering new places, battling, and meeting new people more compared to the other two groups

(continued)

Table 6.1 (continued)

Study	Sample characteristics	Research design	Assessment	Motives	Main associations with motives
Rasche et al. (2017)	German participants ($N = 199$); active Pokémon GO-players ($n = 81$, 66.7% male, $M_{age} = 34.9$ years, $SD = 9.8$), former players ($n = 56$, 60.7% male, $M_{age} = 25.6$ years, $SD = 8.4$), non-players ($n = 62$, 51.6% male, $M_{age} = 38.8$ years, $SD = 19.6$)	Online survey—qualitative and quantitative, cross-sectional	Constructed items—6 items + open-ended questions, content analysis and coding	9 motivations to start playing Pokémon GO (e.g., curiosity, being a Pokémon fan, media reports, nostalgia, etc.); 11 motivations to continue playing (e.g., completing the Pokédex, incubating eggs, fighting in arenas, etc.), 10 reasons for quitting (e.g., boredom, technical problems, lack of co-users, etc.)	Curiosity and being a fan of Pokémon were the key motives for players to start playing Pokémon GO. Former players expressed higher interest in the AR technology than active players and non-players when they started playing Pokémon GO. The main motives of active players to continue playing were associated with the aim of catching all pokémon and reaching higher levels, while former users were more motivated by the in-game competition

(continued)

Table 6.1 (continued)

Study	Sample characteristics	Research design	Assessment	Motives	Main associations with motives
Rauschnabel et al. (2017)	German Pokémon GO players ($N = 642$); 46.9% male, $M_{age} =$ 24.7 years, $SD = 6.3$	Online panel survey—quantitative, cross-sectional	Constructed items based upon previous studies and a pilot study—19 items (2–4 items per factor)	3 groups of benefits based on subsequent confirmatory factor analysis: emotional (i.e., nostalgia, enjoyment), hedonic (i.e., physical activity, flow), social (i.e., image, socializing)	Enjoyment, physical activity, flow experience, and nostalgia drive individuals to play Pokémon GO. Flow and image motives were also associated with the intention to re-use and in-game purchases
Ruiz-Ariza et al. (2018)	Spanish adolescents ($N = 190$); 50.5% male, $M_{age} = 13.3$ years, $SD = 1.1$	Longitudinal-experimental, paper and pencil tests—quantitative	constructed items—5 items (4 motives + do not know)	Boredom, enjoyment, friendship, physical activity	The main motive for playing Pokémon GO was fun among boys and boredom among girls
Tong et al. (2017)	Pokémon GO players from Canada and Hong Kong ($N = 32$); 50% male, 59% between 19 and 24 years of age	Online survey—quantitative, cross-sectional	Constructed items—20 items	Top three ranked motivations: to collect all pokémon, common topic among people around me, being nostalgia of the Pokémon anime	Not investigated

(continued)

Table 6.1 (continued)

Study	Sample characteristics	Research design	Assessment	Motives	Main associations with motives
Vaterlaus et al. (2018)	US college students ($N = 278$); 16% male, $M_{age} = 20.7$ years	Online survey—qualitative, cross-sectional	Open-ended questions, qualitative conventional content analysis approach	Exercise and exploration, catch pokémon, entertainment, realistic device engagement, presence/absence of Pokémon nostalgia, interplayer competition	Not investigated
Yang et al. (2018)	Taiwanese Pokémon GO players ($N = 426$); 49.3% male, 66.9% between 21 and 30 years of age	Online survey—quantitative, cross-sectional	Motivation scale adapted from Chu (2000), Beard and Ragheb (1983), and Wang (2007)—15 items	Self-actualize, excitability, emotional, leisure and entertainment, social	Motivation had a considerable positive effect on players' sport involvement. Furthermore, motivation was associated with tourism benefit

(continued)

Table 6.1 (continued)

Study	Sample characteristics	Research design	Assessment	Motives	Main associations with motives
Yang and Liu (2017)	Pilot study: US adults ($N = 78$); 47% male, $M_{age} = 29.8$ years, $SD = 8.9$ Scale development: US adults ($N = 262$); 55% male, $M_{age} =$ 30.7 years, $SD = 7.8$	Online survey—qualitative (pilot study) and quantitative (scale development), cross-sectional	Pilot study: content analysis; scale development: Pokémon GO Motives Scale—35 items (3–8 items per factor)	Exercise, fun, escapism, nostalgia, friendship maintenance, relationship initiation, achievement	Fun, friendship maintenance was positive, while escapism and nostalgia were negative correlates of well-being. Relationship initiation was associated with more bridging capital and higher levels of loneliness
Zsila et al. (2018)	Pilot study: Hungarian Pokémon GO players ($N = 37$); 64.9% male, $M_{age} = 22.0$ years, $SD = 5.1$ Scale development (study 1): Hungarian Pokémon GO players ($N = 621$); 45.1% male, $M_{age} =$ 22.6 years, $SD = 4.4$; (study 2): Hungarian Pokémon GO players ($N = 510$); 55.9% male, $M_{age} =$ 26.6 years, $SD = 7.8$	Online survey—qualitative (pilot study) and quantitative (scale development), cross-sectional	Pilot study: content analysis; scale development: Motives for Online Gaming Questionnaire—Pokémon GO extension (MOGQ-PG)—37 items (3–4 items per factor)	Social, escape, competition, coping, skill development, fantasy, recreation, outdoor activity, nostalgia, boredom	Impulsivity was not associated with motives for playing Pokémon GO. Competition and fantasy motives predicted problematic gaming behavior

With regard to the sample characteristics of the 14 empirical studies that explored the motives for playing Pokémon GO, 11 of 14 studies used samples consisting of 199–1190 participants, whereas 3 studies used a relatively small sample of Pokémon GO players (32–47 participants).

The nationality of players has showed a large variety across these studies (e.g., research was conducted on a sample of Australian, German, Hungarian, Italian, Polish, Spanish, Taiwanese, UK, and US participants). However, due to the divergence in the assessment of motives (e.g., substantial differences can be observed in the content of several items across studies, even in factors that are based upon similar theoretical conceptualizations such as the nostalgia motive), cross-cultural comparisons are not possible based upon these studies.

Except for one study, the proportion of male and female participants was nearly equal in the reviewed 14 empirical studies. In the study by Vaterlaus et al. (2018), the proportion of female participants was much higher (84%), which may not be surprising provided that this sample comprised US college students, and previous findings have indicated that the proportion of females among US college students have been consistently higher than of males in the past few decades (National Center for Education Statistics 2018). With regard to age, 13 of 14 studies were conducted on a sample that comprised mainly young adults, whereas only one study used an adolescent sample (i.e., Ruiz-Ariza et al. 2018).

The majority of these studies ($n = 13$) were established upon data derived from participants that were invited to complete an online questionnaire, whereas only one study used paper and pencil tests within an experimental context (i.e., Ruiz-Ariza et al. 2018). Similarly, the vast majority of studies ($n = 13$) were based upon cross-sectional investigations, whereas only one study used data from a longitudinal research (i.e., Kaczmarek et al. 2017). Furthermore, 9 of 14 studies explored motives using quantitative research methods, while 2 studies used a qualitative approach, and 3 studies mixed methods (i.e., both qualitative and quantitative research methods). Among those studies investigating motives from a mixed methodological approach, 2 studies (i.e., Yang and Liu 2017; Zsila et al. 2018) reported of conducting a pilot study that aimed to provide researchers with a possibly wide range of motives, including general gaming motives and Pokémon GO-specific motives. The results of the pilot studies were analyzed using qualitative methods and served as a basis for item construction when developing assessment instruments that assess the motives for playing Pokémon GO. Yang and Liu (2017) created the 7-factor Pokémon GO Motives Scale, whereas Zsila et al. (2018) constructed the 10-factor Motives for Online Gaming Questionnaire—Pokémon GO extension (MOGQ-PG). More recently, Caci et al. (2018) created a measure, the Pokémon GO Motivational Scale (PokeGOMS) for the same purpose. These assessment instruments demonstrated good psychometric properties. The third study that used mixed methods, conducted by Rasche, Schlomann, and Mertens (2017), used constructed items as well as open-ended questions to examine what motivates players to start, continue, and quit playing Pokémon GO, without the intent of creating an assessment instrument.

While most studies ($n = 11$) defined the constructs explored in relation to players' enthusiasm towards Pokémon GO as 'motives' or 'motivations', the study by

Hamari et al. (2018) referred to them as 'gratifications' derived from their gameplay, and Rauschnabel et al. (2017) as 'benefits' of playing. In spite of the conceptual differences, these constructs showed several similarities in their content with the motives identified by other studies (e.g., nostalgia, enjoyment, competition, socializing, physical activity); therefore, these studies were also considered as a basis of the current review.

The majority of studies ($n = 10$) explored the range of motives based on the assumption that each motive can be interpreted as a continuum, and players may have several motives to play Pokémon GO but some motives are stronger, while others are weaker. Based upon the strength of motives, Marquet et al. (2017) classified three groups of players (i.e., pokémon and video game fans, physical activity seekers, and curious & social), and investigated the differences between these player groups. Another study by Rasche et al. (2017) explored not only the motives to start playing Pokémon GO but the reasons for continuing and quitting the game.

Overall, the majority of studies ($n = 11$) investigated the associations of motives with demographic characteristics (e.g., Ruiz-Ariza et al. 2018), personality traits (i.e., Caci et al. 2018), indicators of physical and psychological well-being (e.g., Kaczmarek et al. 2017; Yang and Liu 2017), and consumer behavior (e.g., Hamari et al. 2018; Rauschnabel et al. 2017). Furthermore, Rasche et al. (2017) investigated the pattern of motives among active, former and non-players. Only 3 studies explored the range of motives without the intent of investigating their associations with related constructs (see Table 6.1).

In summary, studies aiming to explore the motives for playing Pokémon GO share only a few similarities; however, these studies are more convergent in terms of the identified motive dimensions. After a brief overview of the association of motives with Pokémon GO playing habits, this chapter elaborates on the playing motives and their correlates based upon the findings of empirical studies.

6.3.2 The Association of Motives with Pokémon GO Use

Previous studies have found substantial differences among Pokémon Go players in demographic characteristics. Empirical evidence suggests that males are more active and immersed in the game (Ruiz-Ariza et al. 2018; Zsila et al. 2018), and in turn, benefit more from their gameplay in terms of physical health (Kaczmarek et al. 2017). In addition, Zsila et al. (2018) reported males having higher motives for in-game competition than females.

With regard to age, younger players were found to be more motivated than older players in several aspects (e.g., social, fantasy, nostalgia, boredom motives) in the study by Zsila et al. (2018). Consistent with these findings, Loveday and Burgess (2017) reported that younger players yielded higher levels of nostalgia compared to older players. These findings may not be surprising, considering the fact that the particularly popular Japanese animated series called "Pokémon" was targeted at 4–14 years old children (Buckingham and Sefton-Green 2003), and those enthusiasts

who were children at the time of the first release of the series in 1997 are now 25–35 years old young adults (Loveday and Burgess 2017). Further confirming the relevance of nostalgia in this age cohort, Zsila et al. (2018) found that those players who had been fans of the Pokémon animated series preceding the first release of Pokémon GO reported of higher motivational levels in several aspects (i.e., escape, coping, skill development, fantasy, recreation, nostalgia) than those who had not been involved in the Pokémon franchise before.

In relation to educational level and residence, Zsila et al. (2018) found that players with lower educational levels had higher motivational levels in three aspects (i.e., social, skill development, and fantasy motives) across two studies. Furthermore, those players who lived in the capital city were less likely to play Pokémon GO to develop their skills and avoid being bored (Zsila et al. 2018).

The time spent playing was positively associated with 4 of 7 motives in the study by Yang and Liu (2017) (i.e., fun, friendship maintenance, relationship initiation, and achievement). In a similar vein, Hamari et al. (2018) found a positive association between several gratifications (i.e., challenge, competition, socializing, outdoor activity, nostalgia) and the intention for in-game purchases. Furthermore, gratifications such as enjoyment, challenge, outdoor activity, and nostalgia were positively associated with the intention to re-use the game (Hamari et al. 2018). Consistent with these findings, Rauschnabel et al. (2017) reported that flow and image motives were positively related to the intention to re-use the game and make in-game purchases. In this study, image motive was defined as the user's perception of how playing an AR game can possibly enhance his/her social status.

Some studies have suggested that players' motivation has dropped since the first release of Pokémon GO (e.g., Liu and Ligmann-Zielinska 2017; Zsila et al. 2018). Liu and Ligmann-Zielinska (2017) found that players' game enjoyment has decreased over time; however, this result is based upon retrosepective, self-report data. In line with this result, Zsila et al. (2018) found that players' motivational level was higher in several aspects at the time of the first data collection in July 2016 (i.e., social, nostalgia, boredom, fantasy, escape, and skill development) compared with the motivational levels at the time of the second data collection in November 2016. However, this study was based upon two different samples; therefore, it may be plausible that players of the second sample were not highly motivated at the first release of the game, either. Despite the limitations of these studies, it should be noted that the number of active players has dropped since July 2016 (Vaterlaus et al. 2018), which may indicate that some smartphone users are not particularly motivated to continue exploring the world of Pokémon. However, there are still millions of active players (Orosz et al. 2018) who appreciate different aspects of this game.

6.3.3 The Association of Motives with Health and Problematic Behaviors

Based upon empirical findings, the most frequently mentioned motives for playing Pokémon GO among players were as follows[1]: social (11), physical/outdoor activity (10), nostalgia (9), fun/enjoyment (7), competition/achievement (7), exploration/curiosity (5), boredom (4), and trendiness (4). Furthermore, players were also motivated to play Pokémon GO because they found the AR feature appealing, enjoyed collecting Pokémon species, or appreciated the opportunity to escape from real life. This section discusses the associations of these motives with adaptive and maladaptive behaviors.

A considerable proportion of players reported that Pokémon GO helped improve their social connections in several aspects (e.g., Bonus et al. 2018; Hamari et al. 2018; Vella et al. 2017). In the study by Vella et al. (2017), players reported that Pokémon GO improved their relationships with family and friends, encouraged conversations with other players, and strengthened the sense of belonging in them by establishing a community that has been built on a shared passion for the world of Pokémon. As a consequence, a considerable proportion of players reported spending more time with their family and pets (Hamari et al. 2018), having better peer relationships (Bonus et al. 2018; Ruiz-Ariza et al. 2018), and perceived a reduction in social anxieties (e.g., leaving their home, contacting with strangers) (Hamari et al. 2018). According to an early study, a typical Pokémon GO player is an introverted and close person (Tabacchi et al. 2017), which may suggest that a considerable proportion of players can potentially improve their social skills through the social benefits of this game. Marquet et al. (2017) identified three different player groups based on the main motives to play Pokémon GO (i.e., pokémon and video game fans, physical activity seekers, and curious & social), and found that a group of players is fascinated by some features of the game that are related to the exploration of new areas and social connections. These players were particularly motivated to meet new people and learn more about their city while playing Pokémon GO. Furthermore, this group reported of better mood and more advanced neighborhood awareness and social interactions compared to the other two player groups. Similarly, Caci et al. (2018) classified three groups of needs (i.e., personal, social, and recreation) of which social needs referred to players' motive to know new people, get acquainted with other players from a different cultural background, and express creativity. Yang and Liu (2017) found that the motive of friendship maintenance was related to higher life satisfaction, and the motive of relationship initiation was associated with more bridging capital and higher levels of loneliness, which suggests that the sense of loneliness may motivate players to develop their social skills through the game. Besides, Hamari et al. (2018) pointed out that players with higher gratification levels in terms of socialization via their gameplay are more likely to make in-game purchases.

[1]The numbers in parenthesis refer to the number of empirical studies in which the respective motive was identified as a separate dimension among playing motives.

One of the most appealing features of Pokémon GO is that the game encourages physical and outdoor activity. Indeed, numerous studies found that the time spent playing Pokémon GO was associated with more psychical activity (e.g., Barkley et al. 2017; Bonus et al. 2018; Howe et al. 2016; Kaczmarek et al. 2017; Liu and Ligmann-Zielinska 2017). Yang et al. (2018) also found that the general motivation to play Pokémon GO was positively associated with players' sport involvement, which had a positive effect on tourism benefit, suggesting that tourism industry could benefit from players' motives to seek tourism attractions and sport events. Marquet et al. (2017) identified a subgroup of players called 'physical activity seekers' who were motivated to play Pokémon GO because the game helped them improve their psychical condition. In a similar vein, Ruiz-Ariza et al. (2018) conducted a longitudinal research and found that adolescents who played Pokémon GO for 8 weeks had more advanced selective attention and concentration skills than non-players, and this association was independent of gender and age. Using a similar research design, Kaczmarek et al. (2017) found that players who spent more time playing Pokémon GO did more physical exercise 6 weeks later, and based on the differences in psychical activity levels across player groups, it was revealed that male and older players benefitted more from their gameplay in terms of physical health. Hamari et al. (2018) also suggested that AR games such as Pokémon GO that encourages physical activity may be particularly beneficial for populations with reduced activity levels (e.g., elderly or obese people). Although Baranowski (2016) indicated that most Pokémon GO players intend to maintain their physical activity levels for a long period of time, empirical evidence suggests that initial increase in players' physical activity can only be observed shortly after the first download of the game, and the willingness to do exercise declines rapidly (Howe et al. 2016). Furthermore, some studies pointed out the possibly negative consequences of inappropriate or excessive use (e.g., traffic accidents, health discomfoms) (Ayers et al. 2016; Wong 2017). Despite the possible threats, the motive of physical activity/outdoor activity to play Pokémon GO has been associated with mostly positive mental and physical health outcomes (Kaczmarek et al. 2017; Orosz et al. 2018; Ruiz-Ariza et al. 2018).

Keogh (2017) emphasized that nostalgia played a key role in the success of Pokémon GO. According to Taylor and Whalen (2008), nostalgia is an effort to bring past events, interests, or preferences into the present. For instance, individuals who played a video game when they were young may wish to re-live the amusement (Taylor and Whalen 2008). The Pokémon franchise has a long history, and the world of Pokémon has attracted millions of children and adolescents since its first release in a form of video game for Nintendo's Game Boy console (Tang 2017). Besides, the animated series 'Pokémon' had millions of young viewers who were encouraged to get immerse knowledge of each pokémon species, and collect toys, trading cards, coming books, and other merchandise (Dorward et al. 2017; Loveday and Burgess 2017; Tang 2017). Therefore, some players felt that the latest media product of the Pokémon franchise, Pokémon GO was "not only a game but also as a childhood dream-come-true for young adults" (Tang 2017, p. 2). Supporting this assumption, Tang (2017) found that 68.5% of players admitted playing Pokémon GO because they were fans of the animated series as a child. In addition, 60.8% of Pokémon GO

players who had been fans of the animated series stated that they would recommend the mobile application to others, while only 29.9% gave the same response among those who had not been Pokémon fans before (Tang 2017). In line with these findings, being a Pokémon fan was one of the key motives for players to start playing the game in the study by Rasche et al. (2017). In the categorization of Marquet et al. (2017), pokémon and video game fans represented the first wave of Pokémon GO enthusiasts, who were motivated to play the game for its content. In a similar vein, Loveday and Burgess (2017) found that players' flow experience was predicted by the motive of nostalgia. From a business approach, Hamari et al. (2018) reported a positive association of nostalgia with in-game purchases and the intention to reuse the game. Although Yang and Liu (2017) found a negative relationship between nostalgia motive and well-being, other studies revealed a positive association between nostalgia and some relevant indicators of mental health (e.g., harmonious passion, enhanced well-being) (Bonus et al. 2018; Orosz et al. 2018).

Fun and enjoyment were identified as important motives for players in half of the reviewed empirical studies. For instance, fun was the key motive for playing Pokémon GO among boys in the study by Ruiz-Ariza et al. (2018). In a similar vein, Rauschnabel et al. (2017) identified enjoyment as an influential motive that drives individuals to play Pokémon GO. Hamari et al. (2018) revealed that players with high levels of game enjoyment are more likely to re-use the game. Furthermore, fun was positively associated with players' well-being (Yang and Liu 2017). According to these studies, fun and enjoyment are important motives for playing Pokémon GO; however, studies also suggest that players' game enjoyment and dedication to the application have dropped over time (Liu and Ligmann-Zielinska 2017; Zsila et al. 2018), which may provide an explanation for the decreasing number of active players (Vaterlaus et al. 2018).

In-game competition and achievement were another key motives for players in half of the reviewed empirical studies. Indeed, Rasche et al. (2017) pointed out that one of the main motives for active players to continue playing Pokémon GO was the aim of catching all pokémon species and reaching higher levels, whereas former players enjoyed competing with others. Challenge and competition were positively associated with in-game purchases in the study by Hamari et al. (2018), while the intention to re-use the game was associated with challenge but not competition, which may suggest that reaching higher levels and achieving personal goals in the game are more motivating for players than the opportunity to defeat others. Further confirming this assumption, Loveday and Burgess (2017) found a positive association between flow experience and the game level achieved by players, indicating that players who feel competent in their gameplay are more likely to experience flow. However, when competing behavior lacks the intention of personal growth, competition between players can result in a negative gaming experience. The motive of competition in general online gaming behavior was associated with mental health problems (e.g., depression, anxiety) and addictive use (Király et al. 2015). Similarly, the motive of competition was associated with problematic gaming behavior (i.e., excessive or addictive use) (Zsila et al. 2018) and obsessive passion (Orosz et al. 2018) in relation

to Pokémon GO, which indicates that this motive is associated with mainly negative psychological correlates.

The motives of exploration and curiosity were mentioned in five empirical studies; however, not all of them investigated the psychological correlates of these motives. Rasche et al. (2017) indentified curiosity as a key motive for players to start playing Pokémon GO, which may be based upon players' interest in the AR technology, the media attention, and the social pressure for playing (i.e., everyone plays it). Marquet et al. (2017) found that the curious & social subgroup of players enjoyed battling, discovering new places, and meeting new people more than the other two player groups (i.e., pokémon and video game fans, physical activity seekers). Furthermore, this group reported of the most advanced neighborhood and facility awareness compared to the other two groups (Marquet et al. 2017), which suggests that players with high levels of curiosity can benefit from this game by gaining a more immerse knowledge of their city and other places.

Interestingly, boredom was identified as a motive for playing Pokémon GO in some studies (e.g., Ruiz-Ariza et al. 2018; Zsila et al. 2018), while Rasche et al. (2017) found that boredom was the main reason for quitting the game followed by a general disappointment, difficulties in reaching higher levels in their gameplay, and technical problems. However, a similar response category (i.e., game for traveling) appeared among the reasons to start playing Pokémon GO in the study by Rasche et al. (2017). In the study by Caci et al. (2018), spending free time was integrated into the motive of recreation beside meeting friends and doing physical activity. These categories include a general motive to avoid being bored. In the study by Orosz et al. (2018), the motive of boredom was positively associated with obsessive passion and negatively with harmonious passion, suggesting that the motive of boredom may be associated with another negative psychological constructs among Pokémon GO players. However, more research would be needed to confirm this assumption.

According to a few empirical studies (e.g., Hamari et al. 2018; Tong et al. 2017), some players might be encouraged to start playing Pokémon GO due to the media sensation surrounding this phenomenon, which made the game look trendy. This motive also appeared in the theoretical consideration of Caci et al. (2018) when constructing items for the assessment instrument 'PokeGOMS'. Furthermore, media reports and reports from friends were identified as important motives for players to start playing Pokémon GO in the study by Rasche et al. (2017). Besides, some players were motivated to play this game because they perceived that everyone around them played it (Rasche et al. 2017). These findings point out the prominent role of media in the success of Pokémon GO.

A few studies reported additional motives that can encourage individuals to play Pokémon GO. For instance, some players may wish to escape from reality while playing (Caci et al. 2018; Yang and Liu 2017; Zsila et al. 2018), immerse in a fantasy world (Kaczmarek et al. 2017; Zsila et al. 2018), experience flow (Rauschnabel et al. 2017), or simply wish to collect all pokémon species and complete the Pokédex (Rasche et al. 2017; Tong et al. 2017; Vaterlaus et al. 2018). Furthermore, some players may be fascinated by the AR feature (Rasche et al. 2017; Vaterlaus et al. 2018), while others prefer this game for emotional reasons (Rauschnabel et al. 2017;

Yang et al. 2018). Another group of players may wish to express aggression, sexuality, or hidden aspects of their personality (Caci et al. 2018), fulfill self-actualization (Yang et al. 2018), develop their skills, or use the game as a source of coping (Zsila et al. 2018).

Overall, the majority of main motives (i.e., social, physical/outdoor activity, nostalgia, fun/enjoyment, and exploration/curiosity) have been associated with several positive physical and psychological correlates (e.g., mental well-being, improved social connections), whereas some motives (i.e., competition/achievement and boredom) were related to mostly negative outcomes (e.g., problematic/excessive use, psychological maladies).

6.4 Conclusion

Due to the huge success of Pokémon GO, the game became the topic of scientific investigations quickly. To this date, 14 published works have emerged that assessed the motives for playing Pokémon GO. There are several specific characteristics of this game that are different from previous offline and online games (e.g., the AR feature). Despite these differences, only a few studies used qualitative methods to identify new motivations derived from these new game characteristics. An in-depth qualitative exploration seems necessary to identify some more nuanced motivational constructs. Furthermore, this research method would advance knowledge in future studies that examine similarly popular AR games as Pokémon GO. It should be noted that knowledge is limited about the specificity of motives (i.e., whether these new motives are relevant only regarding Pokémon GO or these can be used in relation to other AR games as well).

Beside a qualitative in-depth exploration, it is also important to operationalize the motivational constructs. For instance, it is possible that different facets of competition emerge from these analyses. An individual can compete in Pokémon GO for self-improvement, while another person may compete to defeat others, and other players may focus on the social comparison aspect while playing (Ryckman et al. 1990, 1996). A similar distinction can be applied for boredom: players can be motivated to alleviate boredom as they find alternative leisure activities meaningless but they can be bored because of the low level of stimulation in alternative activities as well. More nuanced qualitative investigations can help us identify the presence and importance of these aspects and they can contribute to the construction of more appropriate items in the assessment of motives. Besides, such investigations can help us address the question of whether the game is an adaptive or a maladaptive leisure time activity for a person.

Out of the three most salient motives (i.e., social, physical/outdoor activity, nostalgia), two motives were relatively new in the online gaming literature. Physical/outdoor activity is an essential aspect of the game and it has unquestionably more physical health benefits compared to other online games. However, some important questions are yet to be addressed in the literature. For instance, one can report high

scores on the scales assessing physical/outdoor activity but he/she only plays Pokémon GO while traveling, shopping, walking the dog, or doing sport activities. In these situations, playing is attached to pre-existing activities, which can become longer due to the immersion in the game. Therefore, the game capitalizes on the existing outdoor activity and makes it less boring and more entertaining. What may be more interesting to know is that what proportion of players is primarily motivated to go outside and be physically active because of the game. Furthermore, future research should also address the question of how playing Pokémon GO can change these routines in the long run. This question is not specific to Pokémon GO; scientific investigation into the process of how AR games are attached to existing outdoor activities and the modification of these routines can provide a guideline in the development of health-promoting AR games.

Nostalgia is another new motivational construct related to Pokémon GO. Several studies have found that players who were fans of the world of Pokémon preceding the release of Pokémon GO reported of higher motivational levels compared to new players (e.g., Tang 2017; Hamari et al. 2018; Zsila et al. 2018). Creating games for adults that provides them an opportunity to relive their childhood memories not only appears to be a good marketing strategy (in terms of promotion) but it can increase players' motives in almost all aspects. It may not be surprising if future AR games would capitalize on the nostalgia factor and use the games' positive and adaptive aspects in order to promote mental and physical health, recognizing that this motivational aspect can be beneficial for the users. However, longitudinal research is needed to examine the effect of the nostalgia factor on the persistence of other motives as it is possible that users, after immersing into the atmosphere of their childhood, will not be motivated to use this game in the long run.

Overall, we believe that Pokémon GO could become a successful game because it was based upon the main motives of players: the game encouraged the formation of social relationships, created an atmosphere where physical activity is rewarded and childhood memories can be re-lived, provided an opportunity to experience fun and compete with others, encouraged exploration, alleviated boredom, and offered a trendy leisure activity. From a social perspective, playing with others could reinforce the bonding between friends and family members as it provided a common fun activity in which friends and family members had a joint attention to reach the same achievements on an online platform, but they were also present in the same physical reality, which allowed for sharing their experience. Furthermore, it also made possible to meet new people. It also encouraged people to go out and walk, make physical activity, which is stimulating in itself and can lead to a better mood. With the nostalgia factor, it also triggered childhood memories which created temporal distancing and allowed for a past-positive temporal perspective in several players (Zimbardo and Boyd 2015). Regarding the contextual characteristics, the presence of spatial distancing (i.e., seeing reality through a mobile phone) and temporal distancing (i.e., childhood nostalgia) as well as the exploration of the current physical environment can be in itself a very stimulating experience irrespective of the structural characteristics of the game (e.g., scoring, tasks, or skill development). The structural characteristics of Pokémon GO in terms of its competitive and achievement-oriented

nature provided challenges in a trendy and new way, and contributed to the formation of a complex motivational pattern in each player. It might be assumed that all of these characteristics together could lead to the high level of enjoyment in players. It can also be presumed that the success of future AR games (and their players' persistence) can rely on the satisfaction of a similarly complex pattern of motives. Finally, in order to explore the potentially adaptive and maladaptive behavioral correlates of playing AR games, it is important to explore the differences between the different motivational aspects in the assessment of motives. Future studies can build on the motivational constructs that have already been identified; however, the qualitative exploration of new motives is similarly important.

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Chapter 7
Player Experiences in Location-Based Games: Memorable Moments with Pokémon GO

Elina Koskinen, Dale Leorke, Kati Alha and Janne Paavilainen

Abstract *Pokémon GO* was the first location-based augmented reality game to reach mainstream popularity. We present a qualitative survey study (n = 2611) focusing on the *Pokémon GO* players' memorable experiences from the time when the game's popularity was at its peak and the experiences were fresh in players' minds. We analyzed the open-ended written responses with thematic analysis, resulting in seven categories with a total of 82 thematic codes. The categories we constructed were *Game Play and Game Content*, *People and Sociability*, *Location*, *Circumstances and Context*, *Negative Events*, *Feelings* and *Other Codes*. Through our analysis and findings, we provide insights to understand Pokémon GO as a unique social phenomenon as well as a location-based augmented reality game more broadly. In addition to shedding more light on the *Pokémon GO* experiences and considering the potential for location-based games to engage players within the physical and social context around them, the findings capture what players found memorable about the massive phenomenon at its peak.

7.1 Introduction

Location-based games have a long history, dating back to pioneering experiments with mobile and GPS (Global Positioning System) technologies in the early 2000s. The designers of seminal projects like *ARQuake* (Wearable Computer Lab 2000), *Can You See Me Now?* (Blast Theory & Mixed Reality Lab 2001), *Botfighters* (It's

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Alive! 2001), *Mogi, Item Hunt* (Newt Games 2003) and *PacManhattan* (Frank Lantz and students 2004) sought to merge physical and virtual environments through the game interface. Players of these games were tracked through their mobile devices as they traversed the (usually urban) landscape, chasing or 'shooting' each other, collecting virtual items, and completing missions or quests (see de Souza e Silva and Hjorth 2009; Drakopoulou 2010; Leorke 2018). While these early projects relied on an ad hoc assemblage of custom-made and repurposed devices, the popularisation of smartphones in 2008—featuring GPS tracking and cellular data coverage—introduced location-based gaming to a wider audience. Location-based game apps like *Parallel Kingdom* (PerBlue Entertainment 2008), *Shadow Cities* (Grey Area 2011) and *Ingress* (Niantic 2012) built on the concepts of their predecessors, bringing digital gaming into public space. At the same time, they took advantage of the growing ubiquity of smartphones and app stores to both reach more players and achieve greater profits through microtransactions and data collection (see Leorke 2018, Chap. 4).

According to Leorke (2018, Chap. 3), location-based games have been subject to two overarching claims among scholars about their impact on both players and the physical environment in which they are played. First, scholars have argued that location-based games create a "demarcated space for distanced and detached behaviour, allowing players to interact with strangers in ways they wouldn't normally" (Leorke 2018, p. 48). For some, this creates the potential for chance encounters and stronger social ties (de Souza e Silva 2006; Lantz 2006; Mäyrä and Lankoski 2009); while for others, it can encourage intrusive, disruptive or anti-social behaviour (see Davies 2017; Flanagan 2009; McCall and Baillie 2017; Montola et al. 2009). Second, scholars argue that location-based games temporarily transform everyday locations into spaces for play. Some scholars argue this defamiliarises everyday locales and pushes players to explore areas they would not normally visit and see them in a 'new light' (de Souza e Silva and Hjorth 2009; McGonigal 2006; Henthorn 2016). Critics counter, however, that location-based games risk overwriting the everyday, lived conditions of these spaces and treating them as "an entertainment spectacle for an advantaged audience" (Flanagan 2009, p. 206; see also Farman 2012; Gazzard 2011).

When it was released in 2016, Niantic's follow-up to *Ingress*, *Pokémon GO*, took location-based gaming to new heights of popularity. The game reached 65 million active players in its first months of release, and at the time of writing has generated over US$2 billion in revenue, breaking previous records. More notably, it became a public phenomenon, with news media documenting its unprecedented popularity and ubiquity—as well as reports of accidents, injuries, trespassing, and intrusive behaviour by people playing the game (see Jones 2016). *Pokémon GO* thus occupies a unique position in the history of location-based games. It builds on the concept and legacy of previous location-based games, particularly *Shadow Cities* and *Ingress*. But it also capitalises on both Nintendo's recognisable and hugely popular *Pokémon* franchise and the casual style of play afforded by smartphones (see Keogh 2016). Indeed, the franchise itself has also been the most significant reason for players to start playing *Pokémon GO* (see Alha et al. 2019). Fusing all these elements together enabled *Pokémon GO* to not only vastly surpass the player base and profitability

of previous location-based games, but also to become an unprecedented social phenomenon in its own right. It simultaneously fulfilled the various rhetorical promises of location-based games—including their potential to both engage players with, and disconnect them from, their surroundings—all at once (Leorke 2018, p. 153–4).

Given its immense popularity, *Pokémon GO* has also attracted substantial scholarly attention alongside mainstream media coverage. The game's player base continues to fluctuate since its release (Tassi 2018), but scholarly discussions and studies of the game continue to appear. Of these, empirical and ethnographic accounts of the game dominate. Various studies have explored the health benefits of the game, including its potential to encourage physical activity and exercise (Althoff et al. 2016; Barkley et al. 2017), address social isolation and mental health issues (Kato et al. 2017; Tateno et al. 2016) and improve general wellbeing (Yang and Liu 2017). In the context of game studies and game design, researchers have focused largely on players' motivations and reasons for playing (Yang and Liu 2017; Zsila et al. 2017). There have also been a wide range of theoretical discussion of the game's social impact (see Hjorth 2017).

Yet only a handful of studies have empirically tested the claims outlined above about the potential for *Pokémon GO* to transform its players' relationship with the people and physical environment around them through the game. Of these, the study by Vella et al. (2017) is perhaps the most comprehensive to date. Drawing on intercept interviews with a handful of players and thematic analysis of forum posts about the game, the authors analyse the social outcomes for players and the game's impact on their connections with others. Their findings are largely positive, concluding that the game produced "a sense of belonging, facilitated conversations between strangers, and strengthened [social] ties", due in large part to the game's accessibility, ubiquity, and the level of enthusiasm and 'passion' from players (Vella et al. 2017, p. 15–16). Other studies of players' experiences of social interaction and public space include Lee et al.'s (2017) analysis of 'hotspots' where players exchanged advice and stories about the game; and Oleksy and Wnuk's (2017) analysis of the game's potential to facilitate 'place attachment' amongst players.

This paper explores the findings of a broad survey on *Pokémon GO*, focusing in particular on the memorable experiences. This allows for a self-selected approach that also highlights some of the discourse around the game. These findings are useful for researchers, developers and mainstream commentators interested not only in *Pokémon GO* but, as we argue, location-based games as a broader genre with a deeper lineage in public play and playful practices. The article begins with a necessarily detailed outline of our research question and methodology given the size and complexity of the data involved. The next section outlines the results, concentrating primarily on the categories we used to sort the survey respondents' answers. The final section discusses the findings in the context of broader discourses around *Pokémon GO* and location-based games generally, before we consider the unique nature of these findings in the conclusion.

7.2 Research Question and Methodology

Our main research question was as follows: *What kind of self-reported memorable experiences were described by Pokémon GO players; and what did these reveal about their experiences with location-based augmented reality gaming during the early period of Pokémon GO's release?*

In 2016, we designed an online survey focusing on game experiences in *Pokémon GO*. A range of questions was asked in this survey, including both quantitative and qualitative. We have studied the players' positive and negative experiences related to the game (see Paavilainen et al. 2017), and why players have started and continued playing the game, and if they had quit, why they did so (see Alha et al. 2019).

The survey was launched on September 1st, 2016 and was online until September 7th, 2016 with a total of 2616 respondents.[1] This was seven weeks after the game's European launch, and as a result captured the early period of enthusiasm and public attention the game received. Of the responses, two cases were removed due to false information and three cases due to technical problems in saving the responses. Therefore, the total survey data consisted of 2611 survey responses. Table 7.1 lists the background information and the playing frequency of the respondents.[2]

We emphasized the respondents' own narratives and meaning-making by allowing them to answer freely to some open-ended questions. This is a fruitful approach when studying new and emerging phenomena. In this article, we focus on the responses to the following question, as translated from Finnish:

Could you tell us a memorable game experience with Pokémon GO?

Table 7.1 Background information and playing frequency of the respondents

Gender			Age			Playing frequency		
	N	%		N	%		N	%
Female	1628	62.4	Under 18	146	5.6	Several times a day	1394	53.4
Male	926	35.5	18–24	721	27.6	Once a day	483	18.5
Other	57	2.2	25–34	1067	40.9	A few times a week	516	19.8
			35–44	489	18.7	More rarely	99	3.8
			45 or more	188	7.2	I don't play anymore	119	4.6

[1] We tested the survey with 18 respondents and iterated the survey based on the feedback on usability, flow, and other issues that might affect the respondent experience. The final survey was distributed on Facebook in 15 Finnish *Pokémon GO* and other related groups. In the covering note, we encouraged respondents to further share the survey. Two Finnish gaming news portals, V2.fi and Dome also advertised the survey.

[2] Due to our method, the respondents can be presumed to be more active *Pokémon GO* players than the average player population. As an exploratory study on memorable experiences, the respondent sample was not aimed to be representative.

This question was formulated to explore what the participants themselves regarded as important or 'shareable' memories. We did not want to ask about *meaningful* game experience as that might have been misinterpreted by the participants, or might have resulted in self-judgment about what is a worthy response, guiding the participants to anticipate what the researchers would like to hear. Hence, we decided on the term 'memorable experience' as a better way to probe game experiences that the participants consider worth sharing in this context. Memorable experiences also play an important role in the *experience economy* (Pine and Gilmore 1999) where companies aim to design for memorable experience for their customer. In the case of *Pokémon GO*, it is particularly interesting to study how the game affords memorable experience through the social context of game play. As self-selected and self-reported data, the responses also provide an invaluable 'snapshot' of the features, experiences, and attributes of the game that stood out during its first few weeks of release when its player base and enthusiasm for the game was at its highest.

The responses to the 'memorable game experience' question were typically short, ranging from a sentence to a few sentences. Some of the respondents described more than one memorable experience. The question was mandatory to complete the survey, although 211 participants did not report any moments or said that there were none. These answers we coded as *Invalid*, leaving 2400 valid responses.

We used applied thematic analysis (Guest et al. 2012) for the qualitative analysis, where the open-ended answers were thematically coded. The data was coded primarily by one researcher with two researchers coding in specific points in the process. In the beginning, all three researchers coded a sample of the data ($n = 100$) individually, taking notes and marking codes and their descriptions to a code guide. After the coding, the researchers gathered to talk, compare the codes, and merge similar codes together. One researcher continued to code with the code guide the next 1200 quotes. After this halfway point, the three researchers coded a further sample of the data ($n = 100$) separately again with the help of the formed code guide. The resulting codes were compared and discussed. In the case of disagreement, a consensus was sought and the code guide was edited accordingly. After changes to the code guide, previous codes influenced by the change were corrected. After that, one researcher continued to code the rest of the data. This approach was used to make sure that the researchers shared a unified view and the one researcher could code the majority of the data alone, avoiding the high cost and time-consuming process of all researchers coding the whole data. In addition, using several researchers helped us to pinpoint challenging and problematic points, and solving these made the process more reliable.

In total, 117 codes were used to analyse the survey data. Due to the large number of codes and the fact that many of them related to only a few responses, in this article we excluded codes that occurred in less than 1% of the valid responses (i.e. 11 or fewer occurrences) for the purposes of brevity. This left 83 codes that were suitable for analysis. The resulting codes and occurrences are outlined in the next section. We consider occurrences that appeared at least in 5% (around 110 occurrences) of the cases to be quite significant, 35% being the highest amount of specific cases. In future research, we are aiming to also have a look at the outlier experiences. The codes we

have used are likely to stay the same in our future studies, though the quantitative metrics might fluctuate when iterating on the data.

Although the codes allowed us to identify commonly recurring themes or keywords, they also provided a way to quantitatively measure the extent to which each aspect of the game and game play figured into players' memories. However, we did not seek to simply outline the most prominent types of memories and experiences players described, but also to test out the broader claims made about *Pokémon GO* and location-based gaming in general.

As discussed in the Introduction, scholars have for many years made claims about location-based gaming's potential to engage players with or disconnect them from the social and physical environment around them. *Pokémon GO* in particular has also been lauded as encouraging people to get outdoors, exercise, explore their local neighbourhood and public spaces they might not normally visit, strengthen ties with friends and family members and meet and interact with strangers in public. At the same time, it has also been criticised for spurring irresponsible, dangerous and criminal behaviour (e.g. Serino et al. 2016) and reinforcing geographical divides by neglecting rural and economically disadvantaged areas (Kooragayala and Srini 2016; Paavilainen et al. 2017). Although this particular question about 'memorable experiences' was not framed to test out these claims, it formed a lens through which respondents' anecdotes were understood and analysed, allowing us to reflect on *Pokémon GO* as both an example of location-based games as a genre and as a unique and quite specific social phenomenon.

In the following section, we present our findings from the coding and analysis, before providing an overall discussion of the responses in the subsequent section. All quotes from respondents have been translated from Finnish by one of the authors of this chapter fluent in both languages. Survey participants are indicated after the quotes by an ID number, gender and age.

7.3 Results

83 codes were sorted into seven categories for understanding the aspects of the game that the memories related to. These categories are *Game Play and Game Content*[3]; *People and Sociability*; *Location*; *Negative Events*; *Feelings*; *Circumstances and Context*; and *Other Codes*. The two categories with the largest number of codes—*Game Play and Game Content* and *People and Sociability*—were both divided into subcategories. Rather than providing the number of occurrences of each code, we have used percentages as a more general indicator to account for margin of error (see Table 7.2).

[3]Game play (verb) here is defined as the activity and behaviour of players while playing the game.

Table 7.2 List of the categories and codes with percentages

Game play and game content					
Game mechanics		Pokémon		Play experience	
Catching	15%	Specific Pokémon	35%	Hardcore	4%
Lure	11%	Rare Pokémon	9%	Newbie	3%
Gym	8%	New Pokémon	5%	Effort	1%
PokéStop	7%	Strong Pokémon	3%	PokéWalk	1%
Hunting	7%	Favorite Pokémon	2%		
Finding	7%	Many Pokémon	1%		
Hatching	6%				
Team	3%				
Evolve	3%				
Sightings	3%				
AR (augmented reality)	1%				
Lucky egg	1%				
Incense	1%				

People and sociability					
People		Social interaction		Social impact	
Friends	10%	Strangers	16%	Hysteria	4%
Many people	10%	Playing together	13%	Cross-generation	4%
Children (others)	8%	Game discussion	7%	Community	3%
Children (related)	7%	Helping	4%	Event	2%
Partner	6%	Making friends	2%	Forum	1%
Siblings	2%	Sharing happiness	1%	Co-present play	1%
Youth	2%	Bonding	1%	Hype	1%
Parents	1%	Boasting	1%		
Group	1%	Competition	1%		
Family	1%				
Relatives	1%				

Location		Circumstances and context		Negative events	
Specific location (meso)	26%	Night	6%	Escape	4%
Specific location (macro)	11%	Early days	3%	Bug	2%
Specific location (micro)	1%	Weather	3%	Mistake	1%
Sightseeing	2%	Driving	2%	Out of Poké Balls	1%
Travelling	2%	Work	2%		

(continued)

Table 7.2 (continued)

Location		Circumstances and context		Negative events	
Transformation	1%	Cycling	1%		
		Pet	1%		
		Drinking	1%		
		Wild animals	1%		

Feelings		Other codes			
Disappointment	4%	First time	13%	Unexpected	2%
Accomplishment	2%	Funny story	3%	Reflecting	2%
Thrill	2%	If not for Pokémon GO	3%	Spectating	2%
Nostalgia	1%	Exercise	2%	Positivity	1%
Shame	1%				
Frustration	1%				

7.3.1 Game Play and Game Content

As might be expected, most of the memories described by respondents related to the game play and game content itself—namely, the process of catching, hunting, battling and training Pokémon. Because of the large number of codes in this quite broad category, for the purposes of discussion we further divided it into three subcategories: *Game Mechanics*, *Pokémon* (which covers characteristics of the Pokémon, such as strong or rare Pokémon, and many Pokémon); and *Play Experience* (including play style and approach).

The most commonly mentioned game mechanics related to the process of **catching**, **finding**, and **hunting** Pokémon as well as the **lures**, **gyms** and **PokéStops**, which serve as the key mechanisms for locating and battling Pokémon.[4] **Hatching** Pokémon from eggs also featured relatively prominently in the memories. The chosen **teams**, **evolving** Pokémon and **sightings** of them received fewer mentions, while **incense** (which is used to attract Pokémon only for one player, not others), the **lucky egg** (which doubles XP for 30 min) and the optional **AR** (augmented reality) feature, which allows players to see and catch Pokémon against the backdrop of their surrounds through their phone's camera, were rarer.

The second subcategory, *Pokémon*, strongly overlaps with the first, in that many players mentioned capturing, encountering or sighting a **specific Pokémon** they named—typically a **rare** or **strong Pokémon**, **new** one they had not seen before, or a **favourite Pokémon** from their previous experiences with the franchise. There were also a handful of mentions of **many Pokémon**—where an abundance of Pokémon appeared.

[4]In the remainder of this article, the codes used are indicated with bold text.

The third subcategory relating to game play and game content is *Play Experience*, which encompasses the different ways people approached and experienced the game. The most common theme within this subcategory was the **hardcore** style of play. Some players reported being strongly invested in the game to the extent they went to extreme measures, played it for a long stretches of time, or walked long distances just to hunt, catch, and/or hatch Pokémon.

> A 24-hour Poké trip. After that I was tired and everything hurt, but it was worth it. […] (ID 812, female, 22)

Newbie was also a prominent code, which we used to denote respondents' memories that demonstrated a 'newbie-ness'—not knowing how the game works and making rookie mistakes, or more broadly simply being excited about the 'newness' of the game. In some cases, players also mentioned the amount of **effort** the game required, especially in the context of catching or encountering strong or rare Pokémon because they were particularly elusive or involved a lot of time and effort.

> When I found Pikachu. I had walked circles in Kokkola probably for five hours and seeing it in the "nearby" mode many times, but never concretely found it. In Kajaani I accidentally found Pikachu and my joy was limitless. That was the Pokémon that was the most important to find for me. (ID 1012, female, 30)

Lastly, some players mentioned a specific practice which we translated as a 'Pokéwalk'.[5] This is a word invented by players to describe the activity of going out on a walk specifically to play *Pokémon GO*.

> We don't go for walks with my spouse. Now we went for a two-hour Pokémon walk at 11 pm. We walked along the quiet, nocturnal shores of Helsinki. It was fun and romantic. (ID 766, female, 31)

7.3.2 People and Sociability

As with the previous category, due to the large number of codes we further divided this broad category into three subcategories: *People*; *Social Interaction*; and *Social Impact* of the game.

The subcategory *People* was used to generally capture who featured in the responses—who the respondents encountered or played with, and their relationship to the respondents. **Friends** were most common, followed by children—which we divided into **children (related)** and **children (other)**—and **partner**, **siblings**, **youth**, **parents**, **family,** other **relatives** and **groups**.[6] Also seeing **many people** gathering in one place to play the game was often a part of the respondents' memories.

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[5]For example, "pokekävely" or "pokemon-kävely" in Finnish.

[6]In our coding, children (related) has been defined as players' own children and child relatives (niece, nephew, grandchild, godchild). Children (others) means non-related children. Partner means boyfriend, girlfriend, spouse, husband or wife. We defined Youth as young people who were not described as children by the respondents. We used Family when the respondent did not describe the family members more specifically. Relatives was used when other related people like nieces,

In the *Social Interaction* subcategory, respondents described **playing together** with familiar people or encountering **strangers** while playing the game. We coded **strangers** when respondents described interacting with people they did not know previously.

> Generally, it's been a joy to notice how playing connects people. For instance, in lure spots you notice right away who are playing and it's easy to exchange a few words with strangers. (ID 70, female, 25)

Many of these stranger encounters were with **children (others)** or **youth** who were eager to discuss about the game. Having something in common to talk about with strangers, **game related discussion** occurred often in the respondents' memories in addition to **helping** other players with the game. The latter often involved respondents telling others where they had seen some rare Pokémon the other players were after, or the other way around. Some players described **making new friends** while playing. Fewer respondents' memorable experiences were related to moments where someone else, usually their child, was very excited about the game, and the respondents were able to **share the happiness**. **Bonding** through playing *Pokémon GO* was also mentioned several times.

> We have a common Whatsapp group with my siblings (we live in different cities), where we share our funniest game experiences and best catches as pictures. The game and our reciprocal goofing off has brought us closer together (the age difference of youngest and oldest sibling is 11 years). (ID 572, female, 27)

A few players **boasted** how they were the first from their friends to catch a specific Pokémon or they caught or have an especially strong Pokémon. Some players enjoyed the **competition** or competitive element of the game.

Within the *Social Impact* category, many players remarked on the **hysteria** caused by the game especially during the early days. When a rare Pokémon appeared in a park with hundreds of people, this might have caused a stampede when players were trying to catch that Pokémon.

> On the street people were shouting that there's a Dragonite. Small kids were patrolling the main street and directing people who were searching for the Pokémon into the alley. Huge mass hysteria, people were cheering and throwing high fives. (ID 1737, female, 28)

Many players noticed or even admired the diversity of players *Pokémon GO* had. Respondents notified especially the **cross-generational** audience of the game. Having so many people from across generations and from different backgrounds that were playing the game, also a sense of **community** emerged in many of the respondents.

> In a park near a lure, approximately 10-year-old boys asked me: "Do u play pokemon too?" And I said I was on level 24. I continued my walk and heard as one of the boys said: "What a cool granny, and she's played way much." That has made me smile for many days already. (ID 366, female, 53)

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nephews, uncles, aunts, grandparents, cousins or in-laws were mentioned. We coded Group, when the respondent mentioned being with a group of people.

> Also during the night, walking in the streets felt safer than ever, as there was other people always around. The experience relieved the feel of loneliness and created a sense of togetherness. (ID 1924, female, 32)

Some players mention that their memorable experiences were related to *Pokémon GO* themed **events**. Some of these events were related to specific **forums** like Facebook or Whatsapp groups.

> I'm in Pokemon Go Seniorit group on Facebook and we spent a day in Suomenlinna during the summer. It was a really fine experience to spend time with people who were interested in the same game. […] (ID 68, female, 36)

A few players reported **co-present play,** in that they were playing in the same space with few people but did not have any interaction with them despite knowing that they were doing the exact same thing. Some players mentioned **hype**, often in the context of the early days of the game when people were excited about or anticipating playing the game.

7.3.3 Location

When a **specific location** was mentioned, we coded the responses based on three general types of location. These were **micro**, **meso**, and **macro** level sites. 'Micro' refers to very specific locations, such as a park bench, kitchen table or a doorstep. 'Macro' includes the general city, town, region or country where the memory took place. Lastly, 'meso' refers to sites in-between these levels. Unsurprisingly, the meso level was clearly the largest category of these. As such, we broke down the meso-level into subcategories of types of sites, consisting of the most prominent ones in descending order: park, Suomenlinna (an 18th century fortress near Helsinki and popular tourist destination), city center, house, church, forest and graveyard.

In addition to the general location where memories took place, respondents discussed **sightseeing** while playing the game, ending up in or discovering new places on their trips for hunting Pokémon. Respondents also discussed **travelling** specifically for Pokémon hunting or catching Pokémon while they were doing travelling for other reasons. Lastly, we used the code **transformation** to capture instances where respondents described a normally empty place being full of people playing *Pokémon GO* or when a familiar location was transformed by the presence of players.

> In the early phases of the game I was just walking through Kaivopiha [mall]. The atmosphere was eery, when usually rather hectic city environment was now full of people being totally silent and staying put. The feel was like from a Zombie movie or from Hitchcock's Birds, I felt that I have to walk silently and carefully not to wake the zombies and get attacked by the horde. (ID 1168, male, 45)

> As a long-time gamer it was delighting to go to Ruttopuisto [park] and realise that for once, we gamers are the majority instead of ten geeks farming and 500 young adults drinking booze. Even the bathrooms didn't have queues, as people were playing, not boozing. For once, we were the mainstream! (ID 2039, male, 42)

7.3.4 Circumstances and Context

This category captures the conditions and contexts during the memories described. Many players had memorable experiences about when they had been playing during **night**time, or from the **early days** of the game during its launch period in Finland (or even before) when a huge number of people were playing it.

> […] When the game was published to be downloaded, everyone, or 95% of people in Hervanta, seemed to play the game. People of all ages and appearances circled around with phones in their hands and shouted after Pokémon. It looked funny. (ID 2439, male, 22)

Many discussed the **weather**, whether it was especially nice or the respondents noticed that they went out to play even when it was raining. Many players had experiences playing from the car while they or someone else was **driving** or hunting Pokémon while **cycling.** Some respondents played at **work**, or while commuting.

> I opened the game at work, and by accident my phone had audio maxed out. The game's opening music made everyone around laugh and they started teasing that "you're not really playing some PokeGo, are you". I asked how would they recognize the sounds as Pokémon Go. Everyone was embarrassed and continued their work like nothing happened. In ten minutes, my boss emailed me to ask which team I would recommend. (ID 917, female, 32)

Sometimes players' memories included **pets**. In most cases, this was related to the respondents walking their dogs while playing. Some respondents were **drinking** or drunk in their memorable experiences, often having a beer at the park with friends. In addition to finding Pokémon, some players also encountered different **wild animals**, like hedgehogs, deers, and badgers.

7.3.5 Negative Events

Negative events made up a relatively small but still significant proportion of respondents' self-reported memories. The most common of these was when a particular Pokémon **escaped** without being caught. Some respondents also expressed being **disappointed** either with experiences like these (a Pokémon escaping) as well as with the game itself.

> The most bitter disappointment while playing Pokémon was, when after many balls, berries and other persuasion, a Vulpix that I very much wanted escaped. This still stings. (ID 1424, female, 24)

During *Pokémon GO*'s early days, there were many bugs, technical glitches and GPS signal dropouts reported. We coded this by using the catch-all term **bug** to encompass these various issues or problems. When players reported these, they more commonly expressed disappointment but also **frustration**. Some memories involved players running **out of Poké Balls** to catch the Pokémon they were after.

> After a few days of playing, the European exclusive Mr. Mime Pokémon spawned almost in my home yard -> my [GPS] location was acting up, and when the location finally worked, the game bugged and I couldn't "click" the Pokémon. Infinite annoyance, infinite. (ID 2387, female, 24)

Lastly, respondents recounted making **mistakes** while playing the game. Some of these were less serious incidents, like players accidentally breaking their phone or pushing a wrong button in the game, resulting in deleting an important Pokémon. Others were more serious, such as driving into a ditch or tree or almost getting hit by a car or a cyclist.

7.3.6 Feelings

Pokémon GO has managed to elicit strong emotions. In addition to **disappointment** and **frustration** mentioned earlier, players often recognized feelings of accomplishment and thrill. **Accomplishment** was frequently related to being able to evolve a specific Pokémon, capturing an elusive Pokémon or conquering the gym. Players experienced **thrill** especially when they were trying to catch a rare Pokémon and having to throw multiple Poké Balls. Some players experienced **nostalgia** while playing *Pokémon GO*, whether it was related to encountering familiar characters from childhood related to games, animation or collectable cards, or through *Pokémon GO* finally being able to fulfill the dream of being a Pokémon trainer.

> When I caught an Aerodactyl. This connects to a childhood trauma when in kindergarten my friend stole my Aerodactyl minifigure and I never got it back. Felt somehow wonderful to get my favorite Pokémon "back"!! (ID 475, female, 22)

> When I played for the first time and was running around all jazzed up in my surroundings through meadows and hills, finally I found Weedle and caught it, felt like being an IRL Pokémon trainer. :D (ID 884, female, 24)

A handful of players described **embarrassment** related to playing the game. They felt this for example when being late from a meeting because of spotting a rare Pokémon, yelling accidentally out loud when catching one, or lying to partner about not spending money on the game.

> When my brother announced that my favorite pokemon was at a nearby shop and I right away went cycling in my pyjamas. I didn't catch the Pokemon but I felt amused and also a bit ashamed by my rushing. (ID 2368, female, 26)

7.3.7 Other Codes

Some of the occurring features in the respondents' memorable experiences did not seem to fit any of the categories created. Many of the memories related to something that the players did for the **first time**, whether it was for example seeing or catching

a specific Pokémon or conquering the gym for the first time, or hatching their first 10 km egg. Many of the respondents' memorable experiences were **funny stories**. These were from very diverse topics, for example funny situations with AR, giving funny names to caught Pokémon or putting low-level Pokémon to defend the gym.

> When I met other players who recognized me as the "Magikarp man", the player who had left a Magikarp to defend a gym as a joke. (ID 371, male, 27)

The game drove players to do things that they would not normally do **if not for Pokémon GO**. This could mean for instance having unusual social interaction, walking or going out more than normally or seeing new places.

> […] I was brave enough to talk to strangers even though I suffer from social anxiety. (ID 313, female, 24)

Getting **exercise** while playing also came up from time to time. Players also encountered **unexpected** events while playing, mostly encountering a rare Pokémon when they did not expect to see one, for example at their home. Some of the players' memorable experiences were related to **spectating** other players. Often this was admiring how parents and children are playing together.

> I've seen a dad teach two excited young kids how to play in downtown. It was really sweet, and it's lovely that the game in some cases also attracts parents, who would not play with their children outside. (ID 1469, female, 22)

Some players were **reflecting** in their memories the effects the game has had. One example that was often mentioned was the unique experience of the early days of the game when it was extremely popular. Some respondents pondered how it was very easy to talk to strangers and how non-Finnish that is—or, conversely, how sometimes play situations actually were examples of stereotypical Finnish behavior.

> […] During summer nights it has been nice to sit in a group (of strangers) at a lure at the yard of the university even though nobody speaks to each other. Everybody just sits quietly and plays by themselves. Wonderfully Finnish. (ID 1655, female, 23)

> I came to PokeStop that had a lure and no one else around. I stayed to use the lure, and in a moment, mother and son, a pierced and tattooed girl, a bit stubby nerd boy and about 4 young boys (about 7yo) arrived and everyone chatted freely about the game. Talking to strangers is quite rare to us Finns and the situation was even a bit amusing. (ID 179, male, 36)

Some players noticed varied **positive** consequences caused by the game. Some had seen how the game encouraged people to be more active, while others felt that walking during the night felt safer due to the game and players around them.

> I had just started playing and was walking home alone during the night, when an unknown foreign man joined me—he was playing Pokémon too and going to the same direction. He gave me tips on how to play and I found out that he lived almost in our neighbour. The encounter left a good feeling and the realization that Pokémon decreases people's fear towards each other. (ID 1708, female, 35)

> At one gym I bumped into a young man, who was in the same team with me. We conquered the gym together to our team. This man was quite untidy, and he told me that Pokémon GO has made him move again and leave home and go outside. Made me feel good. (ID 1304, female, 27)

7.4 Discussion

As the previous Results section illustrates, our question about memorable experiences yielded a large volume of data—2400 valid responses—that related to a wide and diverse number of *Pokémon GO*'s features. Players commonly recounted memorable Pokémon catches and encounters; interactions with **strangers**; the **specific location** of their memories and exploring their surrounds (both familiar and new locales); and moments relating to the **first time** they played. 'Negative events' and 'Feelings' were less prominent and the latter was more difficult to code, given that players' memories tended to centre on concrete events and incidents, or broader reflections about the game mechanics or game itself. The sheer range of memories, and the diversity of categories we used to code them, demonstrates the difficulty of analysing such a large dataset and extracting specific findings when there are so many thematic issues surrounding the game. Yet, this broad nature of the data is also an advantage, since it provides an insight into what players themselves consider memorable or worthy of mention about the game. It is also a highly unique dataset, as one of the largest sample sizes for an academic survey of *Pokémon GO* that was also conducted soon after the launch of the game in Europe, when its player-base was at its peak.

In what follows, we discuss the relevance of our findings in each of the seven categories, before focusing on the broader implications of the data as a whole.

7.4.1 Game Play and Game Content

The quantitative measurements (percentages) demonstrate that a majority of respondents' memories related to the game play itself—finding, catching, battling and training Pokémon—with many recounting a particularly memorable or exciting catch, encounter or gym battle. But it is important to emphasise that in many cases these were connected to experiences of social interaction, sharing moments with others, and other everyday experiences. As a location-based game, *Pokémon GO* players' actions frequently took place in outdoor, public places. Although some players recounted memories of just the game play itself—catching the Pokémon—many others commented on this experience taking place with others around them, or in specific locations where they played the game. As such, game play and game content should not be considered separate from this context.

One particularly notable game play related finding is the **hardcore** style of play reported by respondents. Although only 4% of responses were coded as **hardcore** experiences, this phenomenon is significant in the context of *Pokémon GO* as a casual game designed to be consumed as "play snacks (rather than meals) that are consumed at various moments throughout the day" (Alexander 2014, p. 196). The different types of hardcore play—spending long hours with the game, walking long distances to hatch eggs, and going to extreme lengths to catch Pokémon—suggest that for some respondents, at least during its early phase, their investment was more

akin to a hardcore player devoted to the game. This reflects Leorke's findings based on in-depth interviews with a small sample of players of another location-based game, *Wayfinder Live* (Troy Innocent 2016). Players of that game similarly described going to extreme lengths (Leorke 2018, p. 230–231), suggesting that a certain type of location-based game player might become caught up in the location-based play experience, rather than treating it solely as a casual game played in brief 'snatches' of play.

The low number (1%) of memories involving **AR** is worth noting. Given that less than 25% of our survey respondents reported using AR at least sometimes (with 9% using it regularly), this is to be expected. It also reflects the generally low uptake of *Pokémon GO*'s AR feature with most players preferring to turn it off to make catching Pokémon easier (see Paavilainen et al. 2017). Most memories mentioning AR were humorous or interesting views or photos taken of Pokémon with the camera, or simply the first time players tried out the feature, suggesting that augmented reality is largely a novel, rather than integral, aspect of the game.

7.4.2 People and Sociability

While game play and game content accounted for the largest percentage of codes, the richest findings related to the social interaction category. The **strangers** code, as mentioned, was used to capture memories where respondents described interaction with people they did not know previously. Although arguments have been made both for and against *Pokémon GO*'s potential to facilitate social interaction (see Davies and Innocent 2017; de Souza e Silva 2017; Lee et al. 2017; Winegarner 2016), the encounters with **strangers** reported by respondents provided strong evidence that the game did facilitate chance encounters and exchanges with strangers that would not have taken place without the game. Our findings resonate strongly with those of Vella et al. (2017), who found that *Pokémon GO* acted as an 'ice-breaker' for strangers playing the game around others in public. One respondent, for instance, wrote:

> It has been a joy to notice that people talk to each other easier than before. Sociability between strangers has increased. For example, at one time when we went pokehunting we talked for a long while with a young immigrant boy, which we might not have done otherwise. (ID 826, female, 34)

The **bonding** code also supported Vella et al.'s findings that the game 'strengthened ties' among players, including with the respondents' **friends**, **partner** and **family** members (**child (related)**, etc.). One mother wrote,

> […] For me the game has meant greatly a new kind of binding with my children, although we were close before, but through the game there has become a one new way to share interest to something in common, many nice memories and experiences are related to that. (ID 1145, female, 36)

And lastly, the **community** code correlated strongly with Vella et al.'s findings that *Pokémon GO* helped establish a 'sense of belonging' for some players, what Vella et al. (2017, p. 10) paraphrase as 'feeling part of a community of players', 'enjoyment of sharing the game with large numbers of other players', 'being a part of something large'. Our survey respondents similarly mentioned feeling that the game 'connect[ed] people' and created a 'sense of community' and 'togetherness'. Furthermore, the **sharing happiness**, **competition**, **team**, and **boasting** codes demonstrated the wide social impact of the game, forging social connections among the game. And the survey responses also identified the phenomenon of **cross-generation** communication, whereby *Pokémon GO* facilitated interactions between players of different generations, usually older people (adults and grandparents) and children.

At the same time, it is important to note—following Vella et al. (2017)—that this social impact of *Pokémon GO* was largely due to its early popularity, massive player base and ubiquitous media coverage. Our survey, unlike Vella et al.'s research, also included a small number of instances in which players avoided social interaction or deliberately chose not to communicate with others. One player, for instance, described

> an amusingly stereotypically Finnish encounter; I ended up to a gym at the same time with another player. We started conquering the gym […] We also happened to belong to the same team. Throughout this whole time we didn't exchange a word, we probably didn't even look each other in the eyes, and we stood as far from each other as physically possible. […] (ID 1103, female, 27)

These types of interactions were vastly outweighed by the more social encounters described above. And as this respondent point out, they may be due to the 'stereotypically Finnish' nature of interactions, whereby Finnish people are perceived as being particularly socially awkward. Nonetheless, they demonstrate that the game does not inherently encourage social encounters in all types of players.

7.4.3 Location and Circumstances and Context

As Leorke (2018, p. 58–61) points out, a second key claim made about location-based games concerns their potential to transform everyday locales through play and encourage players to visit new locations and see familiar locales from a new perspective. *Pokémon GO* itself has also been compared by numerous scholars and commentators with the Situationist International tactic of the dérive in encouraging exploration of the urban environment (see Farley 2016; Sparrow 2016). Although respondents did not use this kind of terminology to describe their experiences, our survey did demonstrate some examples of this potential to explore new places and defamiliarise everyday locales. Players reported **sightseeing**—seeing new sights and discovering places they would not normally go to or notice—as well as memorable moments that took place while **travelling**. One player described starting the game while "on summer vacation in Japan":

> Starting my own pokemon-adventure in the country where the games were originally born 20 years ago was an experience in itself, to that you can add all the interaction with locals while playing the game. (ID 1192, other, 28)

The **transformation** code also demonstrated the potential for the game to radically change or reinvigorate locales, often parks or city centres. Respondents described places normally empty or abandoned at night full of players, parks where people would normally be drinking alcohol instead playing the game, and crossing paths with other players in out-of-the-way parts of the city. These codes are not common in our analysis but nonetheless provide empirical evidence for *Pokémon GO*'s potential to engage players with their surrounds in new ways.

Lastly, the *Circumstances and Context* category reinforced the significance of the timing of this survey, taking place in July 2016—during Finnish summer, and not long after the **early days** of the game's release. From the respondents' answers, it is clear how much these factors influenced their experiences with the game. When **weather** was mentioned, most of the time it was in a positive manner: it was nice to go out and play when it was sunny and warm. Players also often described playing during the **night**time, which would not be so pleasant in Finland during other seasons. In addition, summer vacation time makes it possible to spend time outside late in the evening.

7.4.4 Negative Events and Feelings

Negative memorable experiences were captured through two separate categories, *Negative Events* and *Feelings*. The former contains game specific events (e.g. **escaping** Pokémon, running **out of Poké Balls**) while the latter features personal emotions (e.g. **disappointment**, **embarrassment**, **frustration**). Earlier literature suggests that negative experiences such as frustration plays an important role in game experiences (Poels et al. 2012) and they can make the positive experience stronger (Korhonen et al. 2009). Negative experiences have not been studied rigorously in games research and their role in online game services could be important as highlighted by the relatively small but still significant number of respondents who chose to report these. Distinguishing the "good" negative events (those that motivate to try again for example) would be important from a game design point of view.

The criticised irresponsible and dangerous or at least careless behavior of the players also emerges in the memorable experiences, yet in very small numbers. Due to the open-ended nature of the survey question, however, our data cannot be used to validate perceived or actual risks involved in playing *Pokémon GO*.

Positive feelings like **accomplishment** and **thrill** also highlighted the unique nature of *Pokémon GO* as a social phenomenon that attracted large numbers of players. Both aspects of the game—its mechanics (catching Pokémon) and location-based features (playing in public locations, often with many other people around)—contributed to the memorableness of the game as an experience. Yet

at the same time, nostalgia did not come up as often as one might expect, since for many players the reason to get into the game was due to the familiarity of the brand (Alha et al. 2019) and it was also one of the most common positive experiences in the game (Paavilainen et al. 2017). The surprisingly small representation of nostalgia is further evidenced by the relatively few occurrences of **favourite Pokémon**. These findings suggest that for many players, the game as social phenomenon contributed much more to their memorable experiences than previous experiences with the brand itself.

7.4.5 Other Relevant Findings

In this final discussion section, we wish to focus in particular on the specifically Finnish context of this survey as well as the broader global implications of our findings. As briefly mentioned above, some respondents observed the Finnish mentality, and how sometimes players seemed to act either in a non-Finnish or in a very Finnish way related to social actions. With Finnish people often perceived as socially awkward, some players felt that communicating with strangers as easily as they did while playing *Pokémon GO* was very non-Finnish behavior. On the other hand, when witnessing a situation where people were at the same place knowing that others are doing the exact same thing, playing the game, and not even a glance was exchanged, this was recognized as a very Finnish way of acting. These thoughts were captured through the *Other Code*, **reflecting**, in which respondents reflected on the potential for the game to literally change how people interact and behave in public. In some cases, these related to Finnish sociability particularly, but in many instances they were a broader reflection on the scale and reach of the game in everyday public life.

The sheer ubiquity of the game during its peak—with countless people visibly playing it on the city streets and in other public spaces—demonstrated the potential for just one location-based game product to have an enormous, very visible societal impact, however briefly. The **if not for Pokémon GO** code also captured this notable 'phenomenon' of the game, whereby people described doing things or behaving in ways that they would not normally—whether talking to strangers, finding they have something in common with people from a completely different generation, or going on walks and visiting locations that they might not otherwise. Although it is important to put these in context, with relatively few occurrences of both codes given the survey sample size, they nonetheless provide strong evidence for the momentarily transformative potential of *Pokémon GO*.

7.5 Conclusions

In this chapter, we have presented a thematic analysis made from an online survey answers related to players' memorable experiences of *Pokémon GO*. Our findings

show that there are two main areas for the memorable experiences within *Pokémon GO*: Game play and game content, and people and sociability. This shows that not only was *Pokémon GO* a successful game from a game play and game design perspective, but that it was a highly social experience for the respondents—at least during the game's early period. The game's nature as a location-based game is also demonstrated through the high number of codes connected to different locations the game was played in, and it also demonstrated a modest but still significant potential to transform and engage players with both new and familiar locales.

These results give us a deeper understanding of why *Pokémon GO* was such a success, and why playing it during its early period provided people so many memorable experiences. It is interesting to learn about the player experiences in a game that has been in many ways a unique phenomenon. Asking about memorable experiences let the players themselves choose which moments have been the most meaningful or otherwise important or special to them. As a result, we were able to let the data speak for itself, while also analysing them through the frame of broader mainstream and scholarly discussions about *Pokémon GO* specifically, and location-based gaming more broadly.

After our survey, the game has evolved and changed, and as fewer people play it regularly this also changes the social nature of playing, making many of the social experiences difficult to repeat. In addition to possible impact on sociability, novelty of the game may have had an effect on the strong focus in game play in the memorable experiences. If the survey would be conducted again, **hunting**, **finding** and **catching rare** or **specific Pokémon** might not have such a prominent role. We managed to catch the game experiences when the game's popularity was at its peak and the game still relatively new. After given the opportunity to play the game for a longer while, the emphasis of the memorable moments might shift and even reveal new memorable game experiences.

This chapter is a stepping-stone for further investigation concentrating more deeply on the specific areas of memorable experiences related to *Pokémon GO*. In future studies we are aiming to go deeper to different categories and themes and also present interesting outlier experiences that we were not able to mention in this broader overview of the findings.

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Chapter 8
I Play, You Play and We Play Together: Social Interaction Through the Use of Pokémon GO

Mateus David Finco

Abstract Nowadays mobiles are used mainly for communication throughout social medias and apps, and games on mobiles have not been that successful during the last years. Since July 2016, a location-based augmented reality game named *Pokémon GO* was launched with a potential and promising proposal: making people walking, cycling or running through different urban places, supporting users to be healthier and more active in their daily activities, and interacting with other users by social meetings. The objective of this study is to observe substantial changes of users, regarding how the social interaction through the use of a mobile game can modify people's lifestyle. The methodology was developed with a qualitative analysis involving a sample with players who were invited to complete an online questionnaire to answer specific questions about lifestyle, healthy choices and social outcomes from the interaction and use of *Pokémon GO*. This study involved 125 players (84 male and 41 female) in the city of Pelotas (South of Brazil) that have played the game for at least six months. It was possible to observe how users were meeting new people to socialize and making groups to walk or run together, getting an extra motivation.

8.1 Introduction

Social interaction is changing from time to time. Children, youngsters and adults are attracted by the use of technologies for many purposes: communication, fun or interaction. Mainly, the use of technologies has reduced distances among many people, bringing different types of relationships by the use of apps or social media. Also, we can consider that gameplays are very popular nowadays in many places around the world, where people can search for fun in their free time. Video and computer games are a big success regarding screen time spent by people. On the other hand, mobile games have not been successful during the last years, because of the reduced interactivity, small screen size design, lack of attractiveness for entertainment, and playability that are not very attracting comparing to video games or computer games.

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In the history of digital games, it was rarely possible to associate video games and mobile games as positive contributors for social interaction, as users mainly played on their owns and it became a lonely and individual activity. Some studies show that electronic games could be potentially important to attract players and contribute to sports and other physical activities based on movements and social interaction (Baranowski et al. 2008).

An idea, poorly developed for the massive use of mobiles but recently very well adopted for video games, is the exergames or active video games. Exergames are the combination of exercise and games, were players can jump, throw and dance. The full use of the body is required to interact in the games.

Finco and Maass (2014) define exergames as a type of video games that include any type of physical exercise in the game routines. In these games, it is possible to include also physical activities involving a capture system of movements of activities such as dance and sports. Exergaming or exergame practices are the act of use of this type of video games to work out. The intensity measure in the practice will vary, depending on the game, as well as the caloric expenditure during the interaction. Some of the most popular exergames are *Wii Fit*, *Dance Dance Revolution* and *EA Sports Active*.

Mainly, games offered for mobiles were designed for fun and short time, not involving many tasks and skills as the exergames that involve balance, jumps, kicks or punches. Mobile games have been considered 'sedentary games' for not allowing people to move and interact that much with others. Since July 2016, a location-based augmented reality game named *Pokémon GO* came with a new proposal: making people walking or running through different urban places, encouraging users to be more active and interacting with other users. In the game, players use a mobile device to locate, capture, battle and train virtual creatures that appear on the screen as if they were in the same real-world location as the player.

Csikszentmihalyi (1990) states that the idea of attractiveness in a game depends on how the player's skill is combined with the challenges and the narrative of the game, supported by the flow theory, called the psychology of optimal experience. During the flow experience, our level of focus maximizes our performance and sense of pleasure.

In the last few years, researchers started to investigate how such games could contribute to the practice of physical activities and exercises, to the training of users to participate in a vast range of sports and other movement based activities (Hayes and Silberman 2007).

The aim of this study was to analyze how players of *Pokémon GO* could improve their social interaction while or after using the game in their daily routines.

8.2 Social Skills

Besides health-oriented benefits of an active living with systematized physical activities, there are also opportunities for social interaction, when people share games

or get involved in groups tasks. The development of teamwork skills and the ability to cooperate can be a very good strategy for people motivating each other by playing games that can involve points comparisons, challenges and game level difficulties. In the case of Pokémon GO, it started with the proposal to motivate users for individual tasks and challenges, although people changed the individual goals and began meeting others for "hunting" Pokémons together. This new interaction engaged different players to commence the development of social skills, specially regarding self-awareness and self-esteem. Also, it is possible to observe that social skills are broader than only intrinsic skills (individual), but also in extrinsic skills (group) as tools to interact with others. Good examples of these extrinsic skills are body language, friendship and conversational skills and assertiveness.

Social skills are considered basic for a person to successfully interact with other. They are required in nearly every area of living, especially in the interpersonal communication, in work and studies situations. A person who develops good social skills is tending to make prosperity in different life goals. Moreover, a person who developed relatively well the social skills can face challenges and tasks easily than the ones with poor social skills.

Social skills entail the ability to interact with others in interactive situations and majorly affect the life-adjustment, academic performance, and occupational development of an individual (Argyle 1983).

Research revealed that the use of technologies is associated with poor social skills as assessed by the identification of emotions, shown in pictures of facial expressions and as interpreted from the descriptions of social interaction (Engelber and Sjöberg 2004). Indeed, teenagers may consume more technologies as a pattern of low-risk social interaction, preventing themselves of communication skills and face-to-face situations in social environments.

Research evidence has also shown that programs using games may contribute to the improvement of people's social skills, engaging them in several social situations such as cooperation, assistance, sharing and solving problems (Gregoriadis et al. 2013).

Finco et al. (2015) observed the dynamics of different types of social interaction among participants of a study involving 24 children and teenagers from 8 to 14 years old. Social interaction has been considered in the research as the positive acts, actions, or practices of two or more people mutually oriented towards each other's selves. Interpersonal interactions were shown as important for emotional and psychological well-being and it could conduce students to healthier behavior and appropriate choices during the study.

8.3 Methodology

The research carried out has followed a qualitative approach with descriptive and experimental features. Marconi and Lakatos (2008) stresses that such method focuses on evaluation, explanation and interpretation, aiming at the understanding of some

situation or phenomenon. Furthermore, qualitative research does not seek to enumerate or measure the events studied, nor it employs statistical instrumental data analysis. It involves obtaining descriptive data about people, places and interactive processes by direct contact by the researcher with the studied situation, trying to understand the phenomena from the perspective of the subject, or the situation of participants in the study (Godoy 1995).

Our study focused on the perception of Pokémon GO players and for this reason a questionnaire was developed with eighteen questions, involving 4 questions with personal data (age, sex, educational background and profession) and ten questions related to the use of Pokémon GO and its playability, regarding the social skills developed:

- How did you find out about the game?
- For how long have you played Pokémon GO?
- How many times a week you play?
- What is the reason for you playing?
- Have you changed your life routine since you started playing? How?
- How do you prefer do play Pokémon GO?
- Do you motivate people or other players to use the game?
- Have you met to new friends or mates do play Pokémon GO?
- Did you participate in Pokémon GO events or meetings?
- Would you recommend other people to play Pokémon GO?

Before the questionnaire was launched online on the Google Forms (Google Drive platform), the questionnaire was validated by a research group of video games and mobile games in Physical Education activities (EXIN2) composed of eight undergraduate students and four University lecturers with experience in Exergames and the use of technology in Education and in Physical Education.

The sample was randomly selected and it consisted of 125 people that composed this research. The criteria for selection and exclusion of participants were:

- Be young adults and adults from ages 18 to 40 years old during the time of the research;
- Be a player of Pokémon GO for at least 6 months;
- Be still involved in the activities of playing Pokémon GO during answering the online questionnaire.

Table 8.1 shows the number of participants, where 84 male and 41 female from ages 18–25, 26–33 and 34–40 were participating and after categorized in the groups.

The group of young adults (ages from 18 to 25) represented a total of 38.4%, slightly smaller than the adults (ages from 26 to 33) with 51.2%. The older adults (ages from 34 to 40) represented 10.4%.

Table 8.1 Number of participants by sex and age

Study Sample/sex	Ages 18–25 (young adults)	Ages 26–33 (adults)	Ages 34–40 (older adults)
Male	N = 33	N = 48	N = 03
Female	N = 15	N = 16	N = 10
Total	N = 48	N = 64	N = 13

8.4 Pelotas City

The city of Pelotas is one of the southernmost cities in Brazil, with a population around 360,000 inhabitants (2016). It is a University town, with 3 Universities and 6 Colleges. Around 10% of the whole population is composed of students of undergraduate and graduate courses from different places of Brazil and South America. With a very urban lifestyle, the city of Pelotas does not offer many leisure and green areas for interaction, with only few parks and squares, where mainly young people meet for social moments and free time activities such as adventure sports and board games. Considering this profile, the facts of this selected city for the study were totally addressed to analyze how the young adults were interacting with Pokémon GO and developing social skills (even the gameplay does not work directly with information or tips for this kind of adoption).

Several players from the city of Pelotas were invited to complete an online questionnaire to answer specific questions about lifestyle, social and healthy choices, as well as the connection with Pokémon GO (see Fig. 8.1). Players were contacted through online communities to participate (WhatsApp and Facebook groups).

The outcomes were structured on the answer contents analysis, where a categorization of comments and answers regarding the lifestyle adopted and social interaction was organized and presented on the following heading to bring evidences on the use of *Pokémon GO* and the potential for developing social skills.

8.5 Social Interaction Outcomes

Results in the present study derived from descriptive statistics and narrative analyses. The descriptive analysis focused on the description of qualitative data to highlight the most important responses from *Pokémon GO* players and the total incidence of their words. The narrative analysis was used to substantiate the study, since it allowed describing the ideas, viewpoints and motivations as contents that give meaning to social and cultural interactions among players.

Several studies have demonstrated the association between exercising and quality of life, also in the use of technologies such video games. Active individuals have proven to be healthier, more positive at work and to better cope with everyday stress (Weinberg and Gould 2011). Accordingly, *Pokémon GO* can be a very

Fig. 8.1 Group of players interacting in the main square of Pelotas, Brazil

interesting game capable of bringing positive outcomes to its players, since they exercise, improve their quality of life by visiting different places, meet people and connect to new perceptions while playing it. Adults, in particular, use to perform the same tasks at work every day; therefore, they need moments of leisure to get rid of the stress accumulated after long working shifts. *Pokémon GO* players participating in the present study gave interesting testimonials about changes in their lives: "My experience with the game was very good, because I met my girlfriend"; "This game made my body much stronger. I improved my health conditions and my lifestyle is much healthier today, because I got used to walk a lot! And it is very nice to share it with my friends and family, especially when they play with me!"

These testimonials show that players understood the personal and physical enhancements in their lives due to game playing. Assumingly, such playing allowed informal learning, because players perceived improvements in their social interactions after they started playing *Pokémon GO* and adopted a healthier lifestyle. Social skills emerged because users themselves motivated others to play it by developing conversational skills. When a player reports to have met his girlfriend while playing, it evidences that, although *Pokémon GO* motivates players to walk around different places, they tend to develop a method to interact with other groups and to meet new people by opening themselves up to the possibility of making new friends and to target new challenges overall not provided by the game itself. These challenges are interesting signs of how a game can be designed to motivate such changes, because they encourage players to set different interactions while playing due to the new rules, challenges and organizations. These social interactions reveal interesting outcomes

to be observed, since people can give different cultural and social meanings to any kind of activity.

Moreover, the aforementioned social interactions can have positive effect on teenagers and young adults, since video game players tend to be more introspective and individualistic. Social skills are important at this time of life, because they help youngsters to reach their goals and to have good performance in daily activities.

Finco et al. (2015) highlight that interpersonal interactions are important to emotional development and to achieve well-being; therefore, *Pokémon GO* can be a significant instrument to be used in learning environments, such as schools. Educational projects can be well designed to pedagogical practices, because the game can be used as social–skill development methodology applied to small groups of players. Nowadays, children and teenagers are becoming increasingly individualistic; thus, planning activities focused on students' interactions and on experience sharing at school is a good method to prevent the social inversion.

Many applications (Apps) developed for mobile phones are dating platforms, and the sentence "I met my girlfriend", although *Pokémon GO* was not designed for such purpose, highlights that this game approached two people due to the social interaction set among players. These social interactions connect people through social activities and allow many competences and relationships. Learning these new skills is beneficial for daily tasks, but new interpersonal skills are essential for life in socialized environments.

Nowadays, technologies tend to lead to sedentary lifestyles, because people can stay at home entertained with virtual interactions with others through social networks and Apps. According to Brown (2013), interaction and communication are essential factors for survival in society with other human beings. Humans communicate to exchange information in every culture, on a daily basis. The word 'communication' derives from the Latin word 'communis', meaning 'to share', and yet, in the modern world, 'communication' also refers to electronic, verbal, and non-verbal, communication means. The meaning of sharing through communication is an important component for individuals to understand the world they live in and to learn with others about changes in attitudes, behaviors and in ways of thinking.

One of the interviewees stated: "the game motivates me to make new friends". Different from other games, *Pokémon GO* can be seen as a support for new friendships. Social behaviors can be linked to the act of sharing the same goals, which makes socializing and establishing common ideas and aims. Communication and interaction are basic components for users to get to know other people and to start new relationships, since both factors help people to succeed in their personal lives. Social skills can be shared, practiced and learned by all through interactions with new friends.

Figure 8.2 depicts many players sharing the same environment to play *Pokémon GO* together.

It is important highlighting that players developed different individual, or group, activities to hunt Pokémon. The initial idea of NIANTIC (Nintendo company responsible for developing the game) was to make people more active by walking and playing, so players would gradually start finding new ways to interact with both the game

Fig. 8.2 Players sharing the same environment and getting ready to play together

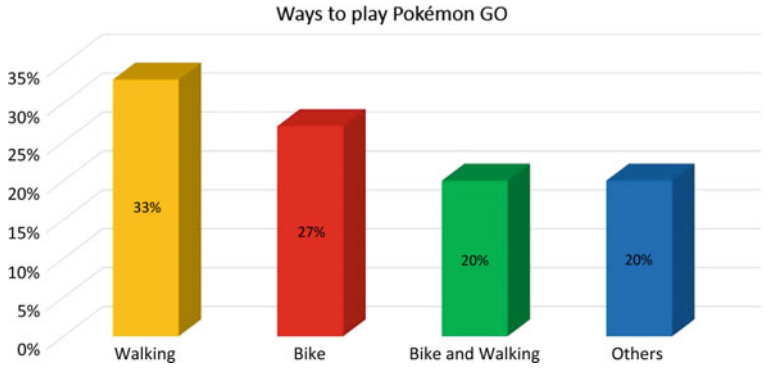

Fig. 8.3 Ways to play Pokémon GO

and other people. "I changed my routine due to the game, I became more active. I got motivated by seeing friends walking or running around the city". This statement clearly shows that, besides the game aims, people can also experience other activities due to social meetings and to other physical activities such as running. Exercising is a very important pattern for people to become more sociable, because it helps the development of different skills such as concentration, teamwork, dedication, leadership, problem-solving skills, among others. *Pokémon GO* does not provide all sports and exercising concepts addressed in Exergames (video games focused on body movements, also called active video games), but it helps players understanding the benefits from walking, running or cycling. Figure 8.3 shows how players interact with the game.

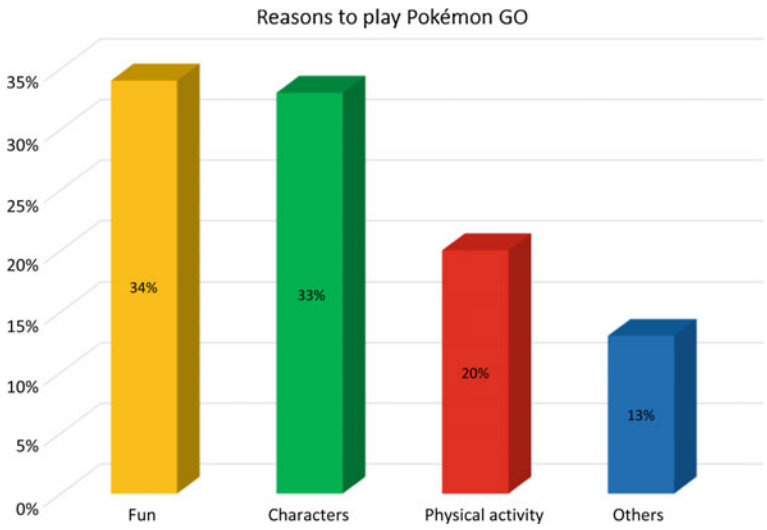

Fig. 8.4 Reasons for playing Pokémon GO

In total, 80% of *Pokémon GO* players engage in exercising: walking, running and biking. The remaining 20% has different ways to collect Pokémon, they do it by car, motorcycles or buses; however, these are not the ways suggested by NIANTIC to play and interact in the game. As aforementioned, the idea was to encourage players to be more active, to have fun and to make people visit Pokestops, which often concern historical and touristic places in the cities. Besides interacting with other people, the interaction with the city makes players observe interesting places and collect information about the location they live in. This new experience can motivate further social interactions with their own kin and friends, mainly at leisure time and during their days off.

The reason motivating people to play *Pokémon GO* is another interesting point highlighted by results in the questionnaires. The motivations and interests can vary from individual to individual, as entertainment is its main goal. Figure 8.4 shows the main reasons motivating people to play this game.

Having fun was the number one reason for playing *Pokémon GO* (34%), and this factor was closely followed by the characters (33%). The cartoon Pokémon and its characters were part of the childhood and adolescence of millions of people from the 1990s on; therefore, they still mean a lot to players, fact that motivated them to virtually interact with such characters. Overall, social meetings were mainly attended by users who wore Pokémon clothes and souvenirs in order to get deeper in the characters' mood.

Approximately 20% of *Pokémon GO* players acknowledge exercising as an important motivation, mainly due to its cardiorespiratory gains and fitness improvements. The other 20% of these players gave a wide variety of answers about their motiva-

tion to play: social interaction, the access to friendly environments, the adventures resulting from the game and curiosity.

Users changed many of their habits concerning exercising, they engaged in daily exercises with friends and kin at times they were not playing *Pokémon GO*. Social skills are an important outcome from game playing, because players created a collaboration and companionship atmosphere to play with others.

Many studies have shown that individuals who exercise and have fun together improve their quality of life. Accordingly, NIANTIC was very successful in developing a game with characters from the 1990s, (reference from the childhood of many adults) focused on motivating physical exercising (running, walking or biking) and the visitation to interesting spaces for social and cultural interactions. Having fun was the main motivation addressed by players to play *Pokémon GO*, although social interactions and the good results from such interactions were also observed in their statements.

Pokémon GO became a good reason for, and mechanism to, make people better organize their schedule in order to find time to leave their homes and offices to interact with other people and to set new connections in their lives.

8.6 Final Considerations

In spite of the benefits that can be gained with *Pokémon GO*, it is clear that exists a strong potential for individuals improving social skills through different patterns. On the one hand, the game *Pokémon GO* has been proposed for the development of a healthier lifestyle, social interaction or simply to get users off their couches or desks. On the other hand, it is important to state that *Pokémon GO* cannot be a substitute for face-to-face interaction, and the game itself does not provide long-term motivation for players.

The main contribution of this study has been to show how a mobile game can be an important tool to develop social skills, such as companionship, collaboration, friendship and group enthusiasm. And besides, motivate users to start becoming more active for a social life, sharing moments with others, visiting different places in the cities they live and starting new aims for personal life.

Regarding the regular practices of some of players and the motivation to keep a social interaction, results have shown that the game *Pokémon GO* provides situations in which players can increase the regularity of their practices, engaging them playing more the game (more hours). These are relevant findings, aligned with results from other studies showing that through the systematic involvement of people in recreational activities of a suitable nature, significant effects may be reached in terms of health and social skills (Mavrić et al. 2014).

Results pointed out that companionship happened, guaranteeing also a relevant outcome that users can share social skills, interacting out of the game in other sit-

uations like promoting other meetings and relationships with other players. Thus, players could support each other throughout their practices and becoming more confident with their performance in the group.

Pokémon GO can be considered a mobile game that promotes a very interesting mechanism: a healthy lifestyle, by the goal of walking, running or cycling to capture the characters from the game; and a social potential, that make people comfortable to meet others by sharing the same aims promoted by the game. But, it is evident that the main potential starts from the individual choices that people can make, either to start playing (mainly for fun, as presented in the results; or by memories from the characters, to remind childhood) or to build new connections inspired by the possibilities that the game offer for a social environment. On this "real" environment, out of the virtual", players can establish solid new experiences in a generation so used to interact mainly by social media. Here we can analyze that it starts by the use of technology and it can result in a real interaction with many people.

It is possible to conclude that *Pokémon GO* is one of the first mobile-based games that can be used to promote a healthier lifestyle with a new way of interaction, changing the way people can interact and supporting social skills. In brief, *Pokémon GO* has a big potential to be used in social, psychological and cultural studies. Many projects regarding Education can also be conducted, especially for studies with children and teenagers. Also, cross-cultural studies with different countries can be interesting comparison researches to be carried out to perceive different behaviors and lifestyles.

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Chapter 9
Long-Term Engagement in Mobile Location-Based Augmented Reality Games

Heinrich Söbke, Jannicke Baalsrud Hauge and Ioana A. Stefan

Abstract Pokémon GO was the first mobile location-based Augmented Reality (AR) game to be widely publicized, and its predecessor—the Ingress game—was the first mobile location-based game reaching a broader audience. Both games are continuously developed and have a large basis of regular players. Therefore, Pokémon GO and Ingress can be seen as successful examples of game design in terms of players' long-term engagement. The usage of games in engineering education has a long tradition, mostly for mediating the understanding of complex systems and often used in a workshop setting where learning takes place not only during game play but also in the debriefing parts. These games have often been multi-player games and have profited from the player interactions, which, since quite unpredictable, has helped to keep the players' engagement high. However, the costs of designing such games are high, the time for improvements and adjustments is long, and due to the high dependency of user interactions, it is also difficult to ensure a formalized learning outcome. Thus, from a game design perspective, it is beneficially to know how the game mechanics of successful games are constructed. The aim of the study described in this chapter is to identify the game mechanics of Pokémon GO that lead to the observed high level of player engagement. The data collection is done with the help of a survey (N = 50). The results are refined by a comparison with the results of a similarly structured study on Ingress (N = 131). Both surveys have for the most part gathered players who have been playing regularly since the release of the games. The results of the study are summarized in a set of hypotheses and recommendations for

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the design of mobile location-based AR games. These findings intend to contribute to an effective design of serious mobile location-based AR games.

9.1 Introduction

The Augmented Reality (AR) game Pokémon GO (Niantic Inc. 2016) is currently one of the most popular game apps. The app exceeded in the Google Playstore the 100 million downloads mark. In some statistics, the daily usage time of Pokémon GO is estimated to be higher than that of frequently used non-game apps, such as WhatsApp and Instagram (Chauhan 2018). Factors identified supporting the enormous popularity were enjoyment, physical activity, flow, nostalgia and image (Rauschnabel et al. 2017). These were confirmed by Hamari et al. (2018) who also added challenge, competition and socializing to the list of popularity-supporting factors.

Mobile location-based AR games are a young genre of video games that thrive on the increasing widespread availability of mobile internet and affordable mobile devices, such as smartphones. The first representative of mobile location-based AR games attracting international attention was Ingress (Niantic Labs 2013). Ingress led to previously unseen outdoor gatherings of players at game-relevant locations, the so-called portals (Porteck 2013). Mobile location-based AR games have characteristics that make them particularly suitable as learning tools (Chen et al. 2015). AR is considered as highly beneficial to learning as indicated in various meta studies (Bacca et al. 2014; Radu 2014; Santos et al. 2014; Akçayır and Akçayır 2017). One reason for the excellent support of learning processes is the contiguity principle: learning is facilitated by the joint local and temporal display of physical object and additional information (Mayer and Fiorella 2014). Ibáñez and Delgado-Kloos (2018) highlight the strengths of AR in educational contexts as fostering "spatial skills, practical skills, conceptual understanding and scientific research". Further, frameworks for designing training AR-based training applications are provided (Söbke et al. 2017b; Bacca et al. 2019). Mobile location-based AR Games offer the setting to look at real objects and to talk to fellow players about problems to be solved (e.g., Missions in Ingress). These characteristics are also known from the learning theory of situated learning (Lave and Wenger 1991). Within engineering education, simulations, games and gamification for educational purposes are regularly used for increasing the understanding of how complex systems work and how the interactions of different system components work differently depending on the situation (Hauge 2014). The technical term *serious game* denotes games that are used for further purposes beyond entertainment, such as learning (Ratan and Ritterfeld 2009).

The design of successful serious games remains a complex, non-deterministic problem and is experience-based (Squire 2011; Hauge et al. 2016). In more detail, the complexity of the systems, as well as the need of students to experience different situations, in order to construct the required system knowledge, lead to long play time of the games, and much of the learning has taken part outside the game, i.e. in the debriefing session. However, this makes it more difficult to actually measure if

and how the learning takes place in the game, and thus it is challenging to generate reproducible results. Thus, much effort has been put in designing digitalized games, as well as in developing stealth assessment methods for a better measurement of the in-game learning. In addition, games for teaching complex systems are mostly designed for workshop settings, and synchronal game-play, which leads to high organizational efforts and an obligation for the students to be at every session, which has an impact on the intrinsic motivation and engagement for some of the students. However, despite the efforts made, it seems difficult to design games that foster long-term engagement in a first place, so that still much adjustment and alignments are required.

In an alternative approach, from the perspective of serious games design, the questions arise to what extent popular video games can be re-used and re-purposed beyond entertainment (Söbke et al. 2013). Sheng (2013) and Buettel and Brook (2016) conceive such a procedure for re-purposing the game Ingress. This chapter, however, focuses on the identification of engaging game mechanics that can be applied in serious game design.

The chapter is structured as follows. The next section describes mobile location-based AR-Games and the most prominent species of this genre, Pokémon GO and Ingress. Section 9.3 describes the results of the survey and links them to the results of the previous study on Ingress. In Sect. 9.4, hypotheses derived from the results are presented. Further, recommendations for the design of mobile games are given. In the following Sect. 9.5 implications and limitations of the results are discussed. It is followed by the concluding section with a summary and conclusions.

9.2 Mobile Location-Based AR Games

Location-based Mobile AR games merge AR technology in parts with the well-known concept of pervasive gaming (Oppermann and Slussareff 2016). Through the success of Pokémon GO and Ingress the genre of mobile AR games has proven to be ready for the mainstream. The genre is also subject of various research efforts, for example, Ganzert et al. (2017) develop the concept of a deferred community. AR games are dependent on objects of the real world. This requirement leads to faster game aging (Söbke et al. 2018a), as argued by Lee et al. (2017). Very relevant from the perspective of designing serious mobile AR games is research on design principles fostering learning. For example, Nisa et al. (2017) emphasize the value of a narrative for mobile gaming. In the following, the study objects, Pokémon GO and Ingress, are described in short.

9.2.1 Pokémon GO

Pokémon GO (Niantic Inc. 2016) was released in July 2016 and reached 6 million downloads alone in the USA, Australia and New Zealand on its release date (Chauhan 2018). Pokémon GO is a mobile AR adaptation of the successful computer game series Pokémon (Pokémon Company International 2018), in which the Pokémon—fantasy figures—are captured, collected and further developed. Pokémon GO gives this game principle a spatial context: Pokémon can now be captured in the real world. PokéStops are places of the real world with special meaning in the game where players can receive game items. Furthermore, gyms are a specific kind of PokéStops where players let the Pokémon fight against each other.

In addition to a large amount of media coverage, Pokémon GO is also the subject of current research. As already mentioned, popularity-fostering factors have been identified by Rauschnabel et al. (2017) and Hamari et al. (2018), based on questionnaires and a broad literature review on scientific findings on Pokémon GO. Paavilainen et al. (2017) have identified movement, sociability, game mechanics and brand as popularity-fostering factors. Feldman (2016) emphasizes the aspect of Pokémon GO as being a social network, while Giddingsbile (2016) discusses the role of imagination with regard to the "hybrid reality of Pokémon GO today".

9.2.2 Ingress

Ingress (Niantic Labs 2013) was released in November 2012. Central elements are so-called portals, i.e. special locations with significance for the game. Portals can be claimed and will then be defended against attacks of the opposing faction. Initially, each player must join one of the two factions. The cooperation with players of the same faction increases the individual progress of players in the game. Portals are located all over the world and can be linked over long distances by cooperation of players. The appearance of Ingress has been "praised in marking a turning point in the changing social acceptance of gaming and virtual realities" [Stingeder (2013) cited in Ganzert et al. (2017)]. For example, groups of adult people playing video games in public have become a normal part of the cityscape. The fact that a significant fraction of Ingress players are adults is confirmed by all demographic surveys, compare e.g., Winegarner (2015). Like its successor game Pokémon GO, Ingress was created by Niantic Labs. This close relationship is also manifested by the fact that portals from Ingress reappear as PokéStops or gyms in Pokémon GO. Like Pokémon GO, also Ingress has been covered by media and scientific work from diverse perspectives. For example, Hernandez (2015) discusses issues of personal safety during play. Chess (2014) analyzes Ingress a narrative for negotiating relations between regionality and globality. A case study by Fragoso and Reis (2016) describes Ingress as a "ludic re-enchantment". Ingress, as an example for mobile game community design, is presented by Li et al. (2016), while Hunzaker (2016) investigates disruptive behavior

in Ingress, such as trolling. Further, Ingress is used to illustrate the impact of new technologies on entertainment (Majorek and Du Vall 2015).

9.3 Player Survey

The study deals with the extremely popular mobile AR game Pokémon GO from the perspective of designing serious games. It aims to identify game mechanics that lead to a high level of player engagement. Engagement is seen as crucial in the context of serious game design, because only the engagement with the game makes it possible to achieve the further goals of the game (e.g., learning). Thus, the identified game mechanics can help to develop effective serious mobile AR games. Methodically, the study is based on a survey. The results of this survey will be compared with the results of a previous similar study on Ingress (Söbke et al. 2017a). That study comprises the answers of 131 well-experienced, long-term Ingress players. The main long-term motivational factors were: the possibilities of exploring environments previously unknown to the players, the social interactions with other players and being outside. These results are in accordance with the findings of Hamari et al. (2018) and Rauschnabel et al. (2017). The main goal of this new survey for the game Pokémon GO is to identify the game-mechanics fostering long-term engagement in this game and to analyze in how far these game mechanics differ from those we identified in Ingress.

Besides demographic data, we also collected data on the level of agreement on statements on gaming behavior (16 items) and on the attractiveness of player successes such as awards and points (18 items), using a 5-step Likert scale. The design of the questions is based on Bartle's Player Taxonomy (Andreasen and Downey 1996). Further, seven items addressed the integration of the game into everyday life and six items were related to self-assessment of the playing style. Additionally, 8 questions aimed to identify the trigger for starting, and 7 for ending a game session. In addition, it was possible to add free text comments to each question block. The number of comments were less than half of the number of comments in the Ingress study [0.56 comments per participant (Pokémon GO (P)) vs. 1.14 comments per participant (Ingress (I))]. Consequently, there was no need for clustering the comments in this study like we did in the previous. The results are presented below and where relevant also compared with the results of the survey on Ingress.

9.3.1 Demographics

The questionnaire was distributed via postings in web-based Pokémon GO communities mainly populated by German players on Aug. 16th 2018. Within 25 days after posting, 50 complete and 15 incomplete answers were received (N = 50). Table 9.1 shows the distribution of the participants' age groups. The largest age groups are

Table 9.1 Age of players

Age group (years)	Percentage (%)
<18	4
18–24	42
25–34	40
35–44	8
≥45	6

18–24 years (42%) and 25–34 years (40%) The mean age is 27 years (I: 40 years). Nearly 62% of participants are male. (I: 80%). Pokémon GO seems to attract a higher percentage of female players, as well as younger players compared to Ingress.

9.3.2 Experience and Level of Engagement

76% of the survey participants started playing Pokémon GO in the year 2016, when Pokémon GO was released (2017: 16%, 2018: 8%). The participants can, therefore, be considered as experienced players. This assumption is supported by the statement that 82% of participants call themselves regular Pokémon GO players. The remaining 18% play occasionally. 30% of participants indicate they play Pokémon GO 5–10 h a week. 25% each have a weekly playing time of 10–20 h, or even more than 20 h. Thus, an average playing time of 9 h per week can be assumed. This is an increase of 50% compared to the value of the Ingress study.

9.3.3 Player Preferences: Motivations

Like Ingress, Pokémon GO covers a wide range of motivational factors by means of different game mechanics. Although Bartle's Player Taxonomy (Bartle 1996) was developed for players of multi-user dungeons (MUDs), it seems suitable for classifying Pokémon GO players: players can start community ventures (*Socializer*) and they can collect items, e.g., Pokémon and badges (*Achiever*). The exploration of new locations is a part of the game (*Explorer*), as well as fights with other players at individually or at group level (*Killer*). To characterize the sample, the first two item blocks have been adjusted with respect to the vocabulary of Pokémon GO. Each item asks for the level of agreement with a statement on a 5-step Likert scale. Some of the items cannot be assigned exclusively to one of the four player types. For example, the item "I like completing Field Research" can be typical for both *Achiever* (Completed Field Research is rewarded with game items) and Explorer (Field Research can also include previously unknown locations), so the items were rated by three experts each for their fractions of Bartle's player types. The resulting ratings were averaged and

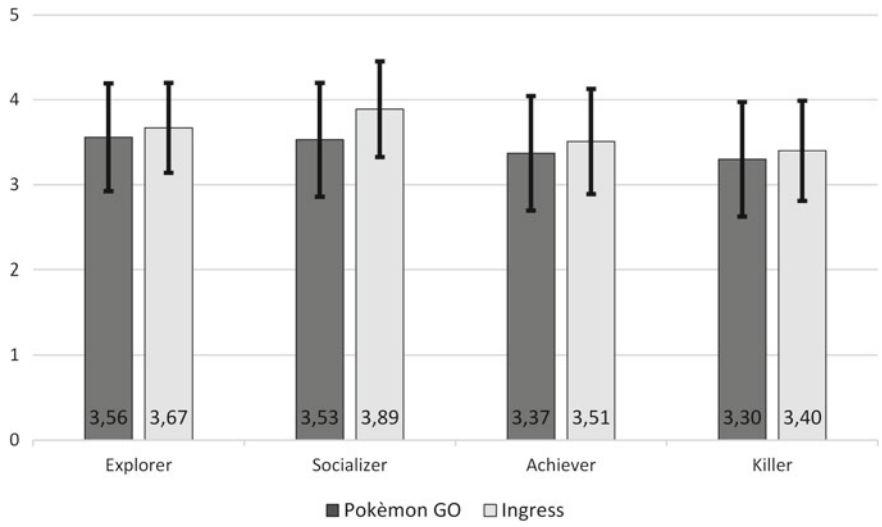

Fig. 9.1 Motivational components according to Bartle's taxonomy

used to determine the overall player type fractions in a linear model. Figure 9.1 shows that *Explorer* is the most dominant player type fraction, while the *Killer* player type fraction seem to be less important. In between *Achiever* and *Socializer* player type fractions are located with a difference of only 0.06 points. The difference between highest and lowest player type fraction is within range of 0.3 points.

As seen already in the Ingress study, there does not seem to be a dominant player type. Regarding the requirement to creating an attractive game for each player type, this is an excellent result. The Ingress study had a similar result with *Explorer* as the largest and *Killer* as the smallest player type fraction. However, in the Ingress study the *Socializer* player type fraction was larger than the *Achiever* player type fraction.

9.3.4 Player Preferences: Activities and Achievements

An item block evaluated player preferences in terms of game activities and achievements. The results of this item block contributed also to the determination of player type fractions in the previous section. Figure 9.2 shows the results sorted by the level of agreement. Capturing Pokémon is regarded as the preferred activity, while getting rewarded with badges (Medals) is considered as less motivating. There is a remarkable difference here: although Pokémon and badges are both digital artifacts, the personalized Pokémon seem to be much more appreciated than the kind of abstract badges.

The main findings of the Ingress study were that Ingress allows players to be active outdoors with friends and explore new locations. The preference for outdoor

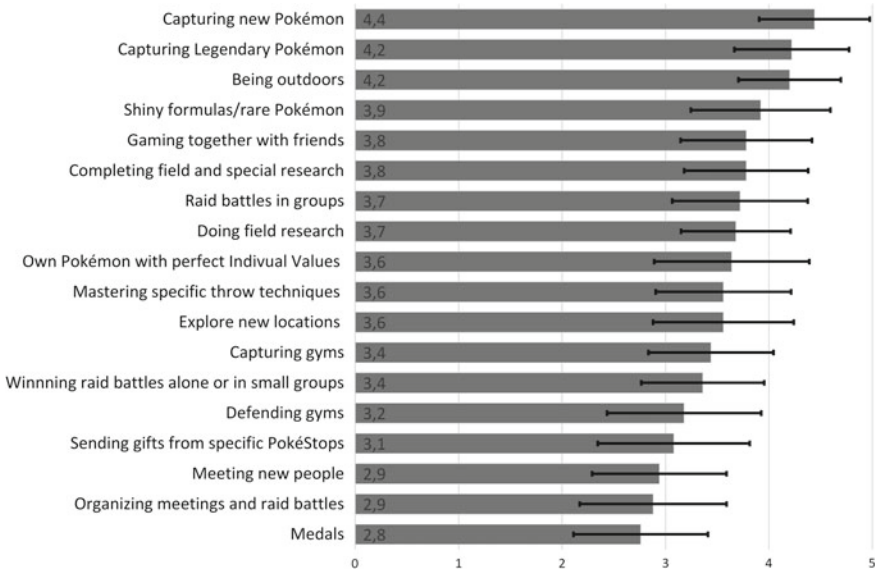

Fig. 9.2 Player preferences: actions and achievements (5-step Likert scale)

activities is confirmed by the value of $\overline{x} = 4.2$. The desire for joint activities also has a comparatively high value ["Gaming together with friends" ($\overline{x} = 3.8$), "Raid battle in groups" ($\overline{x} = 3.7$)]. The rather low value of $\overline{x} = 2.9$ for "Meeting new people" seems to point to a differentiation between cultivating existing acquaintances and making new acquaintances, which has not yet been asked for in the Ingress study. The importance of exploring new locations, as an expression of the Explorer component, is confirmed by the items "Completing field and special research" ($\overline{x} = 3.8$), "Doing field research" ($\overline{x} = 3.7$) and "Explore new locations" ($\overline{x} = 3.6$).

The different ratings for "Capturing gyms" ($\overline{x} = 3.4$) and "Defending gyms" ($\overline{x} = 3.2$) should also be further investigated. Although both activities refer to the same achievement, namely owning a gym, the activity associated with different phases are evaluated differently. Similarly, the "Completing field and special research" (3.8) and "Doing field research" (3.7) items also aim for the same achievement, again the activities in different phases are evaluated differently, albeit only slightly.

The standard deviation was calculated for all items in order to obtain a measure of the homogeneity of the sample. The smaller the standard deviation, the more homogeneous the sample is for the item. In general, the standard deviations of this study are larger than those of the Ingress study. For example, the averaged standard deviation of the items of the "Activities and Achievements"-block is 1.27 for this study, while it is 1.18 for the Ingress study. Overall, this indicates a more inhomogeneous group of players addressed by Pokémon GO. One feature of Pokémon GO that apparently raises the inhomogeneity of the player base is that both collecting (e.g., from Pokémon) and fighting (e.g., in raid battles) are

supported. In Ingress, on the other hand, the possibility to collect game items is less prevalent. Nevertheless, it is interesting to note that the items with the smallest standard deviation are "Being outdoors" ($s = 0.99$), "Doing field research" ($s = 1.06$) and "Capturing Pokémon" ($s = 1.07$). "Being outdoors" is one of the main motivational factors for playing Pokémon GO mentioned as "outdoor activity" by Hamari et al. (2018) and as "physical activity" by Rauschnabel et al. (2017). "Doing field research" especially satisfies the player types *Explorer* and *Achiever*, while "Capturing new Pokémon" is a preferred occupation for the player type *Achiever*.

In the free text answers, there are other types of achievements that have been mentioned: the improved physical fitness enabled by the running activity, the exchange of Pokémon, the registration of different Pokémon in the Pokédex, i.e. the player's register for captured Pokémon and the possibility to try out Pokémon-specific visual effects by tapping on a Pokémon.

9.3.5 Integration of Gaming into Daily Life

According to the survey results, the Pokémon GO players had an average play time of 1.5 h a day over a longer period of time. Such a large effort needs to be planned into the daily routine. Knowledge about possible strategies the players have developed on this may also be useful for the design of serious mobile games. Therefore, the survey also included questions on the integration of the game into the daily routine. The results are presented in Fig. 9.3. The item "I am playing while walking to other activities" receives the highest approval ($\overline{x} = 4.0$). In contrast, the statement "I am playing while working or during breaks" ($\overline{x} = 2.6$) achieved the lowest agreement. Even considering the mean value for "It is always a separate activity" ($\overline{x} = 3.2$), indicates that the Pokémon GO is a casual leisure activity. This is a difference to the Ingress study, where playing while working and in breaks was much more dominant and achieved the highest acceptance. In addition, the ratio of those receiving app notifications was higher in the Ingress study. However, these differences may also be caused by the game mechanics, since Ingress allows the remote charging of resonators, i.e. location-dependent activities without requiring the player to be on site.

A free text field answer addresses the eventual simultaneous play of Pokémon GO and Ingress. Some Ingress portals are re-used in Pokémon GO as gym and PokéStops. When players visit a portal or a gym/PokéStop, they could perform actions in both games at the same time. Another answer pointed out that the Pokémon GO app actually is always active on the smartphone. However, in case the respondent is the only Pokémon GO player in a group, the smartphone is not used interactively and only counts the travelled distance. Thus, in spite of the big engagement with the game world, both studies confirm that players are integrated in the real world. Another comment states a casual attitude towards Pokémon GO: "If you're bored, just go out and look for Pokémon."

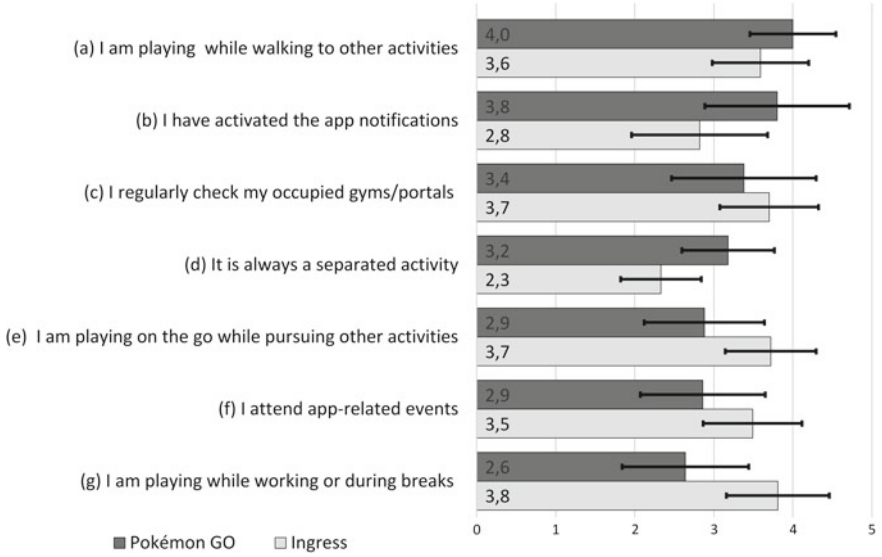

Fig. 9.3 Integration of playing activities into daily routines

9.3.6 Self-description of Playing Style

The players' self-descriptions are a source for the characterization of their playing behavior. Figure 9.4 shows the level of agreement of the players to different statements. A comparison to the results of the Ingress study shows noteworthy differences: Pokémon GO players have a more casual approach, i.e. they play to enjoy the moment, while the game of Ingress is characterized by preparation tasks and regular routine tasks. This may be related to the game mechanics: In Ingress the *Guardian Medal* requires a portal to be owned for a long period of time. For this purpose, the resonators have to be regularly recharged. These regular routine actions can be considered work and finds no equivalent in Pokémon GO. Many common activities in Ingress demand preparation and planning, for example the creation of control fields, which requires the linkage of three portals owned by the same faction. The resulting area of a triangle then belongs to the same faction. Because large control fields can span regions or even continents, it makes sense if the portals involved are conquered and held by local players. Thus, the creation of control fields is an example of how collaborating with other Ingress players can be beneficial. This is reflected in the higher level of agreement/acceptance for involvement in a group (see Fig. 9.4c). The goal orientation has, however, the same relevance for both playerships (see Fig. 9.4b). The use of social media to present their results score equally low in both groups.

In the free texts field, a phased playing style was described, i.e. longer phases of activity are interrupted by longer phases of inactivity. Further, the following comment

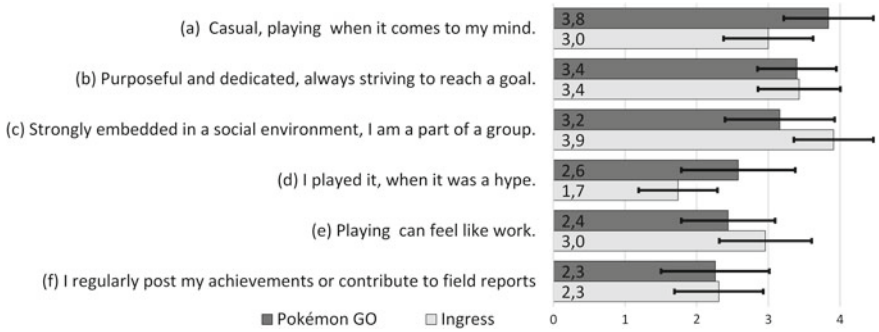

Fig. 9.4 Self-description of playing style

is a hint for the attractiveness for different player types "I want to collect, I don't care about fights".

9.3.7 Triggers for Starting and Ending a Session

A low-threshold access to a serious game promotes the use and thus enables the intended effects beyond entertainment. Therefore, the triggers of activity changes are of particular importance: What causes the players to desire to use the mobile game and what ends the usage? The questionnaire comprised questions for identifying triggers for the start and end of game sessions. Figure 9.5 shows the identified triggers for starting a game session. "Daily bonuses" and "events" (each $\overline{x} = 4.1$) receive the highest approval. "Daily bonuses" provide a reward with game resources that was considered less effective in the Ingress study. Actually, the reward scheme at Pokémon GO seems to be so attractive that it motivates players significantly. Events such as raid battles and community days are an external incentive to start the game. Further triggers (each with $\overline{x} = 4.1$) for starting a game session are visits to a still unknown environment and "being outdoors", which can be combined with a casual game. Friends asking to play collaboratively is also perceived a very relevant trigger ($\overline{x} = 3.7$). The same holds for an update of the game software ($\overline{x} = 3.5$). News via social media ($\overline{x} = 2.8$) and app notifications ($\overline{x} = 2.6$) are classified as less important triggers.

The free text answers also showed that the sight of a nearby Pokémon was considered as a game trigger. On the hardware side, the *Pokémon GO Plus*, a portable notification device similar to a watch, was used. Farming activities often mentioned in Ingress, i.e. the gaming to receive resources useful for the further game play were also reported. A comment "Fun!" denotes again the casual character of the game.

Figure 9.6 shows the approval rates for game session ending triggers. The most important trigger is the need to return to real life activities ($\overline{x} = 4.2$). "no fun anymore" is the second most important trigger in contrast to the Ingress study ($\overline{x} = 4.0$),

Fig. 9.5 Triggers for starting a game session

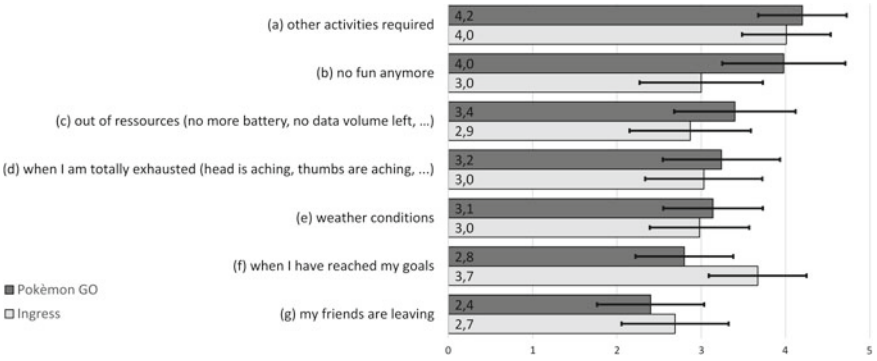

Fig. 9.6 Triggers for ending a game session

where "no fun anymore" belonged to the weaker session-ending triggers ($\overline{x} = 3.0$). With $\overline{x} = 3.4$, missing resources (e.g., out of battery) are more significant than in the Ingress study. This is probably due to the better planning of Ingress players, which also includes the equipment with battery packs. Exhaustion and weather conditions are mentioned similarly often as reasons for stopping playing in both groups. However, looking at the trigger "when I have reached my goals" reveals big differences: While often mentioned in the Ingress study, it was less the reason for Pokémon GO players to end a game session. One possible explanation is that the Ingress game mechanics allow a more targeted approach (for example, walking a route with different portals to hack to receive game resources) than the Pokémon GO game mechanics. The lower value of "my friends are leaving" probably reflects the higher social involvement of the Ingress players compared to the Pokémon GO players.

9.4 Design Implications

The main goal of this study was to identify and investigate what mechanics are perceived triggering the desire of long-term involvement of mobile location-based AR games, such as Pokémon GO and Ingress. The motivation behind this is to

better understand how these mechanics work and to be able to better transfer these mechanics to serious mobile location-based AR games for teaching engineering students the handling of complex systems by fostering joint on-site experiences. The main motivating factors identified in the two studies are:

- Outdoor and physical activities
- Teaming up
- Exploring formerly unknown environments
- Collection of in-game items, such as capturing Pokémon
- Competition and fights.

Transferring these mechanics into games for engineering seems in some occasions simpler than in others—teaming up and group activities is an example of elements that are often included in the existing games already, whereas there are not many outdoor activities yet, since most of the existing games are made for an education context in a safe environment. However, in principle, as long as the technology it allows, it is no barrier in also using this mechanics, if it is purposeful and make sense as a part of the narrative. The capturing of Pokémon could be seen as a rewarding element. Receiving points for a task and an action is a very used mechanics, however, many studies show that this is not supporting a long-term engagement. We therefore need to better explore why collecting Pokémon are more engaging than collecting badges and points. The earlier studies by Hamari et al. (2018) and Rauschnabel et al. (2017) suggest nostalgia and the impact of the brand Pokémon.

Looking into the difference in Pokémon GO and Ingress, we see that the Ingress players seem more dedicated, whereas the Pokémon players are more focused on fun and leisure. Therefore, it could be concluded that since playing a serious game in an educational context is more connected to strategy and planning, it might be worth to focus more on Ingress mechanics than on Pokémon GO mechanics. However, this will require more investigation.

The two studies—this study and its preceding study on Ingress—followed an explorative approach to determine characteristics of mobile location-based AR games that influence the overall success and uptake. They provide strong recommendations of relevant characteristics. However, due to their explorative character, we did not receive final, reliable, evidence-based findings. Therefore, based on the outcome and comparison of both studies presented in Sect. 9.3, we have developed a set of hypotheses and corresponding possible design recommendations for AR-based mobile serious games:

Basic motivational factors. The motivational factors identified in the first study (sociability, outdoor activity, exploration) were confirmed in Pokémon GO, although not to the same extent. The design of any mobile location-based AR game should therefore take these motivational elements into account.

Inhomogeneous target group. The design of a serious game must consider an inhomogeneous target group. One approach is to offer an alternative to playing the game in the didactic scenario that can be used by students who do not feel addressed by the game (e.g., Söbke 2018). Another possibility is to address as many different

types of players as possible in the game, as it is especially well reflected in the design of Pokémon GO.

Pokémon GO appeals to a larger proportion of the population than Ingress. Based on the heterogeneity of the group, it seems that the design of Pokémon GO is better in targeting a group as large as possible compared with Ingress. An indication is the more balanced values fractions of Bartle's player types. A further indication is that Pokémon GO was sufficiently attractive for both collectors (of Pokémon) and fighters (in raid battles), which are examples of different player types. Design of games for inhomogeneous groups should therefore rather re-use the game mechanics from Pokémon GO than from Ingress, even though both are quite well-balanced.

External triggers as incentives. Pokémon GO's game design contains many external incentives, such as community days and raid battles. Since motivation diminishes with time, it is important for the design of serious games to set new stimuli repeatedly to build up engagement. This has already been observed in the context of a quiz app in which periodic competitions ensured almost constant commitment (Söbke 2018).

Use of social contexts. While in Ingress the game mechanics of region-spanning control fields made it necessary that players also agreed supra-regionally (and thus new acquaintances were a regular part of the game), the emphasis in Pokémon GO is more on caring about existing acquaintances. The desire to play together with friends could already be observed in earlier studies on quiz apps (Söbke 2015). From a design point of view, it therefore seems advisable to first focus on the inclusion of existing social relationships, such as those of course groups.

Importance of different phases in the life cycle of an achievement. Although the results still need to be verified, conquering a gym seems to be more attractive than defending a gym. Likewise, the moment of completion of field research is considered more attractive than the work before. The design should therefore ensure that the most motivating mechanics can be achieved frequently. The significance of the individual life cycle phases of an achievement from a motivational point of view still needs to be investigated.

Accessibility and availability. Both Ingress and Pokémon GO offer low-threshold access. This is expressed on the one hand by the ubiquitous availability of locations linked to the game play and on the other hand by the fact that game play is supported during movement activities (e.g., commuting; travelling; walking the dog) and without much preparation. Especially, for Pokémon GO such a concurrent casual game play is prevalent. For the design of mobile location-based AR-Game, a low-threshold access is advantageous, because sessions can be started easily and interaction with the game can take place all around.

Successful reward schedules. Points and badges are generally known to have only weak motivational effects. With the reward scheme "Daily Bonuses" (i.e. at the end of a 7-day streak of game activity the reward for daily play is (almost) doubled), however, Pokémon GO has a reward schedules that motivates many players. Further species of effective reward schedules and the fraction of the population they motivate need to be explored.

Medals versus Pokémon. The motivational effect of personified achievements with a narrative (such as Pokémon) seems to be higher than that of abstract achievements, such as medals. A further incentive arises if the achievements are interactive, e.g., the animation of the Pokémon. Again, the question arises as to what fraction of the population is addressed by this. It should also be analyzed to what extent the effect is determined by the narrative or by the already well-known brand Pokémon and its nostalgic effect, as mentioned in Hamari et al. (2018) and Rauschnabel et al. (2017).

9.5 Discussion

One of the main findings of both studies is the observation of long-time and highly engaged players of all aged groups Pokémon GO and Ingress. Apparently, mobile location-based AR games are able to foster such especially from the point of view of serious game design desirable behavior, as the knowledge transfer for the handling of complex systems is time consuming. In the following, the challenges of transferring the findings to the design of serious games are discussed.

Augmented Reality elements seem to have had only a minor influence on the games in both studies. Ingress does not provide a video-see-through interface, but it augments on-site experiences visually and acoustically. This could leave freedom for the design of cost-efficient apps.

Mobile location-based AR games are primarily technical tools. Their ability to be an effective learning tool depends to a large extent on the didactic scenarios the games are applied with. A well-designed didactic scenario can contribute a great amount to a high level of engagement (Söbke 2018). Therefore, in addition to the implementation of a serious game, the design of an engagement-enhancing didactic scenario is also of importance. Approaches to design such an engagement-enhancing scenario can base on the self-determination theory (Ryan and Deci 2000, 2017), e.g., the psychological need autonomy requires that learners have to be able to make choices. Also informative for the design of a didactical scenario could be mapping the mobile location-based AR game on a user experience model, as for example the METUX model (Peters et al. 2018).

The observed low-threshold access may be feasible for a great number of disciplines, which offer on-site experiences. For example, the disciplines of urban water management (Söbke et al. 2018b) and production logistics offer such on-site experiences. A sufficient number of relevant locations has to be ensured.

Besides learning goals, other objectives of employing mobile location-based games should not be neglected. For example, in the case of the Ingress game, it is claimed that data generated by Ingress are used to improve navigation systems (Hodson 2012). This is an example of using a commercial game app for purposes beyond entertainment by designing usage scenarios.

The sampling bias should also not be neglected. The survey was distributed to various user groups and mailing lists. This influenced the results of the survey, and

we see that predominantly long-term players answered. The participants in the two studies are experienced gamers and highly engaged in the game, but how is this in the targeted cohorts of students? Can we transfer the findings based on samples specifically attracted by Pokémon GO and Ingress? Thus, the challenge of designing games for inhomogeneous groups, may to some extent remain and need further research, since we have no evidence if the same mechanics will work for non-players and we have to find out how to deal with the strong motivational factor of outdoor activities. The characterization of the population with regard to player types is still an open research question. It would be positive for the planning of didactic scenarios to know whether only a minority or perhaps even a majority of students could be appealed to a mobile location-based AR game.

9.6 Summary and Conclusions

Mobile location-based AR games are a new genre of video games and are considered to have great potential as learning tools (i.e. as serious games) due to the combination of AR technology and location-awareness. Pokémon GO is an outstanding example of a mobile location-based AR game. In order to design serious mobile location-based AR games for learning it is important to understand the game mechanics that lead to a high engagement of the players. Therefore, a survey on motivational factors of Pokémon-Go was answered in this study by 50 long-term players. The results were compared with a previous similar study of Ingress players. The motivational factors found relevant in the previous study (outdoor activity, exploration of environment and socializing) were confirmed, albeit with different weightings. By comparing the two studies, it became clear that the attitude of Ingress player was more strategic than the attitude of Pokémon GO players, where hedonic motivational factors predominated. Both games are characterized by high availability and low threshold access. For Pokémon GO attractive reward schedules could be identified. It also became clear that the game benefits greatly from the Pokémon narrative. Regular external triggers, such as community days, seem to be also essential for the engagement. A balanced design contributes to achieving a large number of players with different preferences. Pokémon GO seems to have achieved this more comprehensively than Ingress. Future research is required on a player type inventory of entire learning groups in order to know what fraction of such a group could be achieved with a game like Pokémon GO. On the other hand, didactic scenarios have to be developed that convey learning content using mobile AR Games.

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Chapter 10
Health Implications of Augmented Reality Games on Children and Adolescents

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Abstract This chapter explores the relationship between augmented reality games and the health of child and adolescent gamers. Focusing on Pokémon GO, the chapter highlights potential positive youth outcomes of these games in areas such as psychosocial development, physical fitness and experiences during hospital stays, while addressing some of the possible negative consequences and risks to their usage on the mental and behavioural health and safety of players. It further addresses augmented reality's potential and current impact in relevant areas such as education and the medical field. The chapter concludes with a discussion of the responsibilities and roles of parents, clinicians, businesses, and regulatory organizations as augmented reality games become increasingly popular.

10.1 Introduction

Augmented Reality's (AR) recent debut into mainstream culture is largely a result of the viral reception of Niantic's Pokémon GO. Pokémon GO has captured the minds and imaginations of children globally, spurring a race to enter the mobile AR game (ARG) market. AMC recently released an ARG based on their popular television series, The Walking Dead, while Niantic's next ARG, Harry Potter Wizard's Unite, is scheduled to be released sometime in 2019. Both franchises have large youth fan bases, especially Harry Potter, which rivals Pokémon in both size and fervor. Children will soon have the option to enter their favorite literary or cinematic universe every

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Fig. 10.1 Left: A prototype of a personal touring machine designed in the nineties that guides users through a specific location (Feiner et al. 1997—*Permission granted by the licensor*). Right: A woman wearing a modern AR headset

time they step out their front door. However, these experiences do not come without potential risks. These games can contribute to inattentional blindness, increasing children's risk of physical injury, along with other negative effects. Nonetheless, the possible consequences of these games are not only negative; ARGs also have the potential to create active communities that encourage youth to socialize, explore their neighborhoods, and increase their physical activity.

The original conception of AR occurred in the 1950s and is accredited to cinematographer Morton Heilig, who envisioned a cinematic experience that incorporated all of the senses (Carmigniani and Furht 2011). Ivan Sutherland built the first AR system in 1968, which produced basic wireframe diagrams through a head-mounted display (Infographic 2016). For perspective, Sutherland's invention predated the first mobile phone by five years (Carmigniani and Furht 2011). In the 1990s, Boeing researchers, Tom Caudell and David Mizell coined the term "augmented reality" and initiated the discussion surrounding AR versus Virtual Reality (VR) (Art et al. 2015). While similar in nature and purpose, the major distinction lies in their foundations. VR places the user in a completely manufactured dimension, unrestricted by nature's laws and principles. On the other hand, AR is fixed in reality, digitally enhancing the user's experience by overlaying virtual elements. AR has finally garnered considerable interest among private investors and companies. From 2015 to 2016, investment in both AR and VR surged from $700 million to $1.1 billion and has progressed extensively as seen in Fig. 10.1 (Infographic 2016). Pokémon GO has given us a brief glimpse into a future filled with AR technology enhancing every aspect of society, from military operations and medical procedures to entertainment experiences.

With every new wave of technology and media comes the inevitable controversial analysis into its potential benefits and consequences, especially on the development and welfare of children (Wartella and Jennings 2000). This chapter follows this theme, exploring the relationship between ARGs and the health of child and adolescent gamers. Additionally, the chapter provides a brief overview on AR's direct influence on medical education and the patient experience. Focusing on Pokémon GO, the chapter highlights the potential positive effects of ARGs in areas such as psychosocial development and physical fitness, while addressing some of the possible negative consequences on the mental and behavioral health and safety of players. The chapter concludes with a discussion of the responsibilities and roles of parents, clinicians, and developers as games and other applications using AR technology become increasingly popular.

10.2 ARG's Impact on Children and Adolescents

10.2.1 Pokémon GO Overview

Pokémon GO was initially released in the summer of 2016 for Android and iOS devices. The game was received with fervent enthusiasm, surpassing 100 million downloads within the first month. Seemingly overnight, the game transformed into a worldwide phenomenon. For example, Fig. 10.2 shows a park in Japan being overrun by Pokémon GO players shortly after its release. While its popularity has abated over time, the game still had 147 million monthly users as of May 2018 (Phillips 2018).

Niantic developed Pokémon GO in just two years, heavily drawing from their previous ARG, Ingress. Released in 2012, Ingress is a strategic game that transformed notable physical locations into "portals" that are constantly contested by the game's two factions. Ingress demonstrated the potential of this gaming genre after accumulating a steady user base of 7 million by 2015 (Kollar et al. n.d.). Ingress' legacy is readily observed in Pokémon GO, as those same portals are now PokéStops, which dispense resources after specific time intervals and Pokémon Gyms where the game's three teams battle for control. Pokémon GO players must reach a specific level, which is accomplished by exploring the real world and capturing Pokémon, before joining a team. When encountering a Pokémon, players may view it in AR mode, which displays the Pokémon in the real world as shown in Fig. 10.3. Capturing Pokémon rewards players with in-game currencies that can be used to evolve and strengthen their Pokémon and, in turn, help their respective teams control their local gyms.

Different Pokémon are found in different areas. For example, water-type Pokémon are generally discovered near bodies of water. This mechanic forces players to extensively explore their physical surroundings, as a major game objective is to capture every species of Pokémon. While certain updates have diversified the selection of Pokémon that appear within a region, many species are still restricted to not just

Fig. 10.2 Pokémon GO players catching Magikarp in Setagaya Park Japan. Photo provided courtesy of Brian Miller. No changes were made. The license for this photo can be found at https://creativecommons.org/licenses/by/2.0/

specific types of environments, but specific locations around the world. This unique aspect may encourage children to explore not only their neighborhoods but the world beyond.

Although Pokémon GO was released two years ago (at the time of writing this chapter), it was by no means a finished product. Niantic has since introduced various features to the game, such as a friend's list, the ability to trade Pokémon, and raids. Raids are battles with Pokémon, varying in difficulty and spoils, which encourage and sometimes require a group effort to complete, adding further dimensions and layers to the gameplay (Goldfarb 2018). Pokémon GO will only continue to evolve as future updates and modifications are rolled out.

10.2.2 Pokémon GO and ARG's Physical Impact

Pokémon GO's initial appeal lay in its blending of two worlds generally considered to be mutually exclusive, the outdoors and video games. Thus, a clear by-product of playing Pokémon GO is an inevitable increase in time spent outdoors, as players attempt to develop a competitive and diverse collection of Pokémon. Experiencing the outdoors—specifically nature—is widely understood by both the scientific community and parents everywhere to be beneficial to children's health. For instance, one study observed both affective benefits, such as decreased anxiety, and cognitive benefits, such as improved working memory, in subjects who walked through a nature environment (Bratman et al. 2015). Another study concluded that nature is an

Fig. 10.3 A player attempts to capture a Doduo. They must swipe or "fling" the Poké Ball hitting the Doduo in order to capture it. Photo provided courtesy of Ashley Elizabeth. No changes were made. The license for this photo can be found at https://creativecommons.org/licenses/by-nc/2.0/

indispensable factor in children's health (Chawla 2015). While players in suburban and rural areas are essentially guaranteed to encounter nature every time they leave their homes, this is not necessarily the case for urban players. However, city parks are normally home to at least one PokéStop or Gym encouraging urban players to frequently visit these locations. Therefore, Pokémon GO helps maintain and improve the well-being of its user base by increasing the time they spend outdoors. Despite this, it is important to note that it is unclear how engaging in ARGs during these times may influence the positive effects that are usually associated with time spent in nature.

Another primary and more direct outcome of playing Pokémon GO is physical activity, which is required by mechanisms and methods employed by the game. For example, players must walk certain distances to hatch eggs, thereby collecting more Pokémon. Players also gain experience for leveling up their in-game avatars by walking. Pokémon GO's incorporation of physical activity into its gameplay classifies it as an exergame. Exergaming is a major topic in research due to its potential to combat child and adolescent obesity, which is a major risk factor for several chronic diseases and mental illnesses. According to the Center for Disease

Control (CDC), the percentage of children and adolescents impacted by obesity has more than tripled since the seventies, resulting in 20% of all 6–19 year olds being diagnosed with obesity (Healthy Schools 2018). Exergaming aims to take advantage of technology and gaming's extensive role in the daily lives of adolescents and children to promote more active lifestyles. Several studies have reported that weight interventions centered around active video games or exergames resulted in lower BMI or increased physical activity (Chen and Wilkosz 2014). Furthermore, one study found that children spend more than double the energy when walking on a treadmill at 1.5 mph while watching television, an accurate replication of the degree of physical activity required by Pokémon GO, than during sedentary screen time (Lanningham-Foster et al. 2006).

Anecdotal evidence at the time of release centered on player's increased activity levels, as many complained on social media of Pokémon GO's toll on their legs (Novak 2016). Research initially agreed with the anecdotal evidence as Pokémon GO players engaged in significantly higher levels of physical activity compared to non-players, however, over time this difference disappeared as players returned to original activity levels (Howe et al. 2016; McLaughlin and Milanaik 2018). The results of these two studies are displayed in Figs. 10.4 and 10.5. In hindsight, these findings are unsurprising due to the game's monumental and instantaneous reception. As the initial excitement dwindled and it's committed user base emerged, many lost interest and stopped playing, retreating to pre-Pokémon GO habits. Nevertheless it is safe to say that many of the remaining Pokémon trainers may have retained this higher level of physical activity, if solely for the purpose of advancing in the game.

Unfortunately, this potential increase in exercise may be countered by Niantic's affiliation with the fast-food industry. Niantic immediately capitalized on Pokémon GO's resounding success by partnering with McDonald's Japan for the game's release in Japan. The partnership consisted of 3000 McDonalds being identified as Gyms or PokéStops with the goal of increasing foot traffic to those locations. With Niantic claiming to have delivered over 500 million potential customers to their partners and several partnered companies such as McDonalds seeing increases in sales and traffic, this form of advertising may become a staple in all ARGs (Constine 2017; Sato and Kurimoto 2017). While these partnerships certainly make sense from a business standpoint, they may have negative influences on player's health by encouraging unhealthy lifestyles.

Pokémon GO has come with its fair share of mishaps and negative consequences. For example, it has resulted in an increased risk for physical injury due to a lack of awareness of one's surroundings. This issue is seemingly inseparable from technology and cell phones in particular, due to their universal serviceability. One study that investigated cell phone's affect on preadolescent children's pedestrian awareness concluded that simply having a conversation via cell phone distracted children enough to jeopardize their safety (Stavrinos et al. 2009). ARGs require considerably greater levels of concentration than traditional forms of technology, markedly exacerbating this effect. In fact, researchers testing an educational ARG's performance in a school environment recognized numerous instances of young students becoming engrossed to the point of neglecting their physical surroundings (Dunleavy

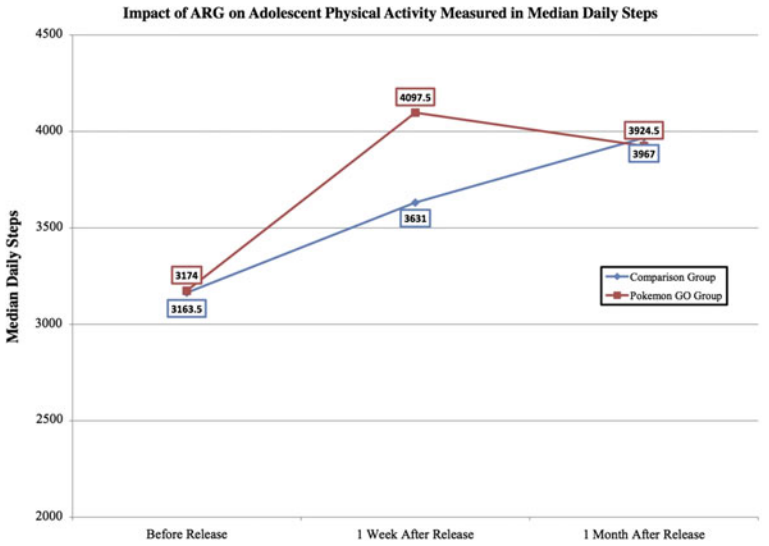

Fig. 10.4 Median daily steps before release, 1 week after release, and 1 month after release (McLaughlin 2016). Reproduced with permission from Journal Pediatrics, Vol. 142, Copyright © 2018 by the AAP

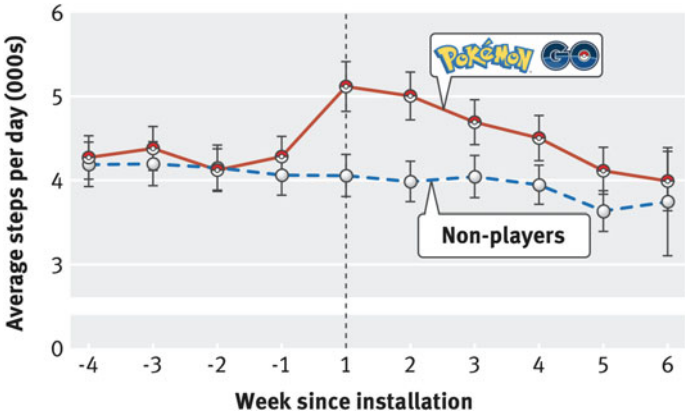

Fig. 10.5 Weekly average daily steps with 95% confidence intervals before and after installing Pokémon GO (Howe et al. 2016). No changes were made to the graph. The license for this figure can be found at https://creativecommons.org/licenses/by-nc/3.0/

et al. 2009). This effect can result in anything ranging from minor inconveniences to serious accidents, injuries and even death. Tragically, one man's devotion to Ingress led to his death in September of 2015, a little under a year before Pokémon GO's release, after falling from a pier while attempting to re-capture a portal for his team. Detectives hypothesized that his death was caused by tripping on a raised grate while looking at his phone (Roseingrave 2016).

Pokémon GO has been the source of countless incidents, injuries, and misunderstandings. For instance, two Canadian siblings unwittingly crossed the Canadian-American border due to their preoccupation with capturing Pokémon, resulting in their mother having to retrieve them from a border patrol station (Fieldstadt 2016). Not long after the game's release, an alarming number of car accidents occurred due to drivers attempting to play the game while driving (see Fig. 10.6). This spike in accidents led to organizations such as Washington's Department of Transportation to issue statements urging players to refrain from playing while driving (Titlow 2016). Just ten days after release, a homeowner fired upon a vehicle parked in front of his home mistaking two teenagers playing Pokémon GO for robbers (Florida 2016). Countless reports of trespassing and loitering have transpired, as players chasing Pokémon accidently entered private property and unwitting residents found their homes to be the location of a Gym or PokéStop. Moreover, criminals exploited Pokémon GO's mechanics to isolate players and rob them of their valuables. The robbers placed lures, an in-game feature which increases the likelihood of Pokémon spawning within a certain physical area, in secluded areas. Since active lures are advertised to all nearby players, they were able to attract local unsuspecting players (Provenzano 2016). This is a very dangerous feature, as children may be so engrossed in the opportunity to catch a Pokémon that they fail to notice, prevent, or react to risky situations. Many police departments have published safety guidelines for those playing the game in an attempt to prevent future crimes and accidents. Although ARGs bring a whole host of possibilities, benefits, and experiences to their users, they also leave room for risk and misfortune. It is imperative that ARG developers, law enforcement, policy makers, and the public remain alert to this potential risk and learn from past events.

10.2.3 Pokémon GO and the Impact of ARG's on Socialization

With the evolution of gameplay, there has been a marked rise in the incorporation of social components into the gaming experience (see Fig. 10.7). Massive multiplayer online games (MMOs), for example, have the capacity to function as virtual hubs where large populations of gamers can have a space to interact, learn, and build social relationships (Steinkuehler and Williams 2006). In a 2015 Pew research survey, 57% of all teens surveyed reported having built new friendships online in networked video games and social media applications (Lenhart 2015). In a 2016 Essential Facts

Fig. 10.6 A photo of a player driving and playing Pokémon GO (Bellal and Armstrong 2016)

about the Computer and Video Game Industry report, 53% of the most frequent game players surveyed reported that video games served as an effective medium to connect with friends (Entertainment Software Association 2016).

Previous research studies have demonstrated predictive associations between prosocial behaviors and video gameplay requiring cooperation among players (Gentile et al. 2009). The unique features of AR technology usage in ARGs may add more layers of depth to these interactions and strengthen the foundations for greater prosocial behaviors and relationships on these gaming platforms. ARGs such as Pokémon GO incorporate elements and scenarios that essentially require players to interact both with their surroundings as well as encounter other players. Pokémon GO, itself, is designed with numerous features that encourage true collaboration, allowing players to establish new connections with other players by meeting to collect and share resources as well as compete in various locations. There is no penalty for sharing information amongst players and teamwork fundamentally aids player progress in the game rather than hinder it. Pokémon GO also incorporates a team element where players can join one of three teams upon reaching a specific level in the game and work together to maintain control of their PokéGyms and progress in the game (Pokémon GO—Teams and Gyms 2018). This game component resembles the "guild" feature in many MMOs which promotes community interaction and has been reported to provide social benefits to players (Das et al. 2017). While features

Fig. 10.7 New forms of technology and online gameplay allow people to interact and share experiences with across more advanced applications

such as its team system and raid battles may encourage group play and socialization, they may also foster negative emotions and experiences both individually and within social groups. For example, the big age range in users may lead young users to be exposed to inappropriate language and conduct. In addition, feuds that occur within the game may spill over into the real world causing tension among peers.

Further prosocial behaviors may be observed beyond peer-to-peer relationships and into family units. Coyne et al. found that the experience of playing video games with parents is associated with fewer aggressive behaviors, diminished levels of internalization, and higher prosocial behaviors among girls, noting how these experiences also related to parent-child connectedness (Coyne et al. 2011). The ASU Center for Games and Impact has further compiled and distributed a series of "Impact Guides" that offer parents advice on how to initiate conversations regarding video games with children, noting that video games can serve not just as a recreational experience but also a learning opportunity that parents can facilitate in order to teach different subjects and skills such as problem-solving (ASU Center for Games and Impact 2013).

Looking specifically at Pokémon GO, children and their parents can use the game's unique design to travel around different locations together while learning more about their neighborhoods and discovering new Pokémon (see Fig. 10.8). Families can establish group dynamics where children can take more leadership roles, such as deciding on and directing the group to specific geographic areas to explore, and educating parents on both the mechanics of the game as well as the expanded Pokémon

Fig. 10.8 A photo featuring a Pokémon GO player walking around a neighborhood

mythology. Through these interactions, parents can learn more about the personalities of their children, see firsthand how they react to moments of disappointment as well as celebration, and use these moments as valuable teaching experiences. These dynamics can also allow parents to guide their children to learn skills such as organization, strategizing, sharing, and helping others. These teaching moments can easily be integrated into routine family activities such as family walks and dog walks, enhancing these experiences and facilitating greater communication and bonding (Sobel et al. 2017).

Research has also suggested that Pokémon GO and other games that utilize AR technology can promote and strengthen engagement within entire communities as demonstrated in Fig. 10.9. A partnership between Niantic and the Knight Foundation was established in 2017 which sponsored experimental model programs in several major cities including Philadelphia, Boston, and San Jose to evaluate how AR gaming could be applied to municipal initiatives. While the results of these models varied based on the particular goals of each municipality, they were generally found to effectively integrate the AR experience with local cultures and foster inclusiveness. In San Jose for example, over 35,000 Pokémon GO players were recruited to play during an open street festival where the goal was to reimagine the public spaces throughout the city without motor vehicles and bring more interest to local neighborhoods and businesses. The city eventually raised over $450,000 for the local economy as a result (Stokes et al. 2018).

Anecdotal evidence also has shown ARGs like Pokémon GO to be successful among particular groups such as children diagnosed with autism spectrum disorder

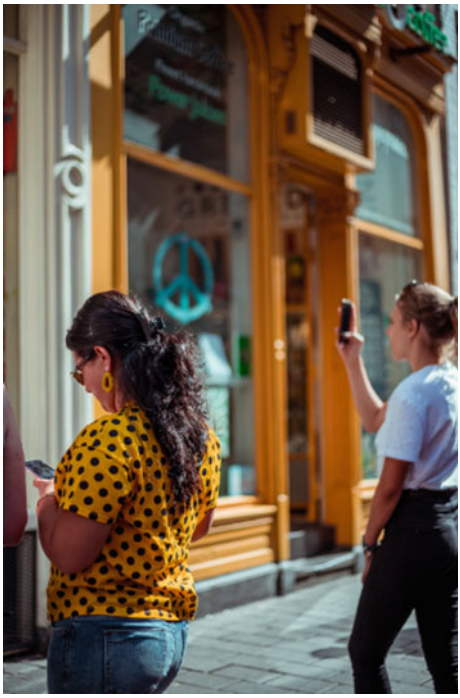

Fig. 10.9 Public spaces provide opportunities for players to explore and learn more about local institutions throughout communities

(ASD) with parents citing that the ARG has been a significant factor in getting children with ASD to not only go outside and explore the world but also communicate and spark new conversations with other players who share their interest (Singal 2016). In fact, Pokémon GO has traversed beyond gender, generational, and racial boundaries, allowing children with ASD and other conditions to interact with players from all walks of life and learn more about the diversity in their communities.

While there is great potential for Pokémon GO and other ARGs to enhance familial interactions, bonding experiences in households, as well as community engagement, more research needs to be done on the extent to which excessive ARG gameplay may carry negative consequences on relationships. It is important that children recognize and understand the difference between AR and physical reality in order to prevent players from completely immersing themselves in ARGs and isolating themselves from more real-world experiences with others. Parents can implement controls that limit screen time and even create rules that can motivate children to take part in other activities and engage in other social settings, balancing these forms of social interaction with ones that are more virtual in nature.

Given the massive popularity of ARGs like Pokémon GO, it is important to consider some of the risks associated with the increased social opportunities available through gameplay. Among the safety concerns to address is the phenomenon of "stranger danger," through which players may meet strangers online and potentially be lured into certain areas and become victims of crime. When investigating these

concerns New York senators discovered that in almost 60 out of 100 cases, sexual predators were located within half a block of a PokéStop or Pokémon Gym. This discovery resulted in registered sexual offenders in New York being restricted from playing the game (McKinley 2017; Governor Cuomo 2016).

Ultimately, despite these safety considerations, it is clear that ARGs like Pokémon GO pose significant opportunities for more immersive interactions and opportunities for bridging social connections and exposing individuals to a wider diversity of perspectives, thoughts, and relationships.

10.2.4 Pokémon GO and ARG's Psychological Impact

Although many people might immediately associate AR with video games, there has been increasing interest among medical professionals in AR's potential to treat various psychological disorders. Anecdotes have shown how Pokémon GO has been able to bring people together, facilitate socialization, and promote exercise. For many individuals, the increase in socialization has greatly helped with their depression or social anxiety as noted by anecdotal evidence (Fernando 2016). Moreover, a number of studies have shown exercise to be beneficial in alleviating depression and since exercise is a byproduct of playing Pokémon GO, it has the potential to mitigate symptoms of depressions (Craft and Perna 2004). For people with social phobia, the game provides a reason for them to go out and meet fellow players. Anecdotal evidence suggests that people with social phobia can benefit from Pokémon GO due to a concept known as exposure therapy, which "exposes" individuals to the things they fear (Kim 2016; What Is Exposure Therapy? 2018). Furthermore, another study even found Pokémon GO to be slightly effective in reducing psychological distress for adult workers, suggesting that the game could have a significant impact on the health of a population (Watanabe et al. 2017).

More generally, AR technology can be used to treat other phobias (see Fig. 10.10) and somatosensory disorders. In a study by Botella et al., AR was found to be an effective treatment for cockroach phobia. Moreover, the results were maintained over the long term (Botella et al. 2010). Although studies examining the effect of AR on phobias of children are limited, it would not be surprising if the results carry over to children. In fact, many of the fears that adults have, such as fears of insects, small animals, needles, and heights often result from unpleasant experiences in childhood. AR seems to show promising potential in reducing or even eliminating these fears in children before they grow even stronger (Phobias Symptoms and Causes 2018). In addition to treating phobias, AR can also be utilized to treat somatosensory disorders, such as phantom limb pain and complex regional pain syndrome. Researchers have demonstrated that AR can successfully emulate the results of mirror therapy–a popular treatment for the aforementioned disorders–with the added benefits of accurately tracking progress and adherence and increased motivation and engagement due to the gaming oriented atmosphere (Trojan et al. 2014).

Fig. 10.10 Arachnophobia, or the fear of spiders and other arachnids, has the potential to be eliminated with the advent of AR

Although there are many benefits of AR, there is also much potential for harm, especially when considering children's health. While it may not be surprising that children and adolescents are spending more time playing video games than before, "Gaming Disorder" has started to be recognized as an official disorder by the World Health Organization (Gaming Disorder 2018). Incorporation of AR into video games, which would provide a dimension of reality, might cause children to spend even more time playing video games, exacerbating the epidemic. Pokémon GO has various intrinsic aspects that has allowed it to draw in millions of people, both young and old. First, since players can still interact with the real world while playing the game, it gives them a feeling of comfort since they are familiar with the setting. In psychology, this concept is known as cognitive fluency, and overall it leads to a more enjoyable experience for the user who will want to keep playing it more. Next, it activates the brain reward pathway much like the way many addictive drugs do. The unanticipated joy of finding a Pokémon stimulates this pathway and urges users to continue playing. Finally, one of the factors that draws many adults to play the game is nostalgia. Pokémon might remind them of childhood memories and might motivate them to place to try to relive those times (Margalit 2016; Edwards 2018). When all of these factors-familiarity, reward, and nostalgia-come together, they can produce a game that is extremely addicting both for adults and children.

Besides the sheer amount of time spent playing video games (see Fig. 10.11), there are other concerns that must be considered because children are influenced heavily by what they see in the games. For example, AR can potentially make video games even more violent. Countless research has shown violent video games to be associated with aggression in children. A meta-study analyzing 100 studies suggested that exposure to violence video games is a risk factor for increased depression, aggressive behavior and cognition, and decreased empathy and prosocial behavior (Anderson et al. 2010).

Fig. 10.11 An image of a individual playing video games

Fig. 10.12 An example of a graphic image often found in violent and graphic video games

Furthermore, frequent exposure to violent video games can desensitize children to violence and make it appear a normal part of life. As illustrated in Fig. 10.12, the scenes for most violent video games take place in a virtual world. AR technology would replace the virtual layer with a real layer and thus the graphics and violent scenes would feel even more like reality. This has the potential to make children even more violent as the distinction between game and reality is slimmed even further.

The effects of prolonged video game use has been well established. Addicted gamers are more likely to develop depression, anxiety, and isolate themselves socially. As research shows, the excess time that is spent playing video games is likely to negatively impacted academic performance in school (Anand 2007). Fur-

thermore, pathological gamers are less likely to spend time on physical activity, thereby increasing the risk of developing obesity and other cardiovascular disorders. Although most of the current research focuses on video games without AR, the introduction of AR has the potential of exacerbating the aforementioned effects since children and adolescent might spend more time playing ARG due to their novelty. Many in society view pathological gamers as those who shirk from real life interactions. Addicted gamers may use AR's inherent layer of reality as justification for their long hours of play. As such, it is not difficult to imagine the potential harmful implications of ARGs on individuals playing for extended durations.

As AR permeates into different spheres of life, one might wonder how exactly this new technology is affecting our brains. Although currently there is limited research on the topic, one preliminary study suggests areas of promise and concern. The study conducted in part by Neuro-Insight included 151 participants and showed that in various tasks, participants using AR were 1.9 times as engaged as those without AR. Furthermore, the experiment showed that the regions of the brain responsible for encoding memory saw an increase of about 2.9 times when compared against non-AR participants (Layered 2018). Although these are preliminary results, they do point to the idea that AR can affect our brains in powerful ways such as increasing empathy by allowing the participant to place themselves in different perspectives. However, if it does in fact enhance memory, this is a great area of concern for developing adolescents as the violent or sexual content they see through AR is more likely to be ingrained.

10.3 ARG's Educational Impact

The evolution of games has invited many in the education community to consider the possibilities and effectiveness of gaming as a learning tool in the classroom (Karagiorgas and Niemann 2017). A 2018 study of 1234 Australian households and 3135 individuals from these households found that the majority of parents believed video games to be helpful in allowing instructors to impart new knowledge and skills, command attention, and ensure that the curriculum remains up to date. Anecdotal evidence obtained through this study highlighted how video games have helped players learn new languages, improve memory, and develop skills and interests in fields that ultimately became full-time careers (Brand et al. 2017).

With ARGs specifically, educators are gradually realizing the potential ways that these games can enhance instructional learning environments. The fundamental multi-sensory nature of ARGs inevitably synthesizes more immersive and engaging experiences for students, as the tasks that they may be assigned to complete using AR technology would not only require them to utilize mental skills such as problem-solving and critical-thinking but also include physical components. One possibility includes the usage of marker technology to create three-dimensional planes from two-dimensional designs that can be utilized in architecture and geography lessons. Another possibility takes advantage of the inherent portability of ARGs, serving as a

conduit for educational treasure hunts and scientific investigations in locations such as zoos and museums, where students can actively learn about the history behind certain geographic landmarks, famous figures, and carry out experiments to test hypotheses (Kohen-Vacs et al. 2012).

Through these and other applications, AR technology has demonstrated tremendous potential in the promotion of collaborative learning (Kaufmann and Schmalstieg 2003; Fonseca et al. 2014). The collaborative learning approach emphasizes active discussion and the exchange of ideas among scholars as they work toward common academic goals within a group setting (Gokhale 1995). With more ARGs being introduced on various platforms, learners have increased opportunities to engage with educational material in dynamic and collaborative environments with peers and faculty. Studierstube is one such collaborative AR system that allows multiple users to share the same virtual environment and still remain in close proximity to one another, permitting natural real-world interactions such as gestures and discussions to take place while virtual scenes are manipulated (Schmalstieg et al. 2002). This combination of virtual images embedded in actual physical settings sets up an innovative and effective means of improving learning capabilities and participation in enriching interactions (Martín-Gutiérrez et al. 2015).

By incorporating elements of AR technology found in popular ARGs like Pokémon GO into educational instruction, teachers can create more immersive lessons. This technology can be applied to such concepts as immediacy in the classroom, and promote ownership of learning amongst students. With increased immediacy, teachers engage in more effective communicative instructional behaviors that serve to strengthen motivation, cognitive learning, and affective learning among students (Baringer and McCroskey 2000; Brann et al. 2005). Considering the multi-sensory and immersive elements that AR technology can afford, its implementation to a classroom environment can facilitate the growth of these immediacy behaviors, creating a more exciting, comfortable, and positive atmosphere both for instructors and their pupils (LeFebvre and Allen 2014).

Using this technology, students would be able to work with virtual objects, models, and simulations superimposed onto real environments (Bronack 2011). For example, the Augmented Chemistry application was developed to assist in organic chemistry education by allowing students to generate and manipulate three-dimensional molecular models (Fjeld et al. 2007). Similar AR technology was used in another application, The Environmental Detectives, which stimulates situated active learning by providing students with portable handheld computers that enhance their experiences conducting investigations, gathering data, and creating context-specific solutions to designated challenges (Klopfer and Squire 2008). While such applications demonstrate the powerful and vast possibilities of ARG integration in educational settings, more data needs to be collected on the efficacy of using ARGs like Pokémon GO in these environments.

In spite of the many possibilities offered by AR technology, challenges to its integration in educational initiatives and teaching practices exist. Previous literature has pointed out a number of technical limitations associated with AR technology, citing their complexity as an obstacle to their usage by students (Squire and Jan 2007;

Wu et al. 2013). Considering the rapid advancements presently being made in this field, such augmented technologies are being produced and are expected to become more extensive in the future. Already, handheld devices including iPads are growing increasingly popular in classroom settings for teaching new skills and connecting school activities to home learning (Northrop and Killeen 2013). Integrating AR tech into these classrooms would serve to enhance their usage and generate greater excitement for learning.

10.4 AR and Improving Children's Medical Experience and Use in Medical Treatment and Education

Staying at the hospital can be an intimidating experience for anyone. Children, especially, may have a difficult time comprehending the events around them. By immersing children in an enhanced experience, AR has immense potential to improve a child's stay. Children's hospitals around the world have started to experiment with this technology to help make experiences less intimidating and more informative for children.

One example of a hospital utilizing AR to improve the experiences of young children is Lucile Packard Children's Hospital Stanford which aims to alleviate anxiety in young patients through the Packard Children's Childhood Anxiety Reduction through Innovation and Technology (CHARIOT) program. In addition to utilizing VR to allow patients to immerse themselves in a completely different world, this program also utilizes AR to allow patients to observe their procedures, allowing them to actively participate in their care. For instance, the AR headsets used display avatars named Ben and Jerry (displayed in Fig. 10.13) that walk the patient through the IV procedure and other minor procedures as they happen. This not only makes the experience more bearable for the young patient, but educates them as well (CHARIOT Program 2018; DeTrempe 2017).

Additionally, Alder Hey Children's Hospital in the UK launched an app called 'Alder Play' which not only shows children what it is like to get blood tests or X-rays, but also aims to help children feel more comfortable in the hospital setting. Children download the app before their stay at the hospital and choose a virtual avatar who will show them around the hospital once they are admitted (see Fig. 10.14) (Debczak 2017). The application features plenty of fun scavenger hunts and other games for kids to play during their downtime, but its most important features are designed to coach young patients through treatments. Short videos walk them through procedures like blood tests so that when the time comes, the situation will feel less intimidating. And for each step in the hospitalization process, such as body scans, doctors can give kids virtual stickers to reward them for following directions or for just being brave.

Not only can these technologies make young patients more comfortable in new hospital settings, as seen in Fig. 10.15, but some research shows that they have the potential of mitigating some pain during procedures. For example, a study examining

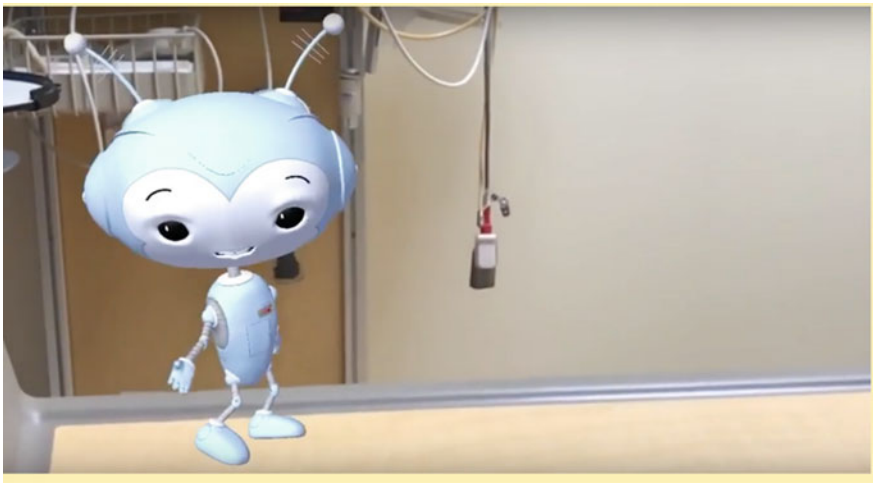

Fig. 10.13 This is an image of Jerry, one the avatars utilized in Stanford's CHARIOT program, walking one of the young patients through an IV procedure. Credit/courtesy of: Thomas Caruso, MD, Samuel Rodriguez, MD, Pediatric Anesthesia, Lucile Packard Children's Hospital Stanford; Elliot Myhre, Miney Moe

the effectiveness of AR in alleviating pain in children undergoing dressing burn changes, found that mean pain scores were lower for children who utilized the AR technology as compared to controls (Mott et al. 2008). Another case study showed

Fig. 10.14 A screenshot from the AlderPlay AR app developed and used by the Alder Hey Children's Hospital in Liverpool (Credit/courtesy of: Alder Hey Children's Hospital in Liverpool)

Fig. 10.15 Young patient distracted during a dressing change. Photo courtesy of Lucile Packard Children's Hospital Stanford

AR technology to help reduce Phantom Limb Pain, a type of pain that can occur after amputations (Ortiz-Catalan et al. 2014). Anecdotal evidence further demonstrates the power of AR technology. However, as much of the research surrounding AR are case studies and limited in number, more research will be needed to maximize AR's reach in the medical setting.

Furthermore, AR can be used for medical educational purposes in children with chronic illnesses. A study done in Spain showed that an ARG could be used to support therapeutic education in children with diabetes (Calle-Bustos et al. 2017). This game attempted to educate children about the carbohydrate content of different foods by displaying virtual food on plates along with the grams of carbohydrates.

Children in most hospitals are given a television, which they watch for most of the day. However, most of the television shows that children watch are not the most educational. Since many of these children are still supposed to be in school, they are losing valuable educational time. AR's sister technology, VR, has the potential of helping children continue learning even when they are in the hospital. By immersing them in another world, this technology can take the children on adventures from the museums and zoos to even a virtual classroom. Not only can they continue learning, but it can take them outside the physical boundaries of the hospital setting and overall make their experience in the hospital more enjoyable.

AR's influence extends beyond just the patient experience and into medical education and treatment. One study found that students who supplemented their standard anatomy course material with a mobile AR application performed higher on an aca-

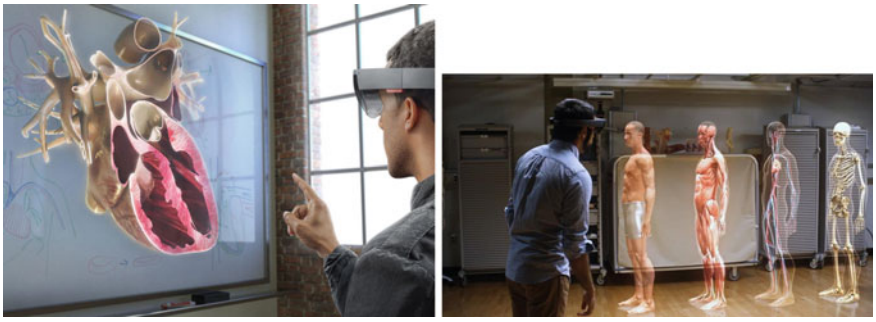

Fig. 10.16 These images show how Microsoft Hololens are being utilized to enhance medical education. *Source* ZDNet/Microsoft

demic achievement test than students who did not have access to the AR material (Küçük et al. 2016). Additionally, a collective evaluation of AR applications used to train medical professionals in procedures such as laparoscopic surgery and neurosurgery concluded that these applications were realistic and beneficial. While a systematic and comprehensive approach to validating these methods is lacking and necessary, these initial findings foreshadow AR's potential impact on medical education (Barsom et al. 2016). AR has a high capacity to engage students and present material, especially spatially and visually complex information such as anatomical structures, in a conducive and intuitive manner (reference Fig. 10.16). Notably, AR also allows professionals to practice highly delicate procedures in safe and realistic conditions. As these applications and methods continue to be refined, patients will ultimately benefit at the hands of skilled and confident physicians.

Despite its recent introduction to the medical classroom, AR has been implemented in the operating room for some time. AR has generally been utilized to resolve many of the obstacles associated with minimally invasive surgery (MIS). MIS is a form of surgery that aims to minimize stress to the body by making the incision or opening as small as possible. The use of MIS in the operating room provides a variety of benefits, including shorter hospital stays and fewer complications, making it the preferred method for surgeons across a wide breadth of specialties (Minimally Invasive Surgery 2017). The two principal techniques of MIS are robotic-assisted surgery, where the surgeon operates behind a console controlling robotic arms, and endoscopic surgery, where the surgeon inserts and operates from a video camera attached to a tube that contains small surgical tools, known as an endoscope (McMacken 2017). The very nature of MIS forces surgeons to sacrifice certain benefits such as a direct view of their movements, but AR has been used to expand the surgeon's visual abilities by rendering and displaying the patient's anatomical framework directly onto the patient's body. Additionally, AR has also influenced other branches of surgery. Some of neurosurgery's newest methods have been spearheaded with AR technology, such as integrating preoperative images into a microscope to guide the surgeon's movements (Pelargos et al. 2017; Khor et al. 2016).

However, these methods still face several challenges, such as requiring exceptionally expensive and niche machinery and failing to accurately account for soft organ and human movement in its visualizations (Nicolau et al. 2011).

Technology's perpetual advancement creates constant opportunities to implement AR in novel ways. For example, surgeons used Google Glass in the operating room to view test results virtually, allowing them to obtain these results while remaining sterile and ready to perform procedures. This saved surgeon's considerable time and effort as they did not have to re-sterilize every time they wished to view a test result (Khor et al. 2016). Despite the potential benefits, AR still faces some obstacles in this field. For instance, the addition of visual and spatial information to sensitive environments such as the operation room always carries the risk of distracting the operator, potentially increasing the possibility of errors and complications or potentially changing the physician-patient relationship in the non-surgical setting. Developers should keep these factors in mind as they continue to advance and refine AR's role in the hospital setting.

10.5 Policy and Groundwork Recommendations

Pokémon GO has established AR gaming's future as a major branch of the video game industry. It has also highlighted potential dangers and risks facing AR gamers. It is imperative that all pertinent groups, from major organizations to parents and players learn from the lessons presented by Pokémon GO.

As children spend more time playing video games and on phone screens, it is important for parents and pediatricians to monitor the time that children spend using media. The American Academy of Pediatrics (AAP) recommends that children from ages 2–5 should be limited to 1 hour of quality programming. For children 6 and older, the AAP recommends that parents place consistent limits on the time that children spend using media (American Academy of Pediatrics 2016). It is not only important to monitor the time spent on screens, but also what type of games are being played, including whether they are violent or not. Many ARGs have the potential to be very violent and graphic, which could have potentially long lasting effects on the developing minds of young children and adolescents.

Video game rating organizations such as the Entertainment Software Rating Board (ESRB) in the United States need to update their rating procedures and language to include ARGs and their unique risks. As shown in Fig. 10.17, Pokémon GO's age rating, as of November 2018, on the iOS app store is, 9+ Infrequent/Mild Cartoon or Fantasy Violence. This rating takes several factors into account such as in-game purchases and sharing the user's location, but does not fully encapsulate the features and risks imparted by ARGs (ESRB Ratings Process n.d.). For many parents these ratings are the only measure by which they assess a game, and even if only weighed lightly, this information can play a major role by simply bringing these dangers to a parent or player's attention.

Businesses have an ethical and moral responsibility to prioritize their customers' well-being over maximizing profits, especially when their customers are children and

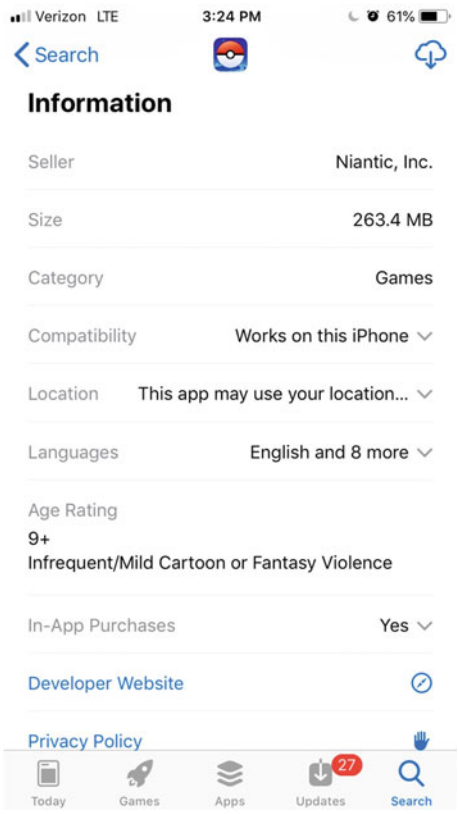

Fig. 10.17 Pokémon GO's age rating in the iOS application store as of October 2018

young adults. Disney Resorts upheld this philosophy a few years ago by overhauling their children's menu, making the standard choices healthier, substituting soda and fries for milk and fruit and providing the former only when explicitly requested. In the case of Niantic and Pokémon GO, the game's corporate partnerships are a fantastic opportunity to positively influence their user's lives. Niantic can replace their partnership with McDonald's with a partnership with any country's equivalent of local YMCAs, further promoting a healthy active lifestyle.

These concerns have not gone completely unnoticed by Niantic, as they recently debuted the Niantic Kids Parent Portal. This platform allows parents to supervise and oversee their children's experiences in Niantic's games along with screening what personal information Niantic collects. While definitely a step forward, this service is really only offered to parents of children under the age of 13, who are too young to give digital consent. Thus, Niantic is required to obtain parental permission to comply with legislation such as Children's Online Privacy Protection Act (COPPA). Another beneficial development was the introduction of Pokémon GO Plus, a small wearable device that allows users to continue playing the game without looking at their smartphones. Its main selling point is convenience, but it also provides the

secondary function of letting players pay greater attention to their surroundings. Pokémon GO Plus is a great example of how developers can advance profits and safety. Future ARG developers must learn from Niantic's obstacles and mistakes and continue to prepare for unprecedented concerns as the genre advances.

As more games become intertwined with AR, it is important to identify which games and platforms can be utilized to help individuals suffering from certain psychological disorders. Pokémon Go has many beneficial aspects, one of them being promoting more exercise. Other gaming platforms should try to incorporate some of the positive aspects so that gaming is not only fun, but healthy as well. However, currently the research is quite limited to the effects of AR in certain phobias. Before these games are advertised for health benefits, there must be more robust and concrete research studies done to ensure efficacy of the platforms.

Ultimately, as the landscape of AR technology and gaming continues to evolve, both pediatricians and parents must adapt and be prepared to not only recognize these concerns but also embrace the new possibilities afforded by this technology. Pediatricians should remain updated on new advancements in AR technology and how it is being integrated into video games and other aspects of children's lives. At the same time, parents remain the most influential force in their children's' development, being primarily responsible for their cognitive and social-emotional growth. Pokémon GO and other ARGs create new opportunities for parents to open dialogues with their children, foster closer relationships, and communicate lessons and lifelong skills with them in ways that were previously not possible. With enough knowledge and supervision, parents and children alike can enjoy ARGs, learn from them, and share new experiences.

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Chapter 11
Playing Pokémon GO in a Public Park in Malaysia: A Survey and Analysis

Siti Aisyah Muhammad

Abstract Public parks have been developed to provide the physical facilities and the cultural activities that cater the needs of the community. This research aims to argue the implications of the Pokémon GO phenomenon with regard to the existing physical activities in a public park, namely Taman Perbandaran Tengku Anis (TPTA), Kota Bharu, Kelantan, Malaysia. Site survey and observation have been conducted to measure the frequency of visitors and the use of the facilities provided. The survey demonstrated that there are 38 general activities implemented in this park and observation has shown that the Augmented Reality (AR) game Pokémon GO has merged to become part of the activities in this park where the *PokéStop* and *Gym* game elements have been involved in this site. The observation was conducted for a period of one week following the launch day of this game resulted in the introduction of a new activity and an increasing number of visitors to this park. However, Pokémon GO only engaged AR, smartphones and the player without utilizing the facilities and engaging with the common activities of this park. Although this park is considered a public park where a multitude of social cultural activities could be embedded, Pokémon GO is one activity that allows the player to undertake his or her own visual physical challenges and gives no provision to the other visitors in terms of safety guarantees and space commonality. The phenomenon drastically increased the number of visitors attracted to the park, although after several months it returned to normal and visitors with sports attire became much more visible. Several issues related to the local authority and religion also resulted in decreasing numbers of players.

11.1 Introduction

Public parks are primarily designed for recreation and can bring enormous benefits to the surrounding neighbourhoods and community by improving health, social well-

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being and enhancing enjoyment of the local environment (McRobie 2012; Christiansen et al. 2001). In addition, the benefits of leisure include physical health, psychosocial well-being, self-actualization, spirituality and self-identity, family bonding, child development, environmental education and social skill development (Veal and Lynch 2001). The important role of urban public spaces is recognized both in the character and the life they bring to towns and cities around the world, and the process of making a place of public value requires the review of substantive dimensions in the design of public spaces such as social, visual and functional dimensions. According to Dobbins (2009), in the broadest sense the elements of urban design may be organized in three spheres, each of which interacts with the others; these spheres are the physical environment, human activity, and the connections between them.

One park, namely Taman Perbandaran Tengku Anis (TPTA), was selected as a case study for this research focusing on the characteristics of the urban park and the local activities implemented within. TPTA is located in the city of Kota Bharu, Kelantan and since it was first developed in 2004 this urban park became one of the centres of physical activities within the city. According to Utusan Online, TPTA is a focal place for the surrounding communities in Kota Bharu, as it offers many activities such as exercise, picnics, and jogging, and it contains a number of facilities including toilets, a jogging track, an observation tower, parks such as a deer and a bird park, a playground, a water theme park, and an abundance of parking space (Mahmood 2014).

This research aims to study the implications of the current phenomenon of Pokémon GO on the existing activities of this park following the game's introduction in Malaysia and other countries worldwide when it became a global issue and trend. Pokémon GO was developed by the Niantic Incorporation of Nintendo USA and launched on 6th July 2016 in the United States, Australia and New Zealand. Pokémon GO reached Malaysia on 6th August 2016 after a mass uptake of the game in more than 30 countries. It is a location-based Augmented Reality (AR) game for smartphones in which the player must walk and explore chosen places to capture the Pokémon characters. The chosen places also involve TPTA with the inclusion within the park of *Gyms* and five *PokéStops*. This research will therefore study this new activity in TPTA and its implications for TPTA itself. Figure 11.1 shows the map of the park.

11.2 Methodology

A period of observation was implemented in order to record the number of visitors to this park and their activities. The park's visitors are multi-racial and include Malay, Siamese, Chinese, Indian and even aboriginal people. As such, visitors are Muslim, Buddhist, Hindu and Christian. A questionnaire was distributed among the young people who are mostly involved in online gaming such as Pokémon GO to measure the frequency of their visits to this park (see Fig. 11.2). This was followed by factor analysis using SPSS 22 (male 47.6%, female 52.4%). The exploratory factor analysis

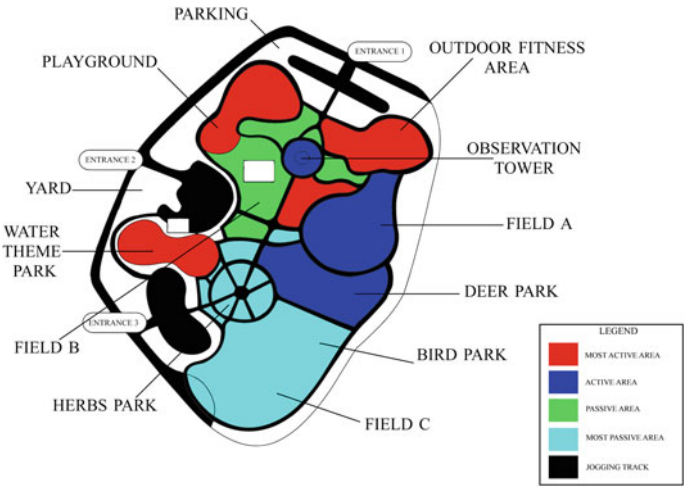


Fig. 11.1 The map of Taman Perbandaran Tengku Anis

Fig. 11.2 Youngsters answering the questionaire

based on eigenvalue cut-off resulted in four factors that explained attraction in Taman Perbendaharaan Tengku Anis with a total cumulative value of 72%. Pokémon GO players were also interviewed and the answers were summarized.

11.3 Pokémon GO in the Park

The player (also known as the catcher) creates an in-game avatar who will capture as many Pokémon characters as possible and will use them to defeat opponents at the actual location detected by the smartphone. A *PokéStop* is a virtual place where the Pokémon characters exist and at each location there are usually two characters with different personalities present based on the real environment surrounding the *PokéStop*. For instance, if the *PokéStop* is located at a river or a watery place, the identity of the Pokémon character that appears is related to water such as the character named Squirtle. *PokéStops* also provide a range of game items such as eggs, Poke Balls, berries and potions. In TPTA, there are five *PokéStops* located within the park as shown in Fig. 11.3. In addition to *PokéStops*, there are virtual battlefields known as *Gyms* for players to fight using their Pokémon characters, and the winner is honoured by gaining possession of the *Gym*. Accordingly, there are two *Gyms* located in TPTA as shown in the map (Fig. 11.3). The *Gyms* that are located at the mosque in TPTA (Fig. 11.4) create a crowd facing the mosque at any time. The *PokéStops* in TPTA are located at the fountain (Fig. 11.5), the playground, the TPTA memorial, the water park and the mural (Fig. 11.6).

Fig. 11.3 Map of Taman Perbandaran Tengku Anis and location of PokéStops and Gyms

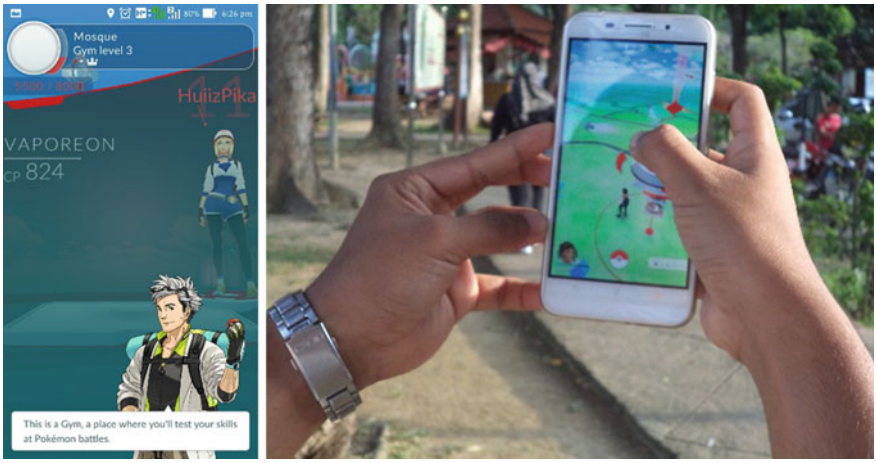


Fig. 11.4 *Gyms* placed at the mosque of TPTA

Fig. 11.5 A *PokéStop* facing the fountain

11.4 Findings

The components are presented by the physical environment, human activity and also the connection between them (see Table 11.1). These factors are associated with the basic facilities provided on the map by the TPTA management. The interpretation of these factors resulted in: Component 1 (30%), Component 2 (21%), Component 3 (14%) and Component 4 (8%). There is huge engagement of the third sphere (the connection between the physical environment and human activity) in this public park as the visitors are offered plenty of activities within the park and are not limited to

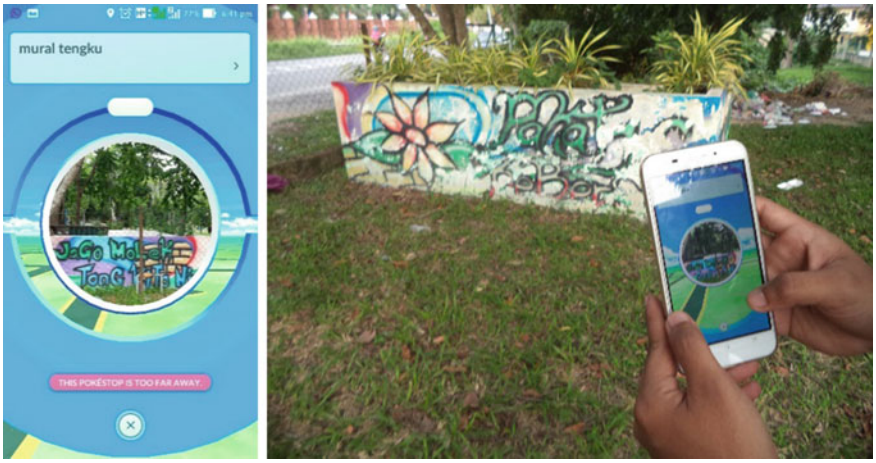


Fig. 11.6 A *PokéStop* facing the mural

the suggested activities referred to by the map. According to the results, there are four factors that attract people to visit this park. The factors are clustered based on the human activities that are connected to the facilities provided. This shows that there is a connection between the physical environment and the human behaviour, but the essence of this relationship relates to the functions of the provided facilities. For instance, the first component clustered five factors which essentially address the general purpose of the public park's features. The second component consists of five factors that highlighted the facilities provided that may represent the major activities people engage with in the park. The third component includes sight-seeing and animal parks, where both factors involve the bird park and deer park. Outdoor fitness is clustered as the fourth component with only a single factor, and this indicates that the associated activities have their own characteristics, and likely involve activities in which physical strength and flexibility are required such as parkour.

Observation took place in both the morning and the afternoon of the Pokémon GO launch day in Malaysia. Based on the observation, visitors were engaged in a total of 43 activities in TPTA, including the Pokémon GO virtual game. The TPTA activity map can be clustered into two peak hours, i.e. in the morning and during the late afternoon. The visitors to this park increased during the afternoon as shown in Figs. 11.7 and 11.8.

The players of Pokémon GO initially appeared to come alone for the first time at midday. Later, there were groups of players in the park, mostly comprised young people who visited and walked from one place to another in TPTA according to the virtual path of Pokémon GO. In the afternoon, the numbers increased with regard to single players and group players. The Pokémon GO players were easily recognized. They came to TPTA to catch the Pokémon characters, yet they did not engage with any other facilities and physical activities in the park. The players were attached to their smartphones and they walked around TPTA and stopped at several spots where

Table 11.1 Results of exploratory factor analysis for one observation day

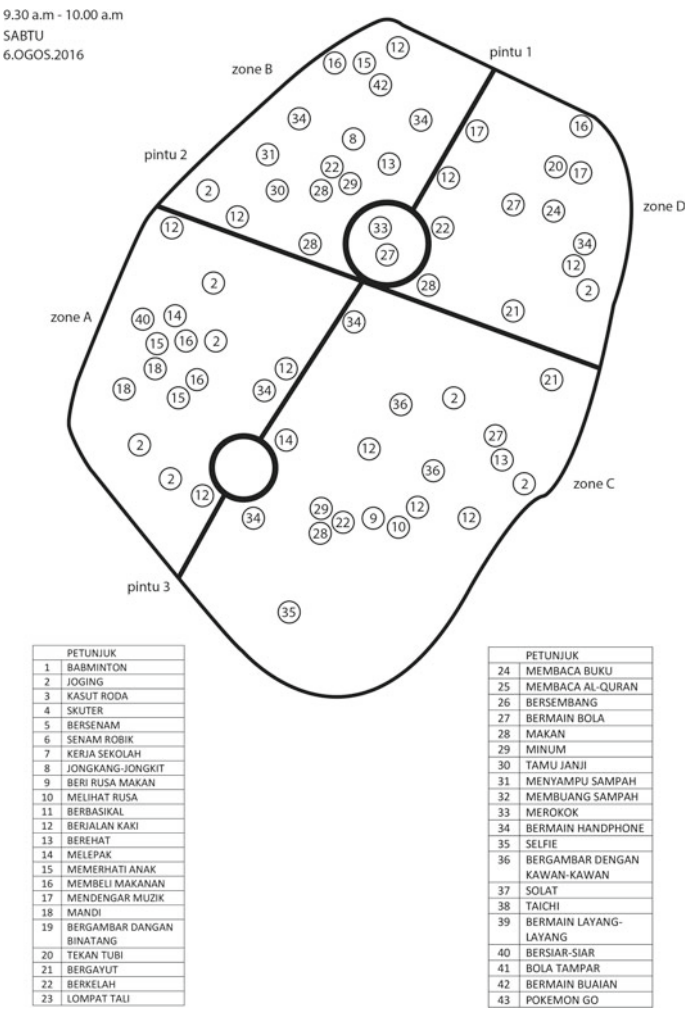
	Component			
	1	2	3	4
Playground	0.672			
Picnic area	0.836			
Parking area	0.740			
Multipurpose courts	0.670			
Landscape area	0.670			
Water themed-park		0.663		
Open space/yard		0.646		
Cycling tracks		0.674		
Jogging tracks		0.858		
Toilets/prayer room		0.635		
Bird park			0.888	
Deer park			0.790	
Outdoor fitness				0.820

the characters and *Gyms* are located. Only the players were able to see the virtual tour and the places they needed to reach. They did not wear sports attire (see Fig. 11.9). Based on the interviews, some players had never been in TPTA previously and they came on this occasion due to rumours that Pokémon characters had been spotted in the park. The first day therefore recorded an increased number of the visitors to TPTA, particularly those of a young age.

Pokémon GO players in TPTA were observed to be passive visitors that did not engage with the facilities provided at this park. The players were however physically active, as they did walk around TPTA but in their own virtual tour and purpose. The World Health Organisation (WHO) defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure (https://www.who.int/dietphysicalactivity/pa/en/). However, a question arises as to whether Pokémon GO leads to the energy expenditure of the players. The interviews were conducted and the answers from the players showed their opinions:

> It's about exploring the park. I am exercising.
>
> We only came once. Once all Pokémon characters were collected then we left.
>
> I never realized this park got many people coming
>
> We are sweating too…just like the others here.

Energy expenditure is the amount of energy or calories that a person requires to carry out a physical function such as breathing, circulating blood, digesting food, or physical movement (Scott 2016). Although the Pokémon GO players did not physically apply the equipment in TPTA or make use of the park's jogging track or bicycle track, they did walk and covered approximately half of the TPTA area. The observation was continued for seven days to measure the frequency of the players



	PETUNJUK
1	BABMINTON
2	JOGING
3	KASUT RODA
4	SKUTER
5	BERSENAM
6	SENAM ROBIK
7	KERJA SEKOLAH
8	JONGKANG-JONGKIT
9	BERI RUSA MAKAN
10	MELIHAT RUSA
11	BERBASIKAL
12	BERJALAN KAKI
13	BEREHAT
14	MELEPAK
15	MEMERHATI ANAK
16	MEMBELI MAKANAN
17	MENDENGAR MUZIK
18	MANDI
19	BERGAMBAR DANGAN BINATANG
20	TEKAN TUBI
21	BERGAYUT
22	BERKELAH
23	LOMPAT TALI

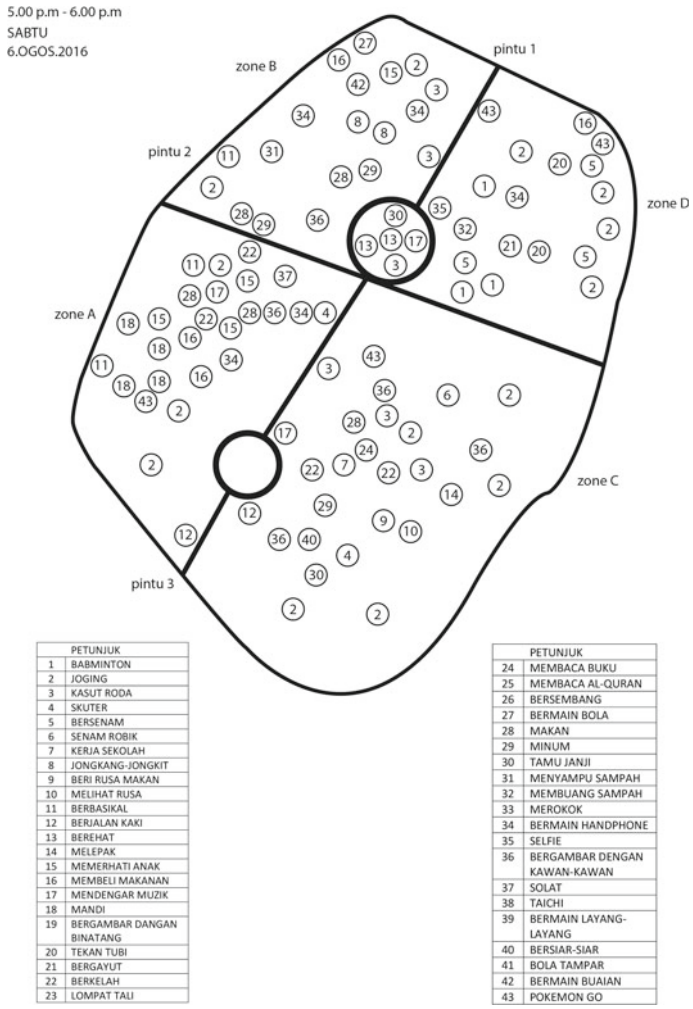
	PETUNJUK
24	MEMBACA BUKU
25	MEMBACA AL-QURAN
26	BERSEMBANG
27	BERMAIN BOLA
28	MAKAN
29	MINUM
30	TAMU JANJI
31	MENYAMPU SAMPAH
32	MEMBUANG SAMPAH
33	MEROKOK
34	BERMAIN HANDPHONE
35	SELFIE
36	BERGAMBAR DENGAN KAWAN-KAWAN
37	SOLAT
38	TAICHI
39	BERMAIN LAYANG-LAYANG
40	BERSIAR-SIAR
41	BOLA TAMPAR
42	BERMAIN BUAIAN
43	POKEMON GO

Fig. 11.7 Activities observation map in the morning

visiting TPTA. According to the results, the number of the Pokémon GO players has decreased.

Referring to Fig. 11.10, there was a drastic decline in the number of the Pokémon GO players in TPTA. There are several possible reasons for this result:

1. The players were affected by a local government statement that this game related to religion, safety, society and more. The state government argued that this game should be banned due to security reasons and because it is also harmful. On 17th of August 2016, the state government prohibited playing Pokémon GO on any government premises (Fig. 11.11).



	PETUNJUK
1	BABMINTON
2	JOGING
3	KASUT RODA
4	SKUTER
5	BERSENAM
6	SENAM ROBIK
7	KERJA SEKOLAH
8	JONGKANG-JONGKIT
9	BERI RUSA MAKAN
10	MELIHAT RUSA
11	BERBASIKAL
12	BERJALAN KAKI
13	BEREHAT
14	MELEPAK
15	MEMERHATI ANAK
16	MEMBELI MAKANAN
17	MENDENGAR MUZIK
18	MANDI
19	BERGAMBAR DANGAN BINATANG
20	TEKAN TUBI
21	BERGAYUT
22	BERKELAH
23	LOMPAT TALI

	PETUNJUK
24	MEMBACA BUKU
25	MEMBACA AL-QURAN
26	BERSEMBANG
27	BERMAIN BOLA
28	MAKAN
29	MINUM
30	TAMU JANJI
31	MENYAMPU SAMPAH
32	MEMBUANG SAMPAH
33	MEROKOK
34	BERMAIN HANDPHONE
35	SELFIE
36	BERGAMBAR DENGAN KAWAN-KAWAN
37	SOLAT
38	TAICHI
39	BERMAIN LAYANG-LAYANG
40	BERSIAR-SIAR
41	BOLA TAMPAR
42	BERMAIN BUAIAN
43	POKEMON GO

Fig. 11.8 Activities observation map at the afternoon

2. The game application allows the player (the catcher) to collect the characters spotted at a specific place in TPTA and to fight for a *Gym*. Consequently, once this has been completed players will go to another place and do not need to remain in TPTA.
3. As the observation was conducted for a week only, the declining numbers were also likely due to the number of players who are students and who therefore may visit TPTA only at the weekend.

Several sensitive issues arose concerning Pokémon GO when *PokéStops* were located at religious sites, government premises, military areas and numerous other

Fig. 11.9 Two Pokémon players without sports attire compared to a jogger with sports attire behind

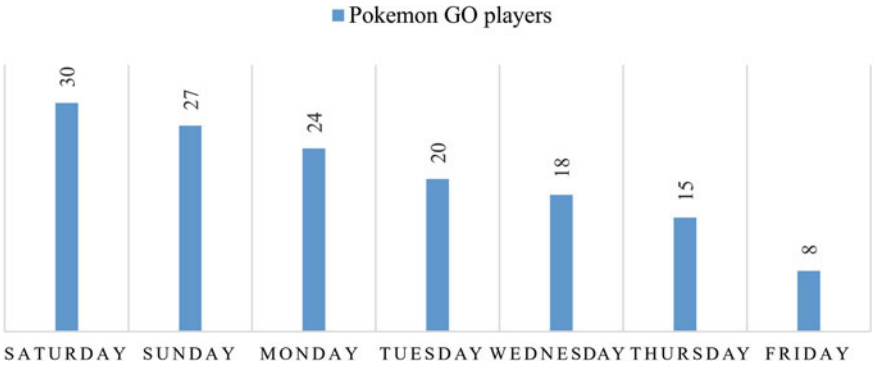


Fig. 11.10 The number of Pokémon GO players in TPTA over seven days

Fig. 11.11 An article titled "Pokémon Go! Kelantan State Government Banned Pokémon Go Online Game" (http://kelantannews.wordpress.com/2016)

private and inappropriate areas. Moreover, several accidents happened to players worldwide as they were hit by vehicles while walking and trying to capture Pokémon characters. The safety issue is incomparable in TPTA as the real locations included in the game and the movement of the players' virtual exploration were harmless to both Pokémon GO players and the common visitors of the park. However, the groups of catchers that gathered at the fountain, water park and the mosque became distractions from the view for the other TPTA visitors. For example, parents felt uncomfortable with strangers holding several smartphones focused at *PokéStops* such as at the water park area, while their children were enjoying a bath.

11.5 Discussion

The findings show the implications of Pokémon GO in TPTA from two perspectives. First, the players are most welcome to visit this public park and to increase the number of visitors and activities. Several of them were visiting for the first time and some were regular visitors. Secondly, common visitors and users of the park make use of the equipment and the facilities provided in this park during activities such as picnics, jogging, playing, exercising and feeding deer. Pokémon GO players or catchers however, do not use the equipment and the facilities the park provides as they have their own virtual tour and purpose. They seem to be engaged only with walking and looking at their smartphones and do not engage with the actual physical surroundings. Without an available measurement, players need to walk almost half of the park area to complete their virtual mission in Pokémon GO. Without preconceptions the game can also be described as a kind of physical activity. The awkwardness created by the Pokémon GO players is because they are moving but within their own virtual path and separate from the existing activities. In a positive view, smartphone users like these are now doing a physical activity in the public area and not simply sitting and concentrating on social media. Although they come to visit such places only once, they also will visit other places as well. Hence, it can be concluded that the Pokémon GO players in TPTA have no impact on the common activities taking place in the park. However, *PokéStops* and *Gyms* have repeatedly been placed at inappropriate locations for playing and loitering such as government buildings and religious buildings such as the mosque in this park. Respect for the beliefs of others and their places of religion affected the number of players when game locations were placed near religious buildings.

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Part III
The Pokémon GO Phenomenon in Educational Context

Chapter 12
A Theoretical-Practical Framework for the Educational Uses of Pokémon GO in Children and Adolescents

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Abstract The game, in its many facets, plays a key role in all stages of life, and especially in physical, social, emotional and intellectual development. Pokémon GO has managed to convert the environment that surrounds us into a space used by a video game, thanks to its combination of physical activity and augmented reality. But what does Pokémon GO involve within the educational system? In this chapter, we will address its impact on those players that were within the educational framework, as well as some practical proposals for its adaptation and use as a didactical tool.

12.1 Introduction

Nowadays, we live in a society in constant change and continued evolution, which requires us to use all our creative resources to transform and adapt the school of the 21st century to current needs. The current scientific literature reiterates the importance of including in the educational system a teaching methodology related to our society, which includes the use of technologies of information and communication (TIC), since the advantages offered are more attractive than those employed in a more traditional methodology (Sánchez et al. 2014). In addition, we must consider that children and adolescents of today are digital natives, that is, those generations of students who were born immersed in the digital language, such as smartphones, computers, or video games (Prensky 2011). Fortunately, in recent years, there has been a great change in the concept of innovation and its relevance in the field of education. In fact, educational innovation has broadened its perspective beyond the physical architecture of the spaces in which the teaching and learning process takes place, and reinforces the idea of creating new learning environments where pedagogical and psychosocial aspects are included (Davies et al. 2013). In this sense, and considering that educational innovation is subject to a permanent evolution, most researchers in the field agree that to create successful learning environments, teachers should take

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a step forward, leaving their comfort zones to the side and challenging themselves to generate innovation in the classroom. For this, the support of the administrations is very important, but, above all, we highlight the willingness on the part of the teachers to explore and experiment with these new teaching and learning spaces. In addition to this, recent research has indicated that a better development of students' abilities is, to a certain extent, related to these new learning environments, which support and improve the personal, social and academic achievements in young students (Davies et al. 2013).

This evolution in teacher praxis, along with new methodologies that can be developed within the educational system, guarantee the development of key skills through playful environments. For many years, the game has been considered as an element contrary to the teaching-learning process and separate from the dynamics that occurred within the classroom. In this sense, videogames have been labelled as distracting and harmful elements for users, when, in fact, their content has not been analysed, and consequently, certain benefits associated with them have been ignored, such as the development of problem-solving skills, logical thinking and decision making, among others. We should not forget that the school-age game is fundamental to making friends, overcoming fears, solving problems and, in general, taking charge of your life. They also use the game to practice and acquire the physical and intellectual skills that are fundamental to success in their society. What boys and girls learn of their own initiative, playing freely, cannot be taught in other ways.

Nowadays, we can emphasize some methodologies and tools that, when included in the educational frame, can produce a beneficial effect for the development of the process of education-learning. This is the case of Gamification: application of elements of a game in non-playful contexts (Deterding et al. 2011); Augmented Reality (AR): combination of physical and virtual worlds into one interface, replacing stationary play with active play by requiring users to explore their physical surroundings (Serino et al. 2016); or *Flipped Classroom*: to transfer part of the process of education and learning out of the classroom in order to use the classtime for the development of cognitive processes of major complexity (Bergmann and Sams 2012). This also includes *Learning Based on Projects*: utilization of realistic projects, based on a task or problem related directly to the context of the pupils, who develop competitions in a collaborative approach in search of solutions (Bell 2010); as well as the increasing trend of Escape Rooms: thematic games in which the players are enclosed in a room from which they must escape in a limited time (Wiemker et al. 2015); or the adaptation to the educational area known as Break Out: instead of escaping physically, they must open a box/boxes closed with different types of padlocks (Detwiler et al. 2018). Also, we can emphasize some tools that had been previously removed from education and that present a great potential if they are included in these spaces, such as mobile devices or "exergames": video games that need corporal movement for the game (LeBlanc and Chaput 2017), among others.

The game Pokémon GO (Fig. 12.1) takes part in a new age of immersed video games inside Augmented Reality Games (ARG), which are defined as a kind of "exergame" that requires participants to be physically active or to do exercise in order to play the game (Anderson et al. 2016; Clark and Clark 2016). Pokémon GO

Fig. 12.1 Game development *Source Ad hoc*

has been one of the major exponents of the expansion of the AR and gained significant fame in a very short time. From its launch in 2016, there have been more than 45 million users of this game. It is the first mass market app that is fully immersed into actual geographical space and that transcends the virtual, the spatial, the social and the physical (Clark and Clark 2016; Tateno et al. 2016). The aim is to catch and level up Pokémon and your avatar across various tasks and by visiting several physical locations using mobile GPS (Anderson et al. 2016). In this way, Pokémon GO allows young people to stay motivated by playing video games and, at the same time, to increase daily physical activity levels (Clark and Clark 2016; LeBlanc and Chaput 2017; Serino et al. 2016). Nowadays, we can find other applications on the market that also they work under this dynamic, such as *Zombies Run's*, or future scheduled launches, such as *Harry Potter: Wizards Unite*, or *The Walking Dead: Our World*.

On the other hand, we must emphasize that the game Pokémon GO may promote a social culture through visiting famous buildings, monuments and cultural places in the company of friends or playmates (Serino et al. 2016; Smith 2016). Nevertheless, there are not only social benefits; news articles also highlight potential social dangers to players by irresponsible gameplay (Sharma and Vassiliou 2016; Wagner-Greene et al. 2017). For example, this ARG may increase the risk of injuries due to walking distractedly, as well as abduction by strangers, spatial disorientation, addiction or social violence (McCartney 2016; Serino et al. 2016; Wagner-Greene et al. 2017). Furthermore, Ayers et al. (2016) and Barbieri et al. (2017) found that Pokémon GO is a hazardous distraction for drivers and pedestrians and may increase the risk of traffic accidents. A study showed that 33% of a random sample of 4000 Tweets indicated that a driver, passenger or pedestrian was distracted by Pokémon GO and that 80%

of Tweets indicated a person was simultaneously playing and driving (Ayers et al. 2016).

12.2 Pokémon GO and Its Relation to Physical Activity

One of the most significant aspects of the game Pokémon GO is that of avoiding sedentary behaviours, one of the principal problems which nowadays our company faces. Adolescents currently spend nearly 9 h per day in sedentary behaviours, mostly associated with the use of new technologies, such as watching television, using smartphones, using computers or playing videogames (Norris et al. 2016). The Global Monitoring Framework for Noncommunicable Diseases established a global objective of a 10% reduction of sedentarism by 2025 (WHO 2018). Physical fitness is defined as the capacity to perform physical activity and is composed of a set of physical components, such as cardiorespiratory fitness (capacity to carry out prolonged strenuous exercise), speed/agility (ability to move the body as fast as possible) and muscular strength (capacity to exert work against a resistance) (Ruiz et al. 2011). On the other hand, fatness refers to the weight status or level of body fat which can be measured in different ways, including body mass index, percentage of body fat and waist-hip index (Cadenas-Sánchez et al. 2017). Low levels of physical fitness in combination with fatness during adolescence have been associated with cardiovascular disease risk factors (Ruiz et al. 2014) and with a higher risk of reporting low life satisfaction and health risk behaviours, such as alcohol consumption or getting drunk occasionally (Grao-Cruces et al. 2014). Despite these factors, approximately 80% of adolescents do not reach the minimum recommended amount of 60 min of daily moderate to vigorous physical activity (WHO 2018).

If we focus on the literature that has investigated the effects of the game Pokémon GO, we might conclude that to allow young people to stay motivated by playing video games would increase daily physical activity levels (Clark and Clark 2016; LeBlanc and Chaput 2017; Serino et al. 2016), decrease sedentary behaviours (Nigg et al. 2016), enhance fitness and overall cardiometabolic health (Krittanawong et al. 2017; Sharma and Vassiliou 2016), prevent and treat many chronic diseases (Anderson et al. 2016) and decrease obesity (Smith 2016). As we can observe, there are numerous the studies that have investigated the effects of Pokémon GO and how it influences the physiological level its users. Taking into account that adolescence is a key stage in controlling physical fitness and fatness levels, there is an imperative need to find novel strategies aimed at motivating young people to go outside and move more. Also, adolescence is a key stage to consolidate healthy lifestyles and increase one's physical activity level.

12.3 Pokémon GO and Its Relation to Cognition

Physical activity not only presents benefits at a physiological level. The relationship of physical activity practice with improvements in cognition has been verified by cross-sectional (Cadenas-Sánchez et al. 2017; Laborde et al. 2016; Vanhelst et al. 2016) and longitudinal studies (Laborde et al. 2016; Stephan et al. 2014). Cognitive performance is the mental capacity affected by inhibitory control and executive functions, which are the factors responsible for the planning, intellectual organization and control the behaviour (Diamond 2013; Ruiz-Ariza et al. 2017). Memory, selective attention, concentration and numerical-linguistic reasoning skills appear among the most important variables in cognitive performance (Esteban-Cornejo et al. 2015; Ruiz-Ariza et al. 2017). One has thought that the young persons with high place cognitive performance have a high level of self-esteem and self-awareness (Fati-Ashtiani et al. 2007). When cognition interacts with emotional aspects, behaviour's answers appear to compose the emotional intelligence (Salovey and Mayer 1990). For some authors, emotional intelligence is a construction consisting of well-being, self-control, emotions and sociability (Petrides et al. 2016). A good level of emotional intelligence is associated with adaptive conduct and social skills (Frederickson et al. 2012), with qualities of leadership and with limited disruptive, aggressive and dependent behaviour in the school context (Mavroveli et al. 2009). Cognitive performance (Esteban-Cornejo et al. 2015; Ruiz-Ariza et al. 2017) and emotional intelligente (Petrides et al. 2016), are highly important for academic performance in school and work success in the future (Laidra et al. 2007). If we focus on a specific game like Pokémon GO and its impact to cognitive level, we can observe that this game helps to carry out family activities (De Oliveira-Roque 2016), increase socialization and outdoor activity (Serino et al. 2016), prevent depression and anxiety (McCartney 2016) and increase selective attention, concentration and sociability levels (Ruiz-Ariza et al. 2018). In this sense, Kato et al. (2016) and Tateno et al. (2016) have concluded that Pokémon GO may help youths with severe social withdrawal. In addition, during this period, there is a high degree of plasticity in the brains of young people, which is decisive in enhancing cognitive performance and emotional intelligence, improving academic performance, securing appropriate behaviours and fostering future social success (Esteban-Cornejo et al. 2015; Ruiz-Ariza et al. 2017).

A good way of summarizing these aspects would be by means of the study published by Ruiz-Ariza et al. (2018), by means of which they indicated that the players of Pokémon GO who played for 8 weeks significantly increased their selective attention (13.26%; $p = 0.003$), their levels of concentration (19.40%; $p < 0.001$) and their levels of sociability (9.87%; $p = 0.003$), in contrast to those who did not play the game (independent of age, sex, socioeconomic level, mother's education and the body mass index). In addition, it is also noteworthy that boys reached a level of game higher that the girls, concluding hereby that playing Pokémon GO, makes it possible to increase in a direct way the quantity of physical exercise as well as having a positive effect on cognitive performance and social relations. These authors also

reveal in this study that normally, the players play approximately 40 min a day and they do so accompanied by other players, feeling happier and motivated.

12.4 Augmented Reality as a Didactic Tool

AR might be an effective method for the creation of an environment in which the users interact. AR combines the worlds physically and virtually in a single interface, replacing the stationary reproduction with the active game, requiring the users to explore their physical environment (Serino et al. 2016). To increase the interaction presented by the technological tools in education, allowing funny learning, offering opportunities to increase motivation and making the learning process more motivating, active and effective. Some recent research has shown that augmented reality could also increase other educational development characteristics in young people, such as the quality of writing (Wang 2017), mathematical abilities (Sommerauer and Müller 2014) or learning a foreign language (Hsu 2017). Inside the AR, we can distinguish between two technologies: the geolocalization with recognition of royal images (as is the case in Pokémon GO's) and the stocks in scoreboards, like QR codes. Both are perfectly adaptable to the school area in general and especially to the classroom, as we observe in the following section.

12.5 Didactic Proposal

The new technologies are transforming the world in which we live and communicate. This in turn involves a change in our cognitive activity and in the form in that we learn. When the persons brain has been analysed without any experience in digital environments, it has been shown that his cerebral activation is similar to that shown when reading a book. People with experience in digital environments and searching of information across the Internet, activate a major quantity of cerebral regions as the prefrontal area, which is the responsible of executive functions (Small et al. 2009). In this case, and under the increasing demand and use of the new technologies, these can turn out to be useful and applicable, to allow new methods of education, in turn encouraging learning in a more dynamic way and offering a major range of opportunities.

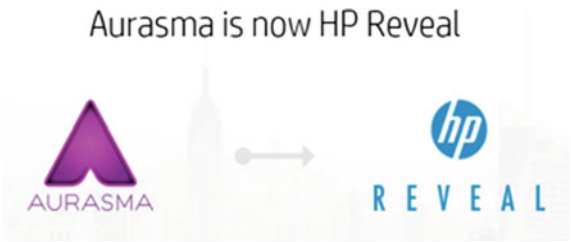

Fig. 12.2 HP reveal app (*Source* www.hpreveal.com)

Fig. 12.3 WallaMe app (*Source* http://walla.me)

12.5.1 Gymkhana by Means of AR in Physical Education Classes

A good way to work the curricular contents within Physical Education classes is through AR. The students could make groups to move around the educational centre, looking for the different places to perform the recommended physical actions. For example, the use of *HP Reveal* is an interesting option (Fig. 12.2).

12.5.2 The Hidden Message

Inside a space delimited in the centre, every pupil will take a photo during the activity, to check the challenge. In the aforementioned photo, they will add images or drawings in which he will share a history or message. In this way, students will create a wall of AR to see the creations in real time with their smartphones (Fig. 12.3).

12.5.3 Roald Dahl GO

This experience comes gathered in the personal page of the teacher Raúl Diego, (www.rauldiego.es/roald-dahl-go/). This activity was inspired by Pokémon GO. This

explains to the student body the disappearance of the prominent figures of the books of the popular novelist Roald Dahl. The students had to look for the books with their smartphones and "catcher them". In this way, the game was trying to also promote the habit of reading in the participants. It might adapt to different authors, books and ages (Fig. 12.4).

12.5.4 Creation of Escape Room or Educational Break Out

The possibility of working curricular elements by means of the game or even being able to evaluate them is highly attractive for the student body. These offers consist

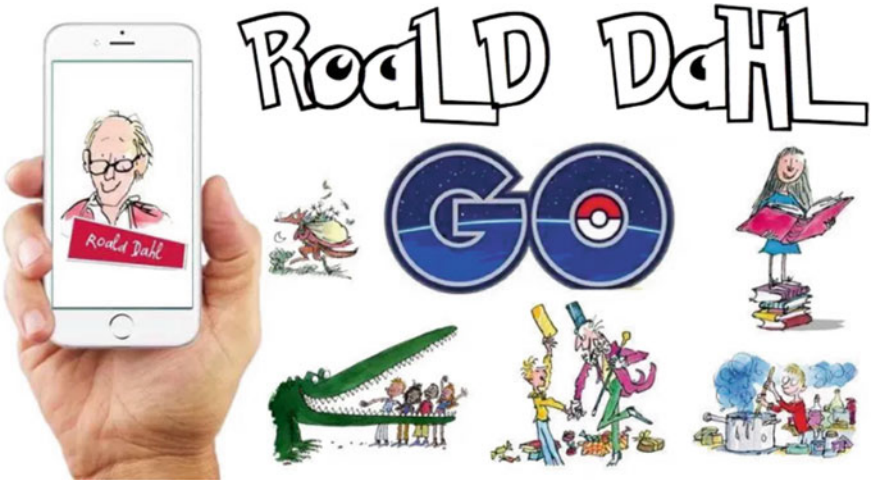

Fig. 12.4 Roald Dahl proposal (*Source* www.rauldiego.es/roald-dahl-go/)

Fig. 12.5 Padlock and digital unlock code (*Source* Own elaboration)

of the fact that the students must solve cruxes, tests, or challenges of a topic in order to learn playing. In the Escape Room, they must escape a physical room, whereas in Break Out, it is necessary to open boxes to discover what they hide. Even in Break Out, there might be digital padlocks that need QR codes or AR videos that explain how to continue in the development of the activity (Fig. 12.5).

12.6 Some Limitations of These Proposals

With regard to the limitations of these offers, it is necessary the implication and collaboration of the teachers, since it supposes to have control over the space where the activity takes place, which can be more restricted depending on the environment in which the educational centre is located. In addition, it is presupposed that the whole student body or most of it has a mobile phone, but there could some cases where this is not possible. A principal solution is that those who do not have a mobile phone could play with some companions, taking advantage of the socialization of those who are more excluded. Equally, as soon as we use AR inside the school context, it is necessary to mention that for the correct execution of a gymkhana with AR or creation of a Scape Room, it is necessary a previous preparation, and to prepare the material. Since the teachers are the principal persons in charge of introducing these innovative methods in order that the student body learns in a different way, the teachers need previous instruction about the use of technological didactic tools.

12.7 Conclusion

The incorporation of the AR or this modality of active video games and its adjustment to the educational area appears to be a great attraction for the student body and the teaching community. Its incorporation in the educational area will lead to a great revolution, since it allows us to transform the classroom, incorporating more original new spaces and motivating the acquisition of necessary competition in our current company, allowing a more integral development of the student body. The schools can be an ideal scene to offer to the children opportunities that might develop thanks to the AR, inciting enjoyment, promotion of health, social relations and, especially, educating in a person to use new technologies. We must be aware about the purpose of the education to students understand the world, and know their own talents, aimed to develop their competences and become active and critical citizens. To facilitate this, the game in its multiple facets plays a fundamental role in all the stages of life and, especially, in physical, social, emotional and intellectual development. The children use games to make friends, overcome fears, solve problems and, in general, to take the reins of their life. Also, they use games to practise and to acquire the physical and intellectual skills that are fundamental for success in their culture. What children learn on their own initiative, playing freely, is not possible to teach in other ways.

The insertion of AR into educational environments stirs up the relations between the curricular content, the practice of exercise, new technologies, social relations, etc. The stimulation and motivation that it generates allows new learning processes, offering much more satisfactory new experiences. This tool might be raised as a useful resource for educational centres, ideally to include in the classrooms, in physical education, playtime and even as complementary activities. In addition, these new strategies are ideal vehicles to reduce the high rates of sedentary lifestyles and to influence in a positive way a more healthy way of life, since it favours increasing the caloric expenditure and reducing the high levels of infantile and juvenile obesity, as we have observed in this chapter. Also, it facilitates increasing the cardiac frequency, to improve coordination and other physical attributes. It definitively facilitates improvement of the general physical condition of the users who have practised Pokémon GO in a specific way during a period of time, whether extended or brief. In terms of cognitive aspects, the development of this practice includes a very favourable tool to improve cognitive and academic performance of the players. Also, it is necessary to bear in mind the possible adverse effects as a consequence of the negligence of the users. To finish, due to the fact that these new tools suppose a great change in the company and, more concretely, in education, it is worthy of future research in educational centres.

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Chapter 13
Pokémon GO Between Incidental Learning and Frame Analysis: It's the End of the World as We Know It

Annamaria Cacchione

Abstract This chapter proposes a reading of Pokémon GO in terms of learning potentiality, trying to describe how learning can occur via the game and which methodological approach fits it better. After a brief literature review about unexpected benefits of the game, especially in terms of health, Schutz's idea of finite provinces of meaning is explored in order to understand how different layers of reality interact in an Augmented Reality-based game. This background analysis opens the way for investigating the process of restructuration that cognitive frames can undergo when players, for example, go to a PokéStop or to a Gym. Since these moments of knowledge creation are unpredictable, the Incidental Learning methodological approach is taken into consideration, along with Transformative and Ubiquitous Learning.

13.1 Introduction

This chapter offers an analysis of Pokémon GO in relation to the learning process: it aims to explore a popular game like Pokémon GO in search of Augmented Reality elements that can be exploited—inside and outside a game-like setting—for learning (Specht et al. 2011). Pokémon GO is therefore the occasion to reflect upon the learning/teaching potentialities that Augmented Reality-based games and similar environments can have.

Even if the moment of the biggest popularity of the game has passed, there is still a huge community of players, who keep on chasing Pokémons every day in familiar or new spaces. According to some observers, the game is currently even enjoying a new increase in popularity (Tassi 2018), probably due to the addition of raids, Community Days, and new Research quests to earn special prizes. However, whichever way you may look at it, the impact on the world of digital games has been so big that it is difficult to deny that Pokémon GO has made history.

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The disruptively of the game raised interest among researchers of several disciplines, because it has been clear, since the beginning, that Pokémon GO sets many things in motion, both literally and metaphorically: going physically in search of non-physical creatures can be positive for players' physical and mental health, while it can be a fun and interactive way to make children learn local geography. More in general, the invasion of our homes and neighbourhoods by those little coloured monsters has deeply changed the phenomenology of our daily life, teaching us a different way to perceive reality. Our work is directly connected to all those aspects and to the last one in particular, since it can show us the game components that have the higher didactical potentialities. The elements we will focus on are, in fact, those concerning the re-semanticization of reality, starting from two main processes: (a) the inclusion of temporary and virtual beings into the "normal" reality and (b) the incidentally of (a) as a moment of "re-assignation of meaning".

In the following sections, after a brief introduction of the game, we will make a cursory review of what has been written about Pokémon GO in terms of potential benefits (e.g. for physical and mental health) and possible cognitive restructuring of reality. This latter aspect—the most recent within the very recent history of Pokémon GO—represents the heuristic bridge bringing us to the initial reasoning: the phenomenological analysis of Pokémon GO and, in particular, the concept of "finite province of meaning" helps us in getting a better understanding of the functioning of framing (see below) and of how to build new knowledge by living in the Augmented Reality.

13.2 The Game and Its Unexpected Benefits

Pokémon GO game integrates Augmented Reality and geolocation, allowing users to interact with Pokémon characters appearing on the game map, that is an anime-style version of Google replacing real street and landmarks with specific buildings such as Gyms and PokéStops—real life locations where users can battle Pokémon rival teams or collect PokéBalls to catch Pokémons. While Augmented Reality is not new per se, new is the way it has become popular: Pokémon GO has brought Augmented Reality to a brand new audience, composed of people who would not have had access to it otherwise. Pokémon GO has become the go-to success story for everyone in the Augmented Reality space and, even if today numbers are not those of two years ago, it is still very appealing for millions of people around the world—it never dropped out of the daily top 100 downloaded apps in both the iOS and the Google Play Store, according to app analytics company App Annie (Barrett 2018).

The research idea is that the enrichment of (real) reality given by the presence of virtual objects embedded in it enriches, in turn, the frames our knowledge is organized into, by modifying them. This kind of cognitive increase happens mostly incidentally, representing the fortuitous outcome of the physical or virtual pathways the game can stimulate. Cognitive re-framing and incidental learning are therefore the two main focuses of this work.

13.2.1 Physical and Mental Health

One of the first and most cited work about Pokémon GO health benefits is that by Bonus et al. (2018). According to this study, several different types of positive effects could be generated by playing an Augmented Reality game such as Pokémon GO, ranging from friendship intensification to walking (Chamary 2018; Howe et al. 2018; Marquet et al. 2018). Many on and offline media summarized those findings in titles like "Pokémon GO people are happy people" (Barncard 2017), meaning that Pokémon GO users result more likely to be positive, friendly and physically active. On-field experimentations have also been conducted, such as the study by Lindqvist et al. (2018), a qualitative analysis of 8 families comprising 13 children and 9 parents in Sweden. The analysis identified enjoyable exploration, cooperation and competition among the main positive effects generated by the game.

According to other studies, Pokémon GO positive effects on physical activity are short-lived: the association between the game and the increase in the daily number of steps tends to disappear after six weeks. The short-term effect of the game—not only in terms of health improvement, but, in general, in terms of engagement and playing—is observed by several studies. Focus groups with children and parents involved in the already mentioned study by Lindqvist et al. (2018) highlight that, in order to keep interest strong, it is important that new things happen in the game. For example, during holidays—for instance, on Halloween—more experience points (XP) and candies can be earned by searching for rare new Pokémon or participating in special events planned.

Studies presented in May 2018 at the Annual Meeting of the American Psychiatric Association have been focused on the game effects on teens and young adults, age groups historically difficult to engage in behavioural treatments for depression and anxiety disorders. After several experimentations, relevant percentages reported an improved sense of well-being and, besides, weight loss. Study participants with a history of mental health treatment spent more time playing than those without previous mental health treatment. The authors concluded that playing Pokémon GO was associated with increases in physical activity and social behavior and an improved sense of well-being, highlighting its potential as a behavioral activation and exposure tool for mental health treatment.

13.2.2 Kids Learning Geography

Fewer but interesting studies about the possible positive impacts on kids, in terms of extra knowledge, lead us closer to our core topics. For instance, National Geographic online focuses on the use of Pokémon GO for learning geography and spatial dimensions by kids (NG online 2018). Since Pokémon GO goodies are often placed at significant landmarks, this opportunity can be used to study iconic spots in the area we live in. The aim to reach those landmarks can be in turn exploited within a

wider learning task, including the drawing of a map in order to prepare for the search. Furthermore, the game can be useful to learn the metric system: in order to hatch, Pokémon GO eggs need to be incubated until the player walks a certain distance (in kilometres).

13.2.3 Reality Restructured: Phenomenology of Pokémon GO

In a very recent and enlightening paper, Liberati (2018, see also this book) proposes a phenomenological analysis of the game, based on Husserl and Schutz's theory:

> This kind of co-existence among realities is well analysed by Schutz's phenomenology which identifies a paramount reality where people usually live in their everyday lives and different finite provinces of meaning […] generated by dreams, arts, literature, and games […]. In these worlds, there are fictional objects which are experienced by players or dreamers, but which do not have any relevance outside of the limited world generated by the special activity, (p. 219).

A finite province of meaning is a zone that can be more or less real but is always social. Within the boundaries of a finite province of meaning, specific rules of behaviour are established and, more importantly, specific meaning structures are accepted as "normal".

When I enter Pokémon GO through the app, the world around gets hybridized and I accept to interact with objects and creatures that only I and other players can see. We can also say that two finite provinces of meaning—the first of the game and the second of reality—overlap: I, as a Pokémon GO player, temporarily live at the intersection between them, a territory generated by the app and projected on a section of real context that has me as the centre of an ideal perimeter of few kilometres.

Within this new finite province of meaning, two kinds of things happen: (1) we encounter Pokémons, who "live" in the physical spaces around us; we have to catch and train them so (2) we can make them fight against other Pokémons at the gyms, that are totally virtual spaces located, like the PokéStops, in correspondence of actual places of interest, such as crossroads or monuments.

The spatial dimension is absolutely central in Pokémon GO: everything happens within an hybrid space. This hybrid space generates, in itself, the development of a game that is quite time-insensitive—the eggs hatch only if the player walks for a set distance; in order to get PokéBalls you have to reach a PokéStop that opens up and releases them only when you enter its scope (about 100 m—see Fig. 13.1) and so it happens for the gym; the Pokémons themselves do appear and disappear depending on where we are (and these are the reasons of the physical and mental advantages above described).

In order to understand where and how learning occurs in Pokémon GO, we can follow what happens during two key moments of the game: the catch of a Pokémon and the PokéBalls refill.

When you open the app in Augmented Reality modality, there is quite always at least one Pokémon in the space where we are (usually in front of us). Once caught (by

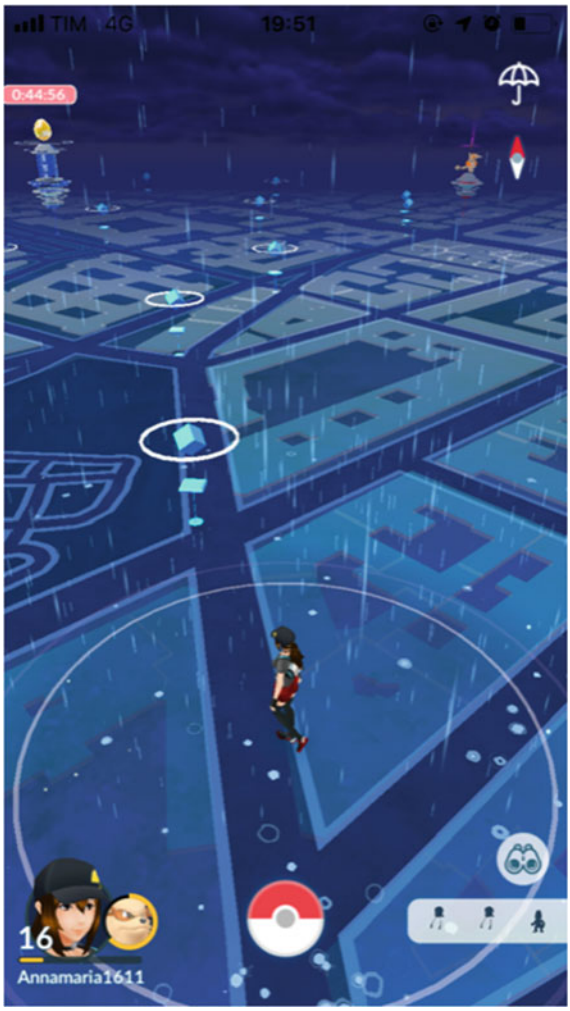

Fig. 13.1 The scope of Annamaria's avatar in the game (Nov 2018)

hitting it with the PokéBall), it is stored in the Pokédex and we can make it get more power or evolve. We can read its file to know its features (ability, power etc.) and we can ask our trainer for a technical evaluation—a very stereotypical reply, quite always telling us the Pokémon is super-equipped. This is not particularly interesting, because what we can learn from it concerns our Pokémon only—nothing that can be useful within another finite province of meaning apart from discussing with other Pokémon GO players.

The case of PokéStops and gyms is different, as already pointed out by other researches, because they compel the player to notice things he/she would have never seen otherwise—this is what we mean by saying that the frame gets enriched, generating new knowledge.

13.3 Frame Analysis

The idea of frames as data-structure for organizing knowledge—basically stereotypical events or situations—has been introduced by Minsky (1975). We can recall it through the famous example of the birthday party, hereby described in Jonassen et al. (1993, p. 125):

> Each frame has certain information attached to it, which presents expectations for what will happen next, the location of certain items, and so on. For example, one might have a frame about a child's birthday party. When one thinks about a child's birthday party, the appropriate frame is accessed, and certain information will be brought forward. One may expect that at this type of party there will be gifts for the birthday child, a cake with candles, and perhaps party games or some form of entertainment. For each frame there will be categories of information, referred to as slots, which must be filled with specific information for each instance of the frame. Taking the example of the birthday party, there may be a cake slot, which would be filled with information about the type of cake served at a given party. There may also be a games slot, to be filled with information about the types of games played at that party.

Minsky's frame theory, meant to explain how the mind works to organize information into knowledge systems, has been further developed for modelling cognitive architecture in Artificial Intelligence (see Kotseruba et al. 2016 for an overall review). This work elaborates on this notion by describing how a set of data connected by a semantic relationship is usually activated by a single lexical element the frame is attached to. Frames can be more or less culturally and "experientially" determined. Those modified by Pokémon GO are of the latter type, i.e. defined by personal experience: I am looking for PokéStops in order to get some PokéBalls and the nearest PokéStop is in a place I often pass by but that I never really observed. The PokéStop forces me to realize the presence of a mural or a statue that I never noticed before and, from then on, my mental image of that place (my frame of it) changes, by enriching with a new element that could possibly become its main feature. That street becomes "the street where there is the mural" (see Fig. 13.2).

According to Minsky's theory, frames are complex structures containing other structures, and are organized around typical observations and procedures. Some aspects of the frame are fixed, but others contain terminals, i.e. slots, that are initially filled with "default" assignments containing information which is supposed until new information displaces it (Thagard 1984). This is similar to what we have described: the retrieved frame of the street or the crossroad—that is a quite standard sub-specification of the overall frame of "street"—fails to fit the reality once we realize there is an important extra element. A new frame is therefore elicited (by means of an interframe procedure) or, in alternative, we can say that the old version of the frame changes by including a new element.

This re-framing process is what we assimilate to the creation of new knowledge, i.e. learning: differently from memorization of notions that are stored somewhere and can easily be forgotten, real learning deeply integrates new elements in pre-existing cognitive structures, resulting in re-shaped schemas (frames) where new and old elements are not separable anymore.

Fig. 13.2 Annamaria's avatar getting closer to a PokéStop (on the left) in correspondence of a statue (Madonnina del Divino Amore) in via Salaria, Rome (on the right)

This approach is very similar to Transformative Learning, introduced by Mezirow (1978). Not casually, the key word for transformative learning is "frame of reference". Frames of reference describe how we perceive the world including habits of mind (e.g. habitual ways of thinking) as well as opinions and values (Mezirow 2000; Slavich and Zimbardo 2012). Meaning structures (perspectives and schemes) are a major component of the theory. A meaning scheme is "the constellation of concept, belief, judgment, and feelings which shapes a particular interpretation" (Mezirow 1994, p. 223). Even if they are on a higher level of abstraction, they can be compared with the frames above described, since they have the same function of identifying what has to be transformed for the learning process to occur. Transformation is a process whereby we move over time to reformulate our structures for making meaning, usually through reconstructing dominant narratives or stories—for example, through our personal Pokémon GO story.

13.4 Incidental Learning

Even if there are situations where the probability of learning is higher, actual learning in Pokémon GO is not predictable, depending on several contingent factors, such as the attractiveness of the content, the actual pre-existence of a mental image or frame to modify, and, above all, personal motivation.

All these aspects have to be considered within a general framework of Situated (Lave and Wenger 1991) and, above all, Ubiquitous Learning. Ubiquitous Learning is based on ubiquitous (mobile) technology and provides a ubiquitous learning environment, which enables anyone to learn at anyplace at any time. It includes real-life experiences augmented with virtual information, and is adapted to the learner and to the learner's environment. Ubiquitous Learning is Incidental, i.e. a form of indirect, additional, unplanned learning—e.g. the main way we develop vocabulary and learn about language.

Even if Incidental Learning is not intentional in its actual realization, for it to take place there must be a sort of pre-disposition for learning in the user/player/learner. Furthermore, the environment the potential learner moves in has to be suitable, i.e. rich of interesting cues, and has to have a dimension of sociality, in order to promote a kind of learning that is intrinsically social. Ubiquitous Learning, collaboration among users in the learning perspective, the occurrence and the exploitation of particularly meaningful moments called "a-ha moments" (Cacchione 2014) have been already explored within a series of studies about a mobile app, called LingoBee, developed to support language learning through lexical growth (Procter-Legg et al. 2014). Analyzing LingoBee allowed to identify key aspects of Incidental Learning, and to define an evaluation framework firstly applied to the mentioned app (Cacchione et al. 2015) and then to Pokémon GO (Cacchione et al. 2017).

The framework is composed of a set of indicators of different nature—neuroscientific, technological, organizational and pedagogical—and aims to provide a comprehensive account of what plays a major role in ensuring effective learning via mobile devices.

When the user enters a new site, new contents pop up from reality surrounding him/her—that's just what Augmented Reality do, enriching the real-life experience by new objects popping up from where we turn our attention to. Therefore, we can affirm that Pokémon GO is strongly situated. Successful Situated Learning is promoted by novelty, intensity and movement. The framework-based analysis demonstrates that all these three conditions are satisfied in Pokémon GO: the game is (still) new, and our brain loves novelty—the same dopaminergic reward pathway that's accessed when we talk about ourselves is also activated when we experience new things. Intensity is given by the environment structure and by its "furnishing". Pokémon GO offers plenty of interesting stimuli such as PokéStops and gyms, besides, of course, Pokémon themselves, while the environment is colorful and well designed so to offer an intense and entertaining experience (yet, intensity is difficult to assess, as it is more linked to subjective perception; see Cacchione et al. 2017, p. 30 for more

details). Finally, as already described in the first sections, movement is constitutive of Pokémon GO, in order to take the game forward.

All the three key elements constitutive of Situated and Incidental Learning are therefore included in Pokémon GO. They are directly linked to emotion generation as well, and emotions are, in turn, deeply connected to good learning, where good means deep, meaningful and long-lasting. The emotional impact is activated by personalization of the game, the rewarding system, competitions, collaboration and its storytelling potential. According to some observers, this latter element is absolutely key, and could strongly contribute to justify the actual achievement of intensity. That is what Rizzotto (2018) says about the game in terms of storytelling potential:

> Pokémon masterfully hijacks your imagination by giving you just enough features for your brain to immerse itself into a fictional world— making it the most successful Augmented Reality storytelling platform in the market today. Immersive Narratives are distinct from any other form of narrative. […] Immersive narratives remove that distance completely, encompass your reality and allow you to be the lead of the story. The boundary between your physical actions and the digital experience blur, and the end result is not something you watch or something you play, but something you live through.

Nedelcheva (2016) concludes her analysis of transmedia storytelling in Pokémon GO:

> Pokémon GO went far beyond gaming – it created an entertainment experience that reshaped the general perception of technology, gameplay and social interactions. Using carefully elaborated transmedia storytelling and focusing on the human component, Pokémon GO made history in the future of social interactions, enhanced by technology, (p. 3750).

13.5 Conclusions

This chapter has been focused on the analysis of the most interesting aspects of Pokémon GO within the didactical perspective, i.e. related to the game potentialities for learning. Pokémon GO has been chosen, as already said in this work and in other parts of this volume, both for being Augmented Reality -based and its success and popularity.

Some clarifications are still needed, now that we are about to come to the conclusions. When we talk about the didactical perspective of the game, we intend to consider the two processes of learning and teaching together. Anyway, within an implicitly constructivist approach, the learner and the learning process play the key roles, while teaching is relevant because it can promote and orientate learning, both in formal and in non-formal/informal contexts, by selecting the best resources, by preparing the setting and supporting learners' choices. We are, however, talking about a game created without educational purposes. The analysis of its didactical components is an implicit acknowledgment of its unexpected educational value, but it remains, first of all, a game, made to entertain and make people have fun. On the other hand, as we pointed out above, fun is a key factor of learning success, so we can return to the beginning of our reasoning.

A further clarification has to be made about the Augmented Reality: Pokémon GO's success, even among researchers, is due to the adoption of Augmented Reality to create a new and appealing game environment, where millions of people could directly experiment Augmented Reality at no cost. This is the exceptionality and the exemplary status of Pokémon GO: a deep integration of Augmented Reality with innovative use of geo-located content and colorful characters. In so doing, Pokémon GO also opened the way for other apps to adopt Augmented Reality. The considerations made so far are therefore valid for every solution—educational and/or playful or of other types—presenting the same key elements and advantages.

In order to analyse the aspects of Pokémon GO that could promote learning, we started from a cursory review of literature about Pokémon GO benefits (see also other contributions in this volume). We furthermore mentioned a note from the National Geographic about the potential use of Pokémon GO to teach kids local geography. This interesting hint has got us closer to our goal. We then examined more closely a new kind of study about the phenomenology of Pokémon GO (see the contribution of Liberati in this book) because it helped us in understanding the architecture of reality when, as in Augmented Reality, it is different and more complex than the one we are used to live in. Understanding the different layers of reality in terms of "finite provinces of meaning", as Liberati (2018) suggests by elaborating on Husserl and Shutz's theory, allows us to identify the different contexts the multiple, hybrid reality created by Augmented Reality puts us in, so that we can understand its functioning, even in the learning perspective. In Shutz terms (1979), we access Pokémon GO province of meaning with a precise jump (opening the app), and, once inside, we make a precise 'epochè' about the existence of other realities (we do not question the reality of Pokemons in our room). In playing and interacting with Pokémon GO objects and creatures, the Pokémon GO province of meaning allows us to make a precise form of experience of ourselves, in this case as inhabitants of an "intersectional world". Our identity, as a consequence, depends on being inside and outside the specific finite province of meaning considered. It is not sure if the province overlapping produced by the game—where Pokémon GO co-exist with humans—could be acceptable in the Shutz theory, that postulated provinces could not interfere each other, but, probably, this point has to be interpreted more in terms of non-reducibility, i.e. they cannot be translated one into the other, and that is true in Pokémon GO. Anyway, Shutz did not have access to Pokémon GO and Augmented Reality. Other researchers, on the other hand, reflected on social media as finite provinces of meaning, like Tagliani (2015) with Facebook.

We subsequently came to the core of this work, by describing the learning process promoted by the game in terms of frame analysis. The definition by Minsky (1975) has been elaborated in order to account for the changes occurring in standard cognitive frames of daily objects (crossroads, monuments) when Pokémon GO objects intrude on them. The typical situation is when we are at a PokéStop, located in a very familiar place, and we suddenly realize—because the app indicates to us—that there is something—a low relief, for example—we never noticed. From that moment on, the place becomes "the place of the low relief", thus reshaping completely its identity:

Pokémon GO has the power to re-structure the frames we have in mind by adding meaningful details that can result in marking them out.

Then, we tried to identify a consistent methodological framework for the kind of learning promoted by Pokémon GO. Transformative Learning, introduced by Mezirow (1978), is based on the transformation of "frames of reference" induced by moments of crisis, when prior beliefs are "shaken" and possibly modified—if not destroyed (Mezirow 2003). Even if Transformative Learning is described in terms of higher-level reasoning process while re-framing concerns simpler mental schema restructuration, the similarity between the two processes is quite strong.

The identification of learning induced by Pokémon GO with Incidental Learning, on the other hand, does not present difficulties. Incidental learning refers to any learning that is unplanned or unintended, occurring when engaging in a task or activity, just as chasing Pokémons. The unintentionality of Incidental Learning does not exclude post-learning intentional reflection, even if there is no agreement among scholars on that point (Kelly 2012). Incidental Learning has been taken into consideration in special connection with the 2.0 world, since, in today's life, a lot of time is spent on surfing the Web, especially via mobile devices (Wang 2014). But what interests more for our purposes is not only that the form of learning promoted by Pokémon GO is Incidental (besides being Transformative), but also that Pokémon GO and similar environments appear to be the ideal place to learn incidentally. By a not-so-strange-coincidence, one of the scholar who early reflected on the value and potentialities of Incidental Learning, especially in relation to technology, has been Schank. Schank and Cleary (1995) put forward a theoretical model which gives Incidental Learning a clearly defined place in the learning process. While students are doing a gaming activity which contain hidden information they learn 'by the way'. Schank is currently engaged in promoting a different type of education, based on the motto that "learning occurs when someone wants to learn, not when someone wants to teach", thus highlighting the centrality of learning and the centrality of motivation for learning—motivation is key in Incidental Learning. In addition, Schank was also the author of one of the earliest elaborations of Minsky's theories (Schank and Abelson 1977) about knowledge structures, frames, scripts and plots: so to say, everything seems to hold together.

In conclusion, in this contribution we analysed how Pokémon GO learning potentiality works and which forms it takes. It has emerged that the acquisition of new knowledge through the game can be assimilated to a process of re-framing, intending frames as cognitive schemas. We also observed how the enrichment of pre-existing frames could be properly integrated into a wider methodological approach, characterized not only as Incidental Learning, but also as Transformative, Situated and Ubiquitous Learning.

Basically, considering Pokémon GO as a learning-promoting environment allows us to see how Pokémon GO is actually the centre of a constellation of innovative processes, both from the technological perspective and from the technological and educational one: it has been and still is a game-changer in all respects.

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Chapter 14
Augmented Education: Location-Based Games for Real-World Teaching and Learning Sessions

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Abstract GPS-equipped smartphones have enabled the construction of location-based games. In augmented reality (AR), fantasy worlds are mapped to real-world settings. Two location-based AR games that use historical markers as points of interest are Ingress and Pokémon GO. This chapter describes and discusses how PokéStop statues in Pokémon GO can be used in primary school outdoor sessions. A case study was conducted on how fifth-grade students learned about local history, social sciences and humanities during game sessions. Findings suggest that AR could be an inspiring extension in educational settings, if activities are aligned to the surroundings and learning objectives and outdoor gaming activities are followed up in more traditional classroom sessions.

14.1 Introduction

The new generation of GPS-equipped smartphones have opened up new ways of outdoor gaming in which engaging fantasy worlds can be combined with real-world settings. Computer gaming has traditionally been associated with a sedentary lifestyle (Telama et al. 2005), but emerging trends such as location-based games and augmented reality are extending the boundaries. Location-based games are often designed with the idea of mapping real-world settings to parallel virtual gaming worlds, where a majority of the interplay occurs at so-called points of interest (POIs). The navigation between the game's POIs often involves the use of maps that can be physical maps or digital built-in maps (Nadarajah et al. 2016).

A broad definition of augmented reality (AR) is a system that combines real-world objects with virtual objects or superimposed information (Bacca et al. 2014). In the system, virtual objects appear to coexist with real-world objects, and both can be mixed in games or simulations (Azuma et al. 2001). The most well-known location-based game that uses POIs in an AR mix is Pokémon GO, a game that gained worldwide popularity in the summer of 2016. One week after the game's

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release in June 2016, Pokémon GO became the most-downloaded mobile game in history (Mozelius et al. 2017).

According to Bacca et al. (2014), educational AR systems have mostly been applied in higher education and compulsory levels of education to increase students' motivation. A compulsory level where several studies have reported interesting results is from middle school students (Di Serio et al. 2013; Dunleavy et al. 2009; Kamarainen et al. 2013). This study focussed on primary school students' use of an AR game when fifth-grade students played Pokémon GO to learn more about local history during a social science session. The aim of the study was to explore how educational outdoor activities might be augmented by the use of a location-based game with statues and buildings as POIs.

14.2 Extended Background

Mobile game-based learning (mGBL), location-based games (LBG) and augmented reality (AR) have all been hyped research fields during the last decade. In research studies, they have mostly been discussed separately. In this chapter, these concepts are combined with the concept of augmented learning to create new conditions for teaching and learning outside the classroom.

14.2.1 Mobile Game-Based Learning

The game-based learning (GBL) concept has been implemented and evaluated with promising results in a broad range of educational settings (Tobias et al. 2014; Vogel et al. 2006). In the role of an experimental didactic concept, GBL has become a mainstream approach in education. One reason for the wide adoption of GBL is the fact that games create flow and intrinsic motivation (Paras and Bizzocchi 2005; Voiskounsky et al. 2004). Furthermore, gaming does not necessarily involve sitting on a chair in front of a computer screen anymore. One obvious trend is the use of LBGs, including augmented reality gaming, in outdoor activities (Freitas 2006; Kapoun 2016). Another recent trend is to combine GBL with the idea of a 'flipped classroom' with gaming as pre- and post-sessions as opposed to traditional face-to face sessions (Hung 2018; Klein 2017).

New mobile technologies have rapidly developed in the 21st century, and according to UNESCO, there are currently (2018) more than 1.75 billion smartphone users in the world, which is opening up a new global framework for living, working, playing and learning (Yu et al. 2018). As highlighted by Lilly and Warnes (2009), mGBL fits into the zeitgeist of 21st-century learning by engaging with the ubiquitous mobile technologies that can be used in a wide variety of learning contexts. If technology is aligned with pedagogy and adapted to age groups, mGBL has the potential to foster autonomous and self-directed learners (Crompton et al. 2018).

14.2.2 Location-Based Games

Global Positioning System (GPS) technology was classified as rocket science three decades ago, but today it is a feature in most mobile phones. This new location-aware technology is creating new types of practices and applications (de Souza e Silva and Frith 2010; Manovich 2006; Weiser et al. 2016), with LBGs as a fascinating and rapidly expanding branch of GBL (DaCosta and Seok 2017; Ejsing-Duun 2011). These games are often built around the idea of mapping real-world actions to a parallel virtual game world, with interplay at special POIs.

Physical or digital maps (Nadarajah et al. 2016) often guide players' navigation between POIs. LGB is a game category that includes both exergames and augmented reality games, such as the exergame Zombie Run (Laine and Sedano 2015), and more dedicated educational games, such as Frequency 1550 (Huizenga et al. 2009).

The most well-known LBG today is Pokémon GO, a game that has been classified both as an exergame (Althoff et al. 2016; Wong 2017), and an augmented reality game (Serino et al. 2016). Pokémon GO is designed with a mix of realistic real-world maps and a fantasy world with Pokémon monsters from a Japanese card collection game. The use of man-made objects, such as public art, in Pokémon GO is inherited from the older LBG Ingress, where players captured their 'portals' at places of cultural significance. The use of artefacts in the Ingress gameplay has been called 'augmented regionalism' (Chess 2014), and both Ingress and Pokémon GO are seen as 'augmented reality games' (Serino et al. 2016).

14.2.3 Augmented Reality

Through combining virtual worlds and real-world settings to form an AR world, an enhanced augmented reality can be created (Bronack 2011; Klopfer and Squire 2008). This is a concept with pedagogical as well as technological implications (Klopfer and Squire 2008), as students and teachers are connecting with content and with one another in novel ways, with new educational affordances (Bronack 2011). Several research studies on AR have pointed out the concept's usefulness for increasing student motivation in educational settings (Bujak et al. 2013; Chang et al. 2010; Di Serio et al. 2013; Jara et al. 2011; Liu and Chu 2010).

In a wide variety of research studies, the term 'augmented reality' has been given various meanings that not always are consistent. Milgram et al. (1995) present and compare the 'restricted AR approach' with the 'broader AR approach'. The restricted approach is technology based on and described as "*a form of virtual reality where the participant's head-mounted display is transparent, allowing a clear view of the real-world*". Compare this definition with the broader approach, defined as "*augmenting natural feedback to the operator with simulated cues*" (Milgram et al. 1995). This chapter discusses AR's broader definition as a concept beyond technology that can be orchestrated in various ways and with various technologies, as suggested by Klopfer and Squire (2008).

14.2.4 Augmented Learning

For decades, research has pointed out the benefits of computer-augmented learning in STEM subjects (Chan et al. 2013; Iacucci and Wagner 2003; MacGregor et al.1988). Later, the concept of augmented learning spread to a wide range of subjects (Alhaija et al. 2017; Han et al. 2017) and often involves game-based learning and mobile outdoor activities (Brom et al. 2010; Dunleavy and Dede 2014). As discussed by Klopfer (2008), IT and mobile phones can, in an educational setting, be seen as both problems and solutions to augment traditional education. Klopfer argues that augmented mobile games have the potential to connect game play, real world and schools. Further, he claims that such games should embrace opportunities to play close to reality, amplify authenticity, create communities of practice, incorporate locations, bend time, tie games to content, promote diverse forms of communication and create deep casual experiences.

In primary and secondary school settings, Pokémon GO has been frequently used to augment learning (Pellas et al. 2018; Remmer et al. 2017). Augmented learning seems to have a potential to engage students and facilitate collaborative and experiential inquiry in and outside of classroom sessions (Dunleavy and Dede 2014; Martín-Gutiérrez et al. 2015), but it is necessary to scaffold and integrate the augmented reality-based applications as part of a well-designed educational setting based on opportunities for interplay (Kularbphettong et al. 2018; Lin 2017). Contemporary research has no algorithm for successful augmented learning, but there is a potential for creating promising learning conditions if activities are carefully designed and orchestrated.

14.3 Method

The research strategy was a case study approach encompassing a combination of indoor and outdoor teaching and learning sessions. Participants in these sessions were students (11 years old) and teachers from a fifth-grade class and researchers from Mid Sweden University. A case study is an exploration of a real-world phenomenon (Yin 2008); the phenomena in this study were the sessions and the interplay of participants analysed in-depth using a combination of data gathering methods (Creswell 2009). In this study, data was gathered through a mix of document analysis, interviews, video recordings and observations. The sessions were video recorded with a handheld video camera and so-called spy glasses (Jaldemark et al., in press).

For this study, the primary school teachers were instructed to design a lesson in social science in which the students would play Pokémon GO outdoors. Each student group had one or two smartphones to share. The purpose of having fewer smartphones than students was to stimulate collaboration and discussion. Students and teachers wore spy glasses to try to capture these sessions from their own actual perspectives. There was also a researcher recording the sessions with a handheld

video camera to get a more complete picture of the multiple perspectives. The video material, the observations and the lesson plans enable a rich description of what students and teachers actually did while they played Pokémon GO.

Data has been analysed thematically in an inductive way to find themes and categories that might meet the research aim. The most important themes found to answer how an orchestration of educational outdoor activities might be augmented by the use of a location-based game and chosen POIs are presented and discussed in the next section.

14.4 Ingress and Pokémon GO

To understand Pokémon GO better, a short introduction to its background might be helpful. The company behind Pokémon GO, Niantic Inc., begun as a start-up within Google and spun off as a private company in 2015. Their first product was *Field Trip,* a virtual tour guide released in 2012, combining Google Maps with POIs ranging from historical facts and architecture to restaurants and nearby offers and discounts. Niantic's first LBG, *Ingress,* was released later in 2012 (Niantic Inc. 2018a). Ingress is a location-based AR mobile game built around a rather advanced science fiction backstory. The storyline is linked to a fictional side effect from the discovery of the Higgs-Boson particle at CERN, which also revealed a transdimensional energy called exotic matter (XM) that has the ability to shape human thought. It enters the world through transdimensional portals, usually located at points of historical, cultural or local interest (churches, libraries, museums, plaques and statues). XM was later determined to be linked to an alien race called Shapers. In the game world, there are speculations whether Shapers have influenced the creation and innovation of these portal objects.

Gameplay builds around two factions: the Enlightened, who believe Shapers are kind and peaceful, and the Resistance, who view Shapers as deceptive and untrustworthy. When first joining the game, a player must choose which faction to join and becomes an agent for that side. By controlling portals and linking them together, players can create control fields that use XM to influence people (referred to as Mind Units, or MU) according to their goals.

The Enlightened wish to use XM to bring about the next stage in human evolution, and the Resistance work to defend the Earth from Shaper influence (Davis 2017). Both factions strive to control as many MUs as possible. In the Ingress beta, the game was "seeded" with portals created with data from the Historical Marker Database (hmdb.org), and those portals are still in use. Additional portals have been added to the game by players submitting candidates in accordance with Niantic's guidelines (see "Candidate Portal Criteria" 2018). A requirement for a portal is that it fits into one of five categories: (1) a location with an engaging story, a place in history or educational value, (2) a cool piece of art or unique architecture, (3) a hidden gem or hyper-local spot, (4) public libraries or (5) public places of worship. Each suggestion needs to be accompanied by a photo and is recommended to contain a descriptive

text. Suggesting portals was initially only available to players at level 10 or higher. That level has been raised, and portal suggestions have also been completely disabled for periods of time.

Portals from Ingress were later used to create the Gyms and PokéStops in Pokémon GO (see Fig. 14.1). Pokémon GO players have subsequently lacked influence over the creation and placement of the POIs in the game, leading to some Pokémon players joining Ingress to gain influence over that process. In the fall of 2018, Niantic announced an upcoming PokéStop Nomination Program (Degtiareva 2018), lending some control over this process to Pokémon GO players who are level 40 or higher.

Parallel to the regular gameplay, agents can perform missions created by other agents. A mission involves a collection of waypoints that the agent is challenged to seek out, and the agent must complete objectives at each waypoint. Objectives range from merely visiting to capturing, upgrading or linking a portal, or entering a passphrase that must be possible to deduce from the real-world setting. The mission waypoints can be sequential (with visible or hidden orders of completion), or free to complete in an optional order. Starting at level 7, agents gain permission to create missions and submit them for review and approval. When creating missions, agents are encouraged to design them around a theme, for instance, demonstrating cultural aspects of a city, focusing on history or historical figures or improving fitness through physical challenges (Niantic Inc. 2018b).

There are a number of studies exploring various applications of Ingress for, (or in relation to), educational use. For instance, Sheng (2013) discusses how Ingress could be used to inform the development of learning from games, naming crowd learning, badges for accreditation, seamless learning and geo-learning as areas in which Ingress might serve as a model for educational designs and the orchestration of learning. On the other hand, Stefan et al. (2016) argue that mechanics from entertainment games cannot be transposed to learning settings without overcoming ethical aspects, such as managing historic violence or culturally sensitive data. Shirai et al. (2015) report a case study in which Ingress was used to create a virtual museum in Sagamihara, Japan. A combination of social media, in-game communication, live events and Ingress missions was employed to construct the virtual experience. Davis (2017) examined how Ingress as a supplement to a higher-education undergraduate course in geography affected students' geographical interests and classroom performance. In addition to regular lectures, student agents participated in missions around their hometowns and the local campus community, and they expressed enjoyment in learning outside the classroom. Results suggest that both geographical interest and test performance improved more among the Ingress-playing students than it did among the non-playing students.

Fig. 14.1 Screenshots from the Ingress interface (left) and Pokémon GO (right) showing the same geographic location, Härnösand City Park. The Ingress interface shows portals with resonators, exotic matter (XM), links and control fields. The Pokémon GO Interface shows PokéStops and two Pokémons. Map data and POIs are the same, but graphical representation differs significantly (screenshots by Marcus Sundgren)

14.5 Findings and Discussions

Found categories have been grouped under the umbrella of augmented education with mobile teaching and learning, collaboration, statues as intended points of interest and orchestration as the main building blocks.

14.5.1 Collaboration and Intended Points of Interest

During the outdoor social science session, students walked from the school to the city park and then back to school. The walk was planned by the teacher, and the points of interest where the teacher intended to stop consisted of different statues. The text that follows focuses on what happened in the interplay between the students, the teacher, the mobile/game and the surrounding locations where these points of interests were located.

One of the PokéStops was the statue of Elias Sehlstedt. Sehlstedt was a Swedish lyricist born in Härnösand in 1808, and there is also a city street named after him.

When students approached the statue speedily, the teacher stopped them by asking if they knew its name. Their interest in the statue itself competed with what simultaneously attracted the students' attention within the game. Parallel to the children's focus on the mobile devices and their discoveries of the affordances within the game, the teacher increased the attempts to bring the students' attention back to the statue itself. The following excerpt shows the conversation that took place when interplay between students and mobile devices was strong and the teacher attempted to bring the students' attention back to the statue (Fig. 14.2).

Teacher: What is this PokéStop called, then?
Fred: Oh three Pokéballs! [Everyone talks at the same time]
Teacher: But what is the name of the PokéStop, then?
Pete: Elias yada yada yada…
Fred: Here's the PokéGym!
Teacher: He has a street named after him at Murberget.
Fred: Check out Pokémons!
Teacher: Yes, a street on Murberget.
Fred: Check out! Check out! A Pokémon!
Teacher: Now we stop, here he is [points at the statue]. Does anyone recognize Sehlstedtvägen? Who has been there? At Murberget there is a street named after him. Why is this statue here then, do you think? Take a guess, why is it here, do you think?
Pete: He's buried?
Teacher: No, it's not his grave.
Tom: He was born in Härnösand.
Teacher: Yes, he was born in Härnösand, but what was his profession then? What was he known for? … You could say that he was an author.

In another group during the social science class, the students were more focused on the shared interplay with the mobile device (what took place on their screens), than engaging in the conversation with the teacher about the statue.

Teacher: He wrote books anyway, when did he live then you think?
Clara: In the 19th century.
Teacher: Yes.
Dana: He reminds me of Zlatan [Ibrahimovic], because he has a big nose.

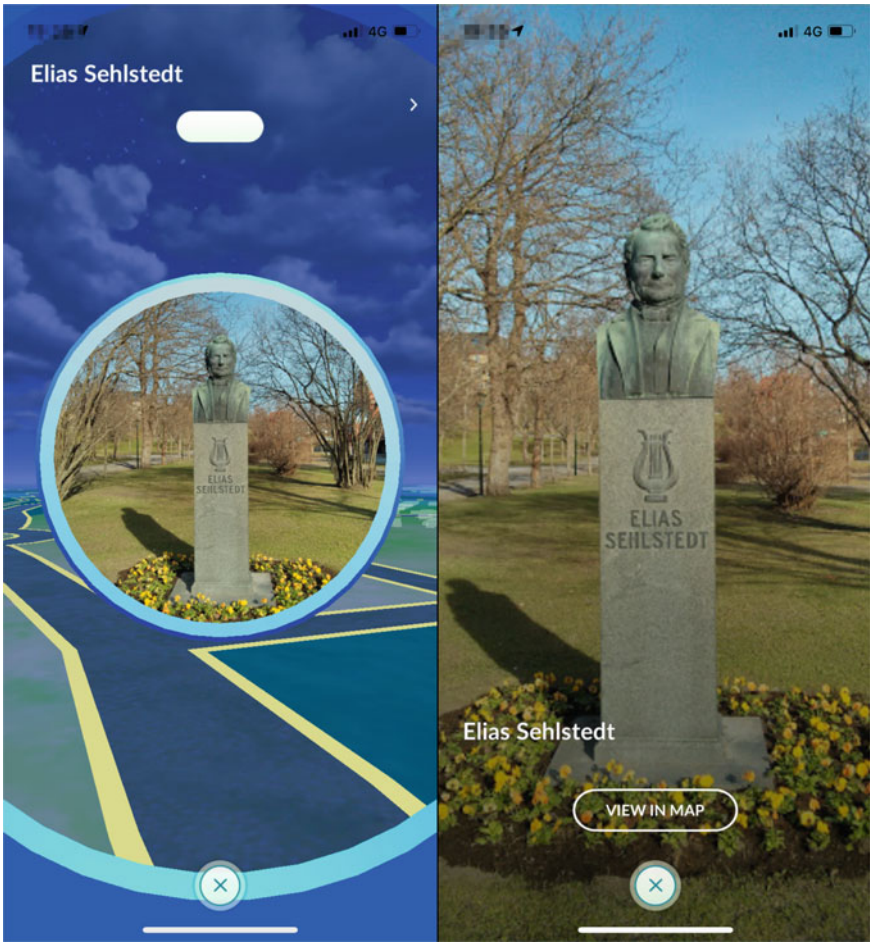

Fig. 14.2 The statue of Elias Sehlstedt as seen in the Pokémon GO app. Left is the view when accessing the POI, right is the detailed view shown when tapping the name of the POI (GPS coordinates: 62.6306, 17.9437)

Teacher: But why does he stand here in Härnösand, like … why does he stand here in Härnösand, do you think?
Gina: Because he…
Clara: Because he wrote something about Härnösand?
Teacher: He is…?
Clara: Born in Härnösand!
Teacher: Yes! He was born here.
Gina: Clara, I caught one more, yes, I caught another one.
Teacher: Hello, are there more things we're going to go to? Did you catch another?
Gina: Yes, while you talked to Clara.

Teacher: Elias Sehlstedt, but if you tap here now on him [they look down on the screen].
Clara: Then just a photo of him appears.

The excerpts above show that interplay can take on different forms between students, teachers, surrounding locations and mobile technologies. In this analysis, the most prominent relationship was between the students and the mobile technologies.

However, the chosen points of interest made students focus their attention on the surrounding locations. Shifting attention from the mobile technology toward the surrounding locations was mostly led by the teacher asking questions that the students were expected to answer. The interplay between students and teacher was thus characterised by the teacher's attempts to capture the students' attention. There was also interplay between the teacher and the mobile technologies, although less frequently than student–device interplay. However, at the end of the above excerpt, the teacher showed interest in one of the girls catching a Pokémon while simultaneously demonstrating what information becomes available in the game when tapping on the PokéStop image of the statue.

The walk continued through the city park, and the students passed another statue, the monument of Frans Michael Franzén (1772–1847), a Swedish poet and composer (Fig. 14.3). He became a member of the Swedish Academy in 1802 and was its permanent secretary from 1824 to 1834.

As at the previous point of interest, the teacher began with questions about who the statue represented. Unlike the first statue, some students looked it up in the game. Thus, a change occurred here in the students' understanding, leading to them using game features to find the answers to the teachers' questions. The object of the game was thus extended as more than play; the excerpt below shows how the teacher, in dialogue with the students, tried to make connections with their preconceptions and deepen their understanding by providing more information about the statue.

Teacher: Listen … He got a school named after him, is there anyone who knows what it's called?
Quintus: That's probably Franzénskolan, where we use to train with the handball club.
Teacher: Yes, they have named that school after him, down there [teacher points]. He was both a man of the church and an author; he has written hymns and articles. And then he became so famous that he had a school called after him. And he was born in the 18th century … but now we have to take that PokéStop that was just too far away now.

At the end of the excerpt, the teacher again showed an ability to link the game to the teaching situation. This encouraged the students to assist the teacher in managing specific tasks in the game, which in turn caused the teacher to ask further questions regarding their perceptions of time and space.

Tony and Quintus [helped the teacher by telling]: And then you tap it, and then you take it, push it now, press now. Oh, you got a five-kilometre egg.

Fig. 14.3 The statue of Frans Mikael Franzén and his muses as seen in the Pokémon GO app (GPS coordinates: 62.6303, 17.9470)

Teacher:	And then you have to walk five kilometres. But how long does it take to go five kilometres then?
Tony [to the teacher]:	Great, great. Yes, but now, when you caught it, check out, can I show?

During the walk, they passed one more PokéStop: a sculpture of Bertil Malmberg (1889–1958, see Fig. 14.4). He was a Swedish writer and translator and became a member of the Swedish Academy in 1953. He wrote epics, film manuscripts and poetry.

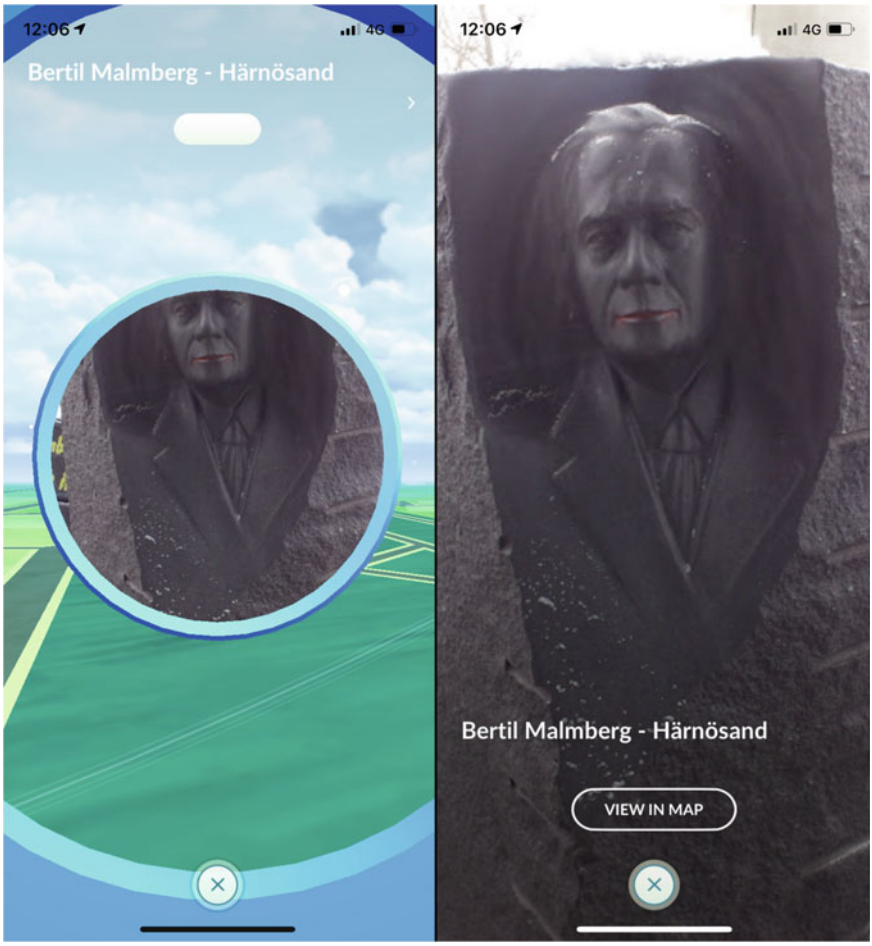

Fig. 14.4 The statue of Bertil Malmberg as seen in the Pokémon GO app (GPS coordinates: 62.6310, 17.9459)

As with the other PokéStops, the discussion included who the point of interest represented and its social function. When they stopped at the memorial of Bertil Malmberg, the interplay between students and surrounding locations became particularly intense. Here the teacher tried to direct the students' attention towards information written on a plaque attached to the memorial. For most students, this was successful, but it was evident that one student's attention could not be averted from the mobile device. Data collected from the spy glasses revealed that he was committed to catching a Pokémon at this moment. Student attention thus switched between the game and the surroundings during the walks.

After the walks, the teacher completed a follow-up session in the classroom, sharing and reviewing material containing facts about the various PokéStops. Students read aloud for each other, and the teacher asked questions about details.

Teacher:	The first stop we did was this man who was down there. Do you remember that? Fred, who was that?
Fred [raises hand]:	Elias Sehlstedt
Teacher:	Yes, Sehlstedt was his name

During the reading, the teacher sometimes interrupted to focus on unknown concepts; for instance, the difference between a bust and a statue. Although some students had difficulty concentrating on the game and on details of the surroundings during the walk, they remembered facts about the POIs remarkably well. The teacher told them, for example, that the people the statues depicted had given names to other things in the surrounding community.

Teacher:	Elias Sehlstedt, do you remember what he had named?
Gina:	A street.
Teacher:	Which street?
Gina:	Sehlstedtsvägen.
Teacher:	Why was this particular street named Sehlstedtsvägen? Why not a street here on Härnön, why only at Murberget? What was the reason for that?
Clara:	He lived there, or they had their farm up there.

Another interesting finding was the students' geographical memories of the walks. They all expressed accurate memories of the locations when retelling how the walks were conducted. It is obvious that they connected to certain landmarks in their stories and used those landmarks as scaffolds to build their stories around.

14.5.2 Orchestrating Mobile Teaching and Learning

The augmentation of the educational settings included an orchestration of the intended educational activities that included places, time frames, technological applications, social settings and content. The social science teacher's work was divided into three phases; preparation, outdoor sessions and follow-up sessions.

In the preparation phase, the teacher worked out a preliminary lesson plan encompassing indoor and outdoor sessions as well as technological applications, time frames, places to visit, particular content to discuss and social configurations for the student group. The orchestration of the content in the preparation phase resulted in the teacher including information on buildings, famous people, statues and historical events. The teacher captured this information in a document with written notes and pictures that were later referred to during the outdoor session. The teacher also prepared a route in the city that should take approximately 30 min, including walking time, playing Pokémon GO, and discussions around issues related to four of the

game's POIs; that is, PokéStops in the surrounding locations linked to statues and buildings represented in the game.

The outdoor sessions were orchestrated as a walk, including the division of the class into smaller groups of three to five students. In these groups, students were supposed to collaborate in subgroups of two to three individuals. The orchestration applied a bring-your-own-device philosophy in which each subgroup was equipped with a smartphone owned by one of the students. To include mGBL in the orchestration, the groups were instructed to play Pokémon GO during the outdoor social science session. When a student group passed the planned stop, the teacher attracted the students' attention to historical or otherwise related facts.

In addition to content planned in advance, the orchestration also allowed discussions of ideas that were brought up spontaneously by the students. The teacher utilised these discussions to involve what spontaneously came to mind during the walks. Students apparently liked playing Pokémon GO, but also gave positive feedback on the orchestration: "[It] felt good to be outdoors and to get some fresh air". Another student added that it "could be good to get some physical exercise". Furthermore, students appreciated the educational orchestration with comments such as "the ordinary social science lessons are really boring", and "we are more tired after an ordinary lesson, now we are still alert".

The follow-up session was conducted a few days after the walk and was more similar to a typical indoor session, with communication led by the teacher in front of the class and students in their usual seats in the classroom. The teacher linked back to the route by taking time for questions and answers on issues related to each of the four PokéStops. Overall, students remembered the issues discussed during the route and at the POIs they visited.

In the video analysis, students sometimes appear to be disorganised, scatterbrained and mainly interested in the Pokémon world. On the other hand, one of the most positively surprising findings was how much students remembered about the authors in the follow-up session. However, without pre-planned assignments and follow-up sessions, the learning retention would probably have been much lower, as according to the Ebbinghaus forgetting curve, a high percentage of information becomes lost over time if learners do not make any short-term efforts to retain it (Murre and Dros 2015).

In mGBL sessions with limited or no orchestration, the augmentation of education would be less pronounced than in the present case. There would be a risk for students entering the so-called 'gamer mode' (Frank 2012) with students only trying to achieve goals that are optimal for the game itself, but suboptimal for the educational objectives. The risk for students getting carried away in the gameplay has also been pointed out by Kapp (2012, p. 84): "Learners without instructional support will learn to play the game but not learn the domain specific knowledge that is embedded in the game".

14.6 Conclusions

This chapter focuses on how education could be orchestrated as walks in surrounding locations, with a discussion on how mobile game-based learning activities can be orchestrated to create augmented learning. Findings show that continuous interplay between different platforms is central. This can be defined as the interplay between students and the mobile device, between students and the surrounding points of interest, and between the students and the teacher. In the same way, the interplay is ongoing between the teacher and the students and between the teacher, the mobile device and the surrounding points of interests. The study shows that it is not the technology itself that influences learning as such, but rather the engagement between the learner and the technology.

Hence, this study shows that the foundation of augmented learning consists of interplay between students, the game and the surrounding locations. The mobile device serves as the scaffold coordination to support collaboration and inquiry in teaching. However, the teacher is significant in such interplay; without the teacher, these Pokémon GO walks become just Pokémon GO walks. The teacher's strong efforts to draw the children's attention to the surrounding points of interest based on the game's PokéStops is crucial for augmented learning to take place. When the teacher's engagement functions like a surrounding scaffold, the walks are characterised by augmented learning.

In the wake of modern childhood sociology, the boundaries of learning are being challenged. The prerequisites for learning are no longer limited within the physical walls of the classroom or the school building. This change requires reflections on how we understand education as formal, informal or semi-formal—and about new learning spaces in childhood. Above all, this change entails a new type of teacher role. Firstly, there is the transformation of the teachership towards a teacher-as-designer that uses digital artefacts, and thereby orchestrates the teaching in the most appropriate educational settings. Secondly, there is the orchestration of the teaching and learning session, where the interplay between the teacher, the students, the mobile technologies and the educational setting is central. Based on the findings discussed above, the authors argue that this new paradigm of teaching could be framed as augmented education.

14.7 Future Research

As in many other studies in the field of AR, the research design was exploratory and based on a relatively small sample. As pointed out by Wu et al. (2013), there is a need for more large-scale studies to investigate the features and affordances of AR in educational settings. It would be interesting to follow several primary school classes with differently orchestrated AR-based teaching and learning sessions over a longer time span.

The current chapter only includes social science applied in one class. The project includes data from another subject and class (Jaldemark et al., in press; Mozelius et al. 2017). Nevertheless, it is still a small sample. Therefore, to reach a higher level of knowledge about AR and its impact on educational settings, more case studies are needed. Such studies should focus on the orchestration of mobile game-based learning in various subjects and be applied to various ages of students.

The study shows that LGB could function as a link between formal institutional learning and students' everyday phenomena. Of interest for further studies would be an investigation of the relation between adopting a popular location based mobile games and students' motivation to learn.

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Chapter 15
Get Gamified: Promoting Augmented Reality and Digital Game Technology in Education

Laura E. Bruno

Abstract Most educators agree it is important to remain current with trends and continue to add fresh, innovative ideas to enhance lessons. This responsibility means that as professionals, educators must continue to seek ways to better understand students so that their unique 21st century needs can be met. Children and youth are introduced to the virtual world from a young age, which implies the manners in how they associate with technology-innovation may impact the ways in which they learn, and therefore, the production or output of knowledge. For this reason, technology innovation should be a key component in curriculum design. This chapter will highlight two main concepts of gaming technology innovation: Augmented Reality (AR), and Digital Game Technology (DGT). Understanding such phenomenon is necessary to meet student learners where they are. Special attention will be given to AR in the field of health and physical education (PE), as this is one discipline where field professionals often disagree on the appropriateness of the use of digital technology. All professional educators; however, must recognize the important role technology plays in the lives of students and seek ways to motivate them while 'talking their talk'.

15.1 Introduction

The main idea of this chapter is that educators need to transform their instructing strategies to improve the abilities that future citizens will require in an advanced digital culture. Technology is a double-edged sword in the world of education. Regular efforts are made for educators to embrace technology and embed this phenomenon into curriculum, yet there is a constant clash between students and educators regarding how, when, and to what extent technology should be used. This is of particular concern in the field of health and physical education (PE), where the cornerstone of the discipline is to develop healthy, "physically literate individuals who have the knowledge, skills and confidence to enjoy a lifetime of healthful physical activity"

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(SHAPE America 2014). The question arises of how can healthy, physically literate individuals who engage in regular physical activity develop if their noses are buried in technology devices and they are sedentary? Most educators agree that technology can be beneficial and enhance student learning outcomes, but the larger question is to what extent, and by what means. The chapter will explore gaming technologies in education, citing examples of Digital Game Technology (DGT) and Augmented Reality (AR) across disciplines, with a special focus on AR in the field of Health and Physical Education (PE).

15.2 Using Augmented Reality and Digital Game Technology as a New Pedagogy in Education

Augmented Reality (AR) and Digital Game Technology (DGT) have great potential to educate today's youth across a variety of domains/disciplines. AR is another form of gaming technology that allows a computer-generated virtual world to be overlaid onto a real-world environment in real time (Lee 2012). AR has gained popularity within the broader educational community and has been referred to as "one of the key emerging forms of instructional technology" (Harley et al. 2016, p. 361). The goal of AR is to promote learning through the delivery of virtual media. Such concepts supplement reality with digital information designed to be relevant to the activity the user is engaged in (Harley et al. 2016). Similar to the idea of Virtual Reality (VR) where reality is replaced with a true virtual world, AR supplements reality, or enhances ("augments"). AR is often referred to a 'mixed reality' as it is mixture of real life and virtual reality. A deeper exploration of AR will be discussed below.

DGT can be defined by two concepts: Game-Based Learning (GBL) and Gamification. GBL is the application of any game-based approach designed with the main purpose of delivering learning rather than entertainment (Noemí and Máximo 2014). While GBL and gamification both involve game mechanics, Gamification is defined as the application of digital game mechanics in a non-gaming context for the purpose of engaging learners, motivating activities, enhancing learning, and solving problems (Kapp 2012). To summarize, Gamification attempts to make the learning process a game, whereas GBL incorporates game play into part of the learning process. Both efforts rely heavily on technology while encouraging and motivating participants to problem solve through game play.

While the concept of gaming technology dates back to the 1980s, the idea of embracing these trends in pedagogy is relatively new. Furthermore, as technology continues to evolve and change, so does the software, platform, and opportunity to incorporate it into mainstream education, making it easier and more accessible for students and teachers, alike. The next subsection will take a deeper look at DGT in a health education curriculum and share findings how gaming technology can positively influence student learning outcomes. A study conducted by Haruna et al. (2018) compared three cohorts of US-based health education classes (traditional, GBL and Gamification, respectively).

15.2.1 DGT in Health Education

Health education is an appropriate forum for DGT as many of the topics focus on student choice and/or student response. DGT platforms allow learners the opportunity to make mistakes in a risk-free setting and through experimentation, learn to practice the right way to do things and see what outcomes and/or consequences come from risky choices. Health education is a required course for the majority of US schools and appropriate for students from PreK-12th grade. Health education and health promotion programs play an important role in helping young people make positive health decisions.

The United States Department of Health and Human Services (USDHHS) (2018) provides science-based, 10-year national objectives for improving the health of all Americans (healthypeople.gov). Healthy People 2020 provides a framework for communities and healthcare providers to improve these health outcomes and decrease health disparities. In an effort to address these concerns in health education, SHAPE America's Joint Committee on National Health Education (2007, Health Education Standards, para. 2) denotes eight health education standards:

Standard 1: Students will comprehend concepts related to health promotion and disease prevention to enhance health; **Standard 2**: Students will analyze the influence of family, peers, culture, media, technology and other factors on health behaviors; **Standard 3**: Students will demonstrate the ability to access valid information and products and services to enhance health; **Standard 4**: Students will demonstrate the ability to use interpersonal communication skills to enhance health and avoid or reduce health risks; **Standard 5**: Students will demonstrate the ability to use decision-making skills to enhance health; **Standard 6**: Students will demonstrate the ability to use goal-setting skills to enhance health; **Standard 7**: Students will demonstrate the ability to practice health-enhancing behaviors and avoid or reduce health risks; **Standard 8**: Students will demonstrate the ability to advocate for personal, family and community health.

Topics such as violence, bullying and suicide are regularly discussed in the health education curriculum. For this reason, health education offers ample opportunity for educators to embed DGT into the curriculum. This concept has been shown to keep students highly engaged in the learning objectives and encourage thought processes that can easily transfer from the simulated environment to real life (EdTechReview 2018). Using DGT as a new pedagogy in health education has noted benefits but also key differences. Haruna et al.'s (2018) study sought to identify which DGT platform was most beneficial for student learning outcomes. This study compared three cohorts of health education classes. The health education curriculum for all three modalities was delivered to 3 different cohorts of 40 students/each in a masked fashion with 40 min/week intervals over a period of 5 weeks.

The first was a traditional health education curriculum that did not include any digital game technology. In this scenario, teaching was done in the classroom and included class discussions, group buzzing, group work, and individual assignments. For both the second and third cohorts of students, classes were held in a computer lab

where each student accessed the corresponding health education curriculum intervention on an offline computer platform (Haruna et al. 2018). Both the second and third cohorts (GBL and Gamification) offered non-traditional opportunities for students to experience real life scenarios in a personalized learning environment through relevant role-playing, avatars and storylines.

The second cohort of students explored the health content via a GBL gaming system that was designed through collaboration efforts of researchers, professionals, and secondary school students. In this GBL curriculum, students were instructed to play the game individually and later attempt a series of questions for each topic. The GBL curriculum increases engagement and makes the learning environment more interactive for participants. This type of DGT also offers practical skills through hands-on learning activities which are translatable to the real world. Additionally, the repetitive nature of GBL is ideal for learning, as the games provide immediate feedback to the learner, allowing them to see exactly where they may have made the wrong decision (Haruna et al. 2018). In this curriculum, students were required to score 6 out of 10 points minimally in order to move on, or the game would restart from the beginning, emerging student learners. This scenario game was developed using UNITY5, manufactured by Unity Technologies.

The third, and final cohort of students used a curriculum that was gamified through game mechanics, including leaderboards and badges via a point system. The Gamification platform used for this study was called Moodle. In this curriculum, students were provided with multiple health lessons in a quiz format. Each topic was represented by a quiz containing 10 relevant questions (Haruna et al. 2018). Students were instructed to answer the questions and based on the appropriateness of their answers, they would earn or lose points. Badges were awarded to students with the highest scores, which cultivated a competitive environment, encouraging students to learn more health education content (Haruna et al. 2018). This type of DGT (Gamification) is proven to be effective in encouraging student participation, which is essential for "influencing the acquisition of the knowledge and skills needed for attitude and behavioral change" (Haruna et al., p. 3). This innovative DGT approach offers ample opportunity for students to be engaged and motivated through the learning experience.

Results from this study found the differences between the average post-test scores for GBL (Mean = 79.94, SD = 11.169) and Gamification (Mean = 79.23, SD = 9.186) to be significantly higher than the control group (Mean = 51.93, SD = 18.705). Such finding suggests that the two innovative DGT teaching approaches can be used to improve health education curriculum and student learning outcomes. Educators' efforts to learn new concepts should continue, as such the world of technology also continues to grow and produce new and potential tools to assist both teachers and students, alike.

15.3 Gaming Technology Framework

Before discussing the why, what, how, and when of AR and DGT in education, it is important to understand the suggested theoretical framework for developmental research (Engestrom 1987). For our purposes, this framework will be used to illustrate gaming technology concept(s). Engestrom's (1987) theoretical approach has been used to develop the Activity Theory (AT), which has been a key framework for the research and design of DGT like GBL and Gamification, as well as AR instructional interventions (Haruna et al. 2018). The AT framework consists of 6 key components: subjects, instruments, objects and outcomes, rules, division of labor, and community. Figure 15.1 presents an adapted version of the AT theoretical framework suggested by Engestrom (1987) and designed by Haruna et al. (2018, p. 4).

Technology was an important development in the application of theory in human studies dating back to the late 1980s and 1990s. During this time, AT was employed to address challenges associated with computer information systems (Kaptelinin and Nardi 2018). A number of researchers suggested that by "framing human-technology interaction within a larger context of purposeful human activities, the theory makes it possible to reach a deeper understanding of technology and its meaning for people" (Kaptelinin and Nardi 2018, p. 3). There have been numerous studies that support the use of the AT framework on human-technology interaction (Kaptelinin and Nardi 2018).

Haruna et al.'s (2018) health education study discussed earlier used this proposed framework when developing their study. The gaming mechanics used in both the GBL and Gamification modalities have proven to be successful educational tools. The GBL and Gamification curriculums embraced stories, scenes, characters, realistic environments/situations, points, badges, and/or leaderboards appropriate for the

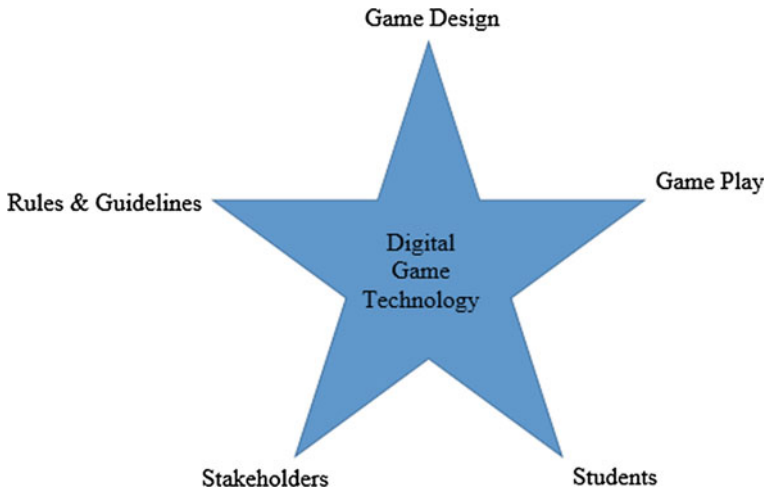


Fig. 15.1 AT theoretical framework for DGT adapted from Haruna et al. (2018)

GBL and Gamification platforms. Various stakeholders were brought in to assist with the development and planning practice (researchers, secondary school-aged students, and professionals). Together, these initiatives helped students with knowledge acquisition (the object) which is critical to achieving the goal (better health outcomes). This framework can be seen consistently throughout the many gaming technology platforms that will be discussed in this chapter. With a basic understanding of the framework in mind, the question may arise of 'why' should education embrace gaming technology. The following will answer the questions of why, what, how and when AR and gaming technology can be used in the classroom.

15.4 The 'Why' of Augmented Reality and Digital Game Technology

Whether we care to admit it, we are living in a high-tech world. The U.S. Census Bureau (File and Ryan 2014) reports that 83.3% of U.S. households own a computer. Findings from the Center for the Digital Future's 15th annual study on the impact of digital technology for Americans (2017) report that the average American spends 24 h per week online; which is more than twice the number reported in 2010 (Cole and Suman 2017). Figure 15.2 illustrates this growth below.

Moreover, the Pew Research Center (Lenhart 2015) reports that 88% of teens aged 13–17 own a cell phone; 73% of which are smartphones. As cited by Bruno (2018), findings from the Common Sense Census found that teens spend an average of 9 h per day consuming some form of digital media (not including school or homework usage); and children ages 8–12 spend nearly 6 h per day doing the same (Common Sense Media Inc. 2015). To American youth, technology is as natural and fundamental as the air they breathe. The primary language of today's student is technology and if educators want to be impactful, they, too need to learn to speak this language.

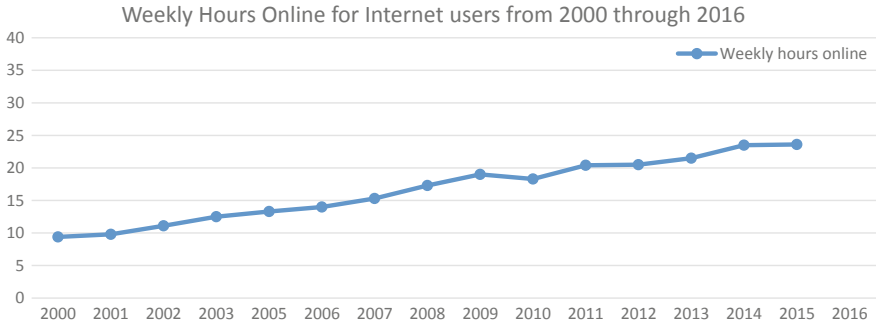


Fig. 15.2 Weekly hours online for Internet users from 2010 through 2016 adopted from the Digital Future Report Center for the Digital Future at USC Annenberg (Cole and Suman 2017)

15.5 The 'What' of Augmented Reality and Digital Game Technology

Play is a common experience for children and adults alike, in which they voluntarily invest time and energy while deriving great enjoyment. Past research has indicated that play is not only important in the growth and development of learning and socialization, but it is also a suitable and respectable way to describe meaningful learning (Kerr and Aptar 1991). Due to the uptick of technology in our lives over recent years, it is only rational to expect to see an intensification of play through technology. Digital Game Technology (DGT) holds an educational promise, allowing users to try things in an artificial environment or act through a simulated practice (Misfeldt 2015). Several studies, including Haruna et al.'s (2018) study noted earlier, have indicated that well-designed educational gaming technology has great potential for improving the learning outcomes of students (Hwang et al. 2012). Gaming technology that has a game as either the main activity or as a stimulus for other related activities, and has learning as a desired or incidental outcome is defined as game-based learning (GBL) (Denham et al. 2016).

GBL is a type of game play that has defined learning outcomes. This idea balances subject matter with gameplay and the ability of the player to retain and apply subject matter to the real world (EdTechReview 2018). In an ideal GBL environment, students work towards a goal, choosing actions and experiencing the consequences of those actions along the way. Throughout this time, students have the opportunity to make mistakes in a risk-free setting and through experimentation, learn to practice the right way to do things and/or outcomes associated with decision-making. This concept keeps students highly engaged in the learning objectives and encourages thought processes that can easily transfer from the simulated environment to real life (EdTechReview 2018). GBL is an innovate platform to offer students the opportunity to make appropriate choices in all disciplines and/or subject matter.

The AR platform also includes a level of play, but shifts the focus from 'play' to the 'experience'. AR allows the participant to experience an 'enhanced' reality. In education, AR has great potential to positively impact the learning process. AR makes it possible to change the location and timing of studying. For example, while completing homework, students could scan a QR code that has been embedded in their text books that can take them to a pre-recorded lecture from the teacher. AR further has the ability to change how topics and theories are introduced; AR technology has the ability to take complex theories or objects and turn them into 3D models, making the abstract concept easier to grasp. Lastly, AR can offer a greater, more meaningful and realistic perception of abstract theories and concepts. One such example could include human anatomy or a 3D model of the heart to help students grasp chambers and blood flow. The capabilities of AR technology are limitless as technology continues to evolve.

Both AR and DGT have the ability to transform the learning environment and expose students to opportunities and experiences traditional pedagogy can't. These experiences are possible due to the positive strides made in the gaming technology

industry through available software and accessible platforms. A large portion of these platforms are application-based and can be accessed through the user's own cellular device. This leads into the next section, the 'how' of gaming technology.

15.6 The 'How' of Augmented Reality and Digital Game Technology

This question may transcribe differently across disciplines and/or subject matter. The author will share four examples across four different disciplines offering ideas of possible DGT and/or AR that can be used in the classroom. As indicated earlier, special attention has, and will be, devoted to health and physical education (PE) since these disciplines are non-traditional in context. UNITY5 and Moodle illustrated how DGT (Gamification and GBL) can be used in health education. Pokémon GO will demonstrate how AR can be incorporated in a Physical Education class.

15.6.1 AR in Physical Education

This example of gaming technology in education is specific to AR in the field of Physical Education (PE). The Alliance for a Healthier Generation (2018) defines PE as "the class in which kids learn to be active for a lifetime. In PE, students learn how to move their bodies fluently and develop the knowledge, fitness, physical skills and personal and social skills necessary for lifetime of health and physical activity" (para. 1). This definition is supported by the SHAPE America (2018) National PE Standards:

Standard 1: The physically literate individual demonstrates competency in a variety of motor skills and movement patterns; **Standard 2**: The physically literate individual applies knowledge of concepts, principles, strategies and tactics related to movement and performance; **Standard 3**: The physically literate individual demonstrates the knowledge and skills to maintain a health-enhancing level of physical activity and fitness; **Standard 4**: The physically literate individual exhibits responsible personal and social behavior that respects self and others; **Standard 5**: The physically literate individual recognizes the value of physical activity for health, enjoyment, challenge, self-expression and/or social interaction (para. 2).

PE is non-traditional in the educational context as students are actively engaged in large spaces, not sitting in a classroom at a desk. There are various digital technology platforms that can be incorporated into the curriculum; however, this example will focus on using the AR-game, Pokémon GO, in a PE geocaching unit. Geocaching is defined as a real-world, outdoor treasure hunting game using GPS-enabled devices (McNamara 2004). Participants are given coordinates and then navigate the area to find the cache (a cache typically consists of a container, logbook, pen and small trinket(s.). Trinkets may include stickers, plastic toys, arcade tokens, shells, feathers, etc.)

According to Geocaching Newsroom (2018), there are more than 3 million active geocaches, hidden in 191 different countries on all 7 continents. Currently, there are over 9 million registered Geocache profiles. The sport of geocaching gained recent attention as Pokémon GO gained significant popularity. Geocaching participants will explore nearby areas looking for caches and gaining unique experiences.

Pokémon GO is an augmented reality game appropriate for Android and IOS devices and uses a live-feed Global Positioning System (GPS) location to place Pokémon in the real world setting for players to collect (Bruno 2018). Pokémon is the Japanese word for 'pocket monsters' which consist of colorful cartoons. The objective is for the player to catch, or capture as many Pokémon as possible (there are over 150 species available on Pokémon GO). Pokémon are then raised and commanded by their owner (called 'trainers'). Bruno (2018) explains that once the player has the app open on his/her device, a GPS map of the surrounding area will appear. As the player travels, the device vibrates to indicate a Pokémon is near. Thanks to the device's camera, the player will see a 3-D Pokémon image (colorful cartoon) on the screen in front of them. To capture the Pokémon, the player must throw a Pokéball at the target to contain it (this is done digitally by a flick of the finger. The player obtains Pokéballs at Pokéstops (which are local landmarks indicated by markers on the screen; Pokéstops can consist of anything from stores to churches). Once the Pokémon target is contained, the player owns it.

The uniqueness and popularity of Pokémon GO make it the perfect DGT to implement in a PE geocaching unit. In the first week after its release, Pokémon GO became the most downloaded app in history, and has reportedly attracted nearly 21 million daily active users in the US, which makes it the biggest mobile game in US history (Mediati 2016). For this reason, many students will likely be familiar with the game objectives and concepts which the teacher can use to their advantage by demystifying the game objective(s) and connect the concepts between this augmented game and an AR Pokémon GO geocaching unit for students.

To begin, teachers will obtain coordinates of their space. They can do this through the use of a compass and/or the Google Maps application on their device. Teachers will set different coordinates to represent numerous cache locations (each cache can include a log book and a Pokémon trading card, each worth a different value). Once the coordinates are recorded, the coordinates can be shared with students. Utilizing either a compass, handheld GPS unit, phone or iPad to detect each coordinate, students can work in teams to locate and capture the Pokémon cache.

In similar fashion to the Pokémon GO game, students will need Pokéballs to capture the Pokémon. Teachers can promote physical activity by designing fitness challenges that students must complete in order to earn Pokéballs. To do this, the teacher will allocate certain areas termed 'gyms' where students can complete fitness challenges and in turn earn Pokéballs for their team. Gyms can be scattered around the perimeter. Each gym/fitness station can consist of numerous aerobic, muscular strength/endurance, and flexibility activities. For example, Gym/Fitness Station #1: 50 jumping jacks, 10 push-ups, 20 s hold of down-dog yoga position, 30 s hold of plank position, and a crab-walk around the cones. Each teammate should be required to complete the fitness activities in order to obtain a Pokéball. Pokéballs can consist

of a variety of balls found in the equipment closet: gator balls, tennis balls and foam balls all work great. Each team should be given a (mesh) bag to secure their Pokéballs in throughout the class period.

Once students have a Pokéball, they can begin the hunt for Pokémon/cache. Using the given device (compass, phone, iPad or GPS handheld device) have students work to follow the coordinates given to locate the Pokémon. Once a location is identified, students may attempt to capture Pokémon by throwing their Pokéballs at the target. Targets can consist of archery targets, self-made targets and/or hula hoops. Once the target is hit, the team has successfully captured that Pokémon.

From here, students should be encouraged to use the given coordinates to locate more Pokémon, gyms and Pokéstops. Pokéstops can consist of coordinated locations which offer students the unique opportunity to incorporate playing strategy into their adventure by either (a) completing additional fitness tasks to earn more Pokéballs, or (b) trade in lower value Pokémon for additional Pokéballs. At the end of each class, all teams report their point value (based on captured Pokémon values, to the teacher). The teacher can keep a master scorecard so teams can earn points throughout the course of the unit.

Since students will be navigating school grounds, this unit would work best in an area the instructor can oversee altogether, or in a team-taught setting where two or more teachers are facilitating to make sure students are supervised at all times. There are many avenues that can be explored in this DGT unit. Figure 15.3 makes the following suggestions for embracing these game concepts (Bruno 2018).

Teachers can add their own creative ideas to the unit. The key concepts should include: embracing technology in the PE classroom, making the unit enjoyable while encouraging ‘play’ and promoting physical activity to further the SHAPE America national standards. Pokémon GO offers users the opportunity to join one of three teams: Valor, Mystic, and/or Instinct. Teachers can embrace this concept and incorporate a school-wide initiative that allows students the opportunity to work across grade levels on a corresponding team to earn points for their team (Bruno 2018). Teachers can use this as a school-wide challenge to raise funds and/or promote school climate/unity. Ultimately, students should become proficient with navigation (through digital technology) and geocaching skills, while engaging in physical activity.

15.6.2 DGT in Science Education

The next example of gaming technology in education is specific to the field of science. The National Science Education Standards (NSES) are guidelines for K-12 science education in United States schools. Originally established in 1996 by the National Research Council to provide a set of goals for teachers to set for their students. Many states have more recently adapted The Next Generation Science Standards (NGSS). The NGSS were advanced to improve science education for all students. In a science classroom where the unit objective is HS-ES S2-4 which states, “students

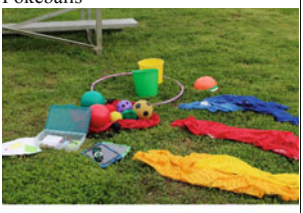
Game Concept	Implementation Idea
Pokéballs 	Students can gather Pokéballs at Pokéstops and/or gyms to attempt to capture Pokémon. Students will continuously collect and secure as many Pokéballs as possible to increase their chances of successfully capturing the Pokémon once each location is identified. This concept pr omotes team work and collaboration as students work together to secure as many Pokéballs as possible throughout the class period.
Pokéstops 	Students can further their geocaching skills to navigate the land and find these given coordinates/locations. Once they locate the Pokéstop, they are permitted to earn additional Pokéballs and /or trade in lower valued Pokémon for additional Pokéballs, in the hope of using those balls to capture higher value Pokémon.

Fig. 15.3 Game Concept and strategy for implementing a Pokémon GO geocaching unit in Physical Education. Photos used with permission from Bruno (2018)

who demonstrate understanding can use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate" (NGSS Lead States 2013).

To illustrate proficiency in this standard, a science teacher may opt to use gaming technology to further student knowledge. The simulation computer game, SimCity is designed to help students think critically about energy and greening options. In this web-based game, players design a city from the ground up. They select sustainability energy options (solar, geothermal, wind farms, etc.) to support the needs of a growing community. As they develop their sustainable environment, they are able to upgrade their resources and improve the livelihood and wellbeing of their city's residents.

As players progress through the game, they are faced with additional challenges that encourage critical thinking such as sewage issues and the health of their residents. Relating this back to the AT framework, this game design exposes students (players) with an environment in which they can make decisions regarding energy and sustainability. As they create a more sustainable environment, they earn points to make valuable upgrades. The inspiration for the game came from stakeholders using guidelines in their game design to promote sustainability outcomes through simulated game play.

15.6.3 AR and DGT in Mathematics

The next gaming technology example for use in education is specific to the field of mathematics. The National Council of Teachers of Mathematics (NCTM) identify five content standards that describe the understanding, knowledge, and skills that students should develop from PreK-12th grade. Standard 1- Numbers and Operations notes that students will be able to "understand meanings of operations and how they relate to one another" (NCTM 2018, Standards and Positions section). To help students grasp concepts associated with number operations, a teacher may consider exploring the technology-based game, Skills Arena (GoKnow Learning, Dallas, TX USA). This platform was developed to teach students basic arithmetic skills using the GameBoy (Nintendo Co., Kyoto, Japan) system.

In this game, players create an avatar (or character with their own unique identify) and move through the appropriate challenge tasks as this character. Each game has three options for arithmetic tasks: addition, subtraction, and mixed addition and subtraction. Additionally, the game has options for speed level (6 levels presented in the form of cartoon characters). Players must solve the problems before the questions fade out on the screen. As students answer a question, they instantly find out if the answer was correct or incorrect; as well as receive a performance summary at the end of each game (Shin et al. 2011).

To enhance these concepts and skills, teachers could further consider taking students on a field trip to MathAlive! MathAlive! is an AR exhibit that brings math alive by creating an interactive and immersive experience through video games, sports, fashion, music and robots. This offers students a highly entertaining and interactive AR experience. Again, the AT framework can be seen throughout the game design.

15.6.4 AR and DGT in English Language Arts

Finally, an example of gaming technology in education specific to the field of English Language Arts (ELA) is the technology-based game, Raz-Kids. The Common Core State Standards for ELA & Literacy represent the next generation of K-12 standards designed to "prepare all students for success in college, career, and life by the time they graduate from high school" (National Governors Association Center for Best Practices, Council of Chief State School Officers 2010). CCSS.ELA-Literacy.RF.1.2 states that students will demonstrate understanding of spoken words, syllables, and sounds (phonemes) (National Governors Association Center for Best Practices, Council of Chief State School Officers 2010, ELA Standards, Reading, Foundational Skills, Grade 1 section). To assist students with meeting this objective, an ELA teacher may use the technology-based game, Raz-Kids.

Raz-Kids is an online guided reading program with interactive e-books that help the user with reading comprehension skills. The game allows players to create an avatar and work through grade-level books to earn points which can be traded in for

upgrades to their avatar and/or related items. Players begin by selecting an appropriate challenge level book. The challenge text is pre-determined by the teacher based on grade level and current reading ability.

The program highlights the words as the text is read aloud to players. This technique helps the reader with word/sound recognition. Once the book is complete, players answer a series of questions to assess their comprehension. They are informed if the answer is correct/incorrect at the end of the quiz and are given the opportunity to review and correct answers. Once they have completed the book, they earn points and have the opportunity to select a new text or go back to review any previous text.

For younger students learning letters and letter sounds, teachers may use the AR-inspired app, AR Flashcards. Through the use of AR and flashcards, students open the app on a digital device (tablet or phone) and using the device's camera, scan the letter on the flashcard. The application brings the cards 'to life' by showing live animals on the card. Youngsters can tap on the animal to hear the letter and name the 3D animal. Children begin to associate sounds and letters with a fun, lively 3-dimensional animals. In addition to ELA, AR Flashcards offer interdisciplinary opportunities such as: history, math, space and/or shapes.

15.6.5 The 'Who' and 'When' of Augmented Reality and Digital Game Technology

Finally, as educators, it is critical we adapt to the ever-changing and evolving environment. For some, this can be a challenging task as technology can be intimidating. A good place to start is researching what DGT and/or AR games are available for your specific discipline. Once a platform is identified, explore the game on your own time. Learn the ins and outs of the game. Learn how to set up and explain the game or app. Questions to consider are: cost, feasibility, accessibility and age appropriateness.

Once the above has been addressed, the teacher should run a pilot of the gaming technology platform. Start small and maybe offer students the opportunity to experiment with the game and/or app during class time/student centers/elective time. Offer class demonstrations where students explore the technology alongside the teacher. If the technology is app-based, first demonstrate how to use the app and associated technology. Then consider allowing students to experiment in small groups, or individually. If the gaming technology is game-based, first teach students how to use the game by creating a class avatar and exploring the challenge/task together. Once students have a clear understanding, assign or allow them to access the game outside of school hours. Consider using the platform for practice or homework hours to reinforce skills being worked on in the classroom. Finally, identify the appropriateness of the technology in the classroom to use as means to enhance student learning objectives.

15.7 Conclusions

As educators, it is our due diligence to make efforts to remain current and meet student learners where they are. If DGT and AR have not been explored, one must wonder if the unique needs of student learners are being met. Education needs to be forward-thinking and preparing students for the future, not the past. Recent reports suggest 38% of US jobs will be automated by the year 2030 A.D.

Moreover, in today's Information Age, it is estimated that 60% of the content a college technology major learns is outdated by the end of their junior year (NJSBA Governance III: Student Achievement 2018). One cannot expect students to excel in the future if they have not been exposed or prepared for a digital world. The tides are changing in education, and it is our job to embrace and cultivate this change to help our students find success. For this reason, educators should venture out, find their inner child, and revive the concept of 'play' and 'exploration' in the classroom; it's time to get gamified!

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Concluding Remarks: Back to Life, Back to (Augmented) Reality

Vladimir Geroimenko

Computer games have taken game players away from the real world into a computer-generated digital world that could range from a simple electronic version of a classic game to a fully immersive and highly complex virtual reality environment. This escape from the physical world can be considered one of the major drawbacks of video games—it's simply not healthy to sit at home in front of a monitor instead of going out to enjoy fresh air and urban or rural surroundings.

The arrival of augmented reality games has provided a unique possibility for resolving the game players' dilemma of 'play at home' or 'go out'. The door of their 'voluntary digital prison' swung wide open and they were free to leave their chairs and sofas to go and play their beloved computer games outdoors. The spell of physical immobility in cyberspace was broken and a countless army of computer game players could at last get 'back to life, back to reality', namely to augmented reality that allows them to experience digital gameplay in a physical, real-world environment.

Pokémon GO, released by Niantic, Inc. in 2016, has become one of the most popular smartphone apps. But it is even more important that this record-breaking computer game turned out to be a technological, social and cultural phenomenon that has spiked the popularity of augmented reality games in their entirety and brought them to the crowds. Millions of people learned for the first time about a 'new' and exciting computer game technology called 'Augmented Reality'. (I should probably mention here that I used to teach Augmented Reality to my UK's students as long ago as 2003: first, as a theoretical concept; then, as a practical application utilizing a webcam and the Flash Augmented Reality Toolkit by Adobe, Inc.; and finally, as smartphone-based creative projects and games.)

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In Volume I of this two-part research monograph, the team of authors discuss a broad range of topics related to the Pokémon GO phenomenon: its essential features considered in theoretical, cultural and conceptual contexts, the educational use of the Pokémon GO game in children and adolescents, Game Transfer Phenomena, motives for playing Pokémon GO, players' experiences and memorable moments, social interaction, long-term engagement, health implications, and multiple lessons learned from the rise of this ground-breaking augmented reality game.

In other words, the authors strive to consider the most interesting and diverse facets and issues of the revolutionary Pokémon GO phenomenon. However, research into the nature of this leading augmented reality game is being continued and we sincerely hope that a possible 2nd Edition of Volume I will be able to add new authors, new thought-provoking chapters, new significant findings and many other things that will help to comprehend the Pokémon GO phenomenon in more detail and in greater depth.

Finally, we encourage you to take a look at Volume II of this two-volume book, which explores the most important and challenging issues that have been raised by the use of the Augmented Reality approach and technology in the gamification of education, healthcare, medicine and digital art. Volume II provides the reader with a systematic analysis of educational augmented reality games, their use for health promotion in old age and for improving people's well-being, the gamification of augmented reality art and immersive reading experiences, among other topics. We hope you will be happy to keep reading about augmented reality games and their practical uses as serious games.