

Why serious gaming is more than just a game

The relationship between serious gaming, science and psychology

Whitepaper February 2024

Serious gaming, science and psychology

For whom?

This whitepaper is intended for anyone looking for innovative ways to improve learning outcomes, stimulate behavioral change or conduct research. And for anyone who is already convinced of the power of gaming but struggles to get the rest of the organization on board! This whitepaper explains exactly how and why gaming is a perfect tool for change-related challenges.

'But I'm not into games...'

Perfect! That's not necessary. This whitepaper is not about games, but about serious gaming as a grounded method for research and societal change.

After reading this whitepaper:

- You will understand why serious gaming is more than just 'creating and playing a game' - it is a methodology that can change the way we learn, work, and live
- You will have a better understanding of how serious gaming brings together the worlds of science, psychology, and design
- You will be better equipped to consider the possibilities that serious gaming offers for challenges in your field of work

1. INTRODUCTION

Serious games are games that revolve around more than just entertainment – they are designed with a specific purpose in mind. For example, conveying information or influencing behavior. It's no coincidence that serious games have seen a tremendous rise in various sectors over the past decade, from healthcare to business. Some examples: games aimed at improving therapy adherence in rehabilitation, games for team building, or games for facilitating discussions on challenging topics.

However, the process of serious game development is still unfamiliar to many people. There is often a focus on the end result: a game with a goal, ranging from board games to digital products. The extensive research involved in developing such a game is not always visible. This is unfortunate – because the development process in itself often initiates change. For example, new insights about the target audience frequently emerge during the testing phase.

Designing a game together with the target audience is essentially a form of action research. That's why serious game projects typically involve not only designers and programmers but also researchers. Throughout the process, a lot of knowledge exchange takes place among experts from various fields. Also, it's not uncommon for game designers themselves to have backgrounds as academics, psychologists, coaches, or teachers.

We feel it's time to look beyond the buzzword and end product. What is the value of the game development process, and what psychological principles underpin game design? Organizations like the Lectorate Design Driven Innovation & Serious Gaming of NHL Stenden play a crucial role in answering these questions. And this kind of knowledge now needs to reach a wider audience. At 8D Games, we are committed to contributing to this cause.

We extend special thanks to Boudewijn Dijkstra, Steven de Rooij, Bas Altenburg and Arjan van Houwelingen for their kind cooperation.

Maarten Stevens, Johan van der Meulen en Giel Hekkert

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With cooperation from:



Arjan van Houwelingen is affiliated as a lecturer, teacher trainer, and study advisor at the Creative Media & Game Technologies program at Hanze University of Applied Sciences Groningen. An important aspect of his work is bridging the gap between the industry, research groups, and students, enabling them to collaborate on projects for serious games. As a freelance game author, he develops games both independently and on behalf of clients. In 2015, Arjan founded Het Spellenmaakgilde, which has grown into a nationwide network with testing evenings and a vibrant community. As a board member at SAGANET, he organizes seminars and annually presents the SAGANET Award to the best newcomer within the domain of serious games.

Steven de Rooij - besides being an avid gamer - is a researcher and lecturer in Serious Gaming at NHL Stenden. After completing his studies in Work and Organizational Psychology, he shifted his focus towards learning through simulations and the use of forced feedback cycles to enhance the effect of priming. Over the past years, he has developed the Serious Gaming Lemniscate, which is utilized to gain insights into the development and evaluation of the end-to-end process of serious gaming. His current work focuses on further refining the lemniscate by attempting to implement it as a methodology for students to grasp 'learning to learn' and to foster a better understanding of the entire serious gaming process.





Boudewijn H. Dijkstra is a lecturer-researcher and coordinator affiliated with Serious Gaming education and research at NHL Stenden University of Applied Sciences. Since 2010, Serious Gaming has increasingly become the focus of his work. Alongside colleagues, Boudewijn has been involved in the development of the Master Health Innovation (2015), Master Serious Gaming (2017), and Master Design Driven Innovation (2019) programs. In addition to his role as a lecturer-researcher and coordinator, Boudewijn has been active within NHL Stenden in the field of ICT/edutech advice, project management, and as a project coordinator for practice-oriented research projects.

"Games are as complex as any other form of designed culture; fully to appreciate them means understanding them from multiple perspectives."

- Katie Salen & Eric Zimmerman in the book Rules of Play: Game Design Fundamentals (2003, MIT Press)

With cooperation from:



Bas Altenburg has been working as a game designer and project manager at the serious game company 8D Games since 2019. He develops board games, VR simulations, gamified apps, and everything in between. Through his role at the company, he analyzes complex situations in various sectors (healthcare, education, corporate) and collaborates with end-users to develop solutions for challenging societal issues. His designs have reached hundreds of thousands of players in the Netherlands and beyond. As a project manager, he is involved in international consortia, organizing workshops to promote serious gaming both domestically and internationally. He also enjoys engaging with the gaming community at the local level, participating or judging in the Global Game Jam, speaking at expert sessions, or coaching novice designers.

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2. THE SCOPE OF SERIOUS GAMING

Serious gaming is often associated with the end product: a game with a purpose, such as knowledge transfer or behavior change. But the term encompasses much more. Right at the beginning of the cycle, serious gaming is a strategy to clarify all facets of an issue. And only at the very end of the cycle is serious gaming a final product used to address an issue; the somewhat narrow conception that often reaches the media.

In conversation with Boudewijn Dijkstra, a senior researcher associated with the Master's program in Serious Gaming at NHL Stenden, we outline the true scope of serious gaming. This Master's program – launched in 2017 – focuses entirely on training professionals who conduct research using gaming principles. This educational offering is unique in the Netherlands.

Dijkstra: "At our institution, students learn how to study change-related challenges using a serious gaming strategy. This strategy aims to 'elicit' responses and behaviors by using game interactions. This makes it possible to methodically analyze the issue at hand. Concrete skills addressed here include simulating, observing, and analyzing. Our program is essentially a community of learners. Both the students and the serious gaming industry itself are constantly evolving, in consultation. Human interaction is crucial in this process. Designing change together and methodically studying the process increases the likelihood of a game having a real impact."

> "At our institution, students learn how to study change-related challenges using a serious gaming strategy."

GAMING AS A METHOD

Conducting research using a serious gaming strategy: what does that look like in practice?

Case: Improving communication among employees Client: Company in Friesland, the Netherlands Implementation: Master Serious Gaming - NHL Stenden

A company from Friesland approached the Master's program in Serious Gaming with a common problem: communication among employees was difficult, leading to dissatisfaction and frustration. Could serious gaming solve this?

Teacher Steven de Rooij – colleague of Boudewijn Dijkstra - supervised the master's students who tackled this issue. De Rooij: "The preliminary research by the students revealed that it was actually too early to think about ways to improve communication, because employees struggled to recognize or express frustrations. Both in themselves and in colleagues. And how can you address something you don't even recognize? That brought up a new, underlying problem: how do you teach people to describe something they don't sufficiently recognize, especially if the topic is also 'taboo'?"

"Next up, we simulated and studied behavior and frustration through game prototypes. That's an aspect of serious gaming that doesn't receive much attention. A full-fledged game is tangible and more media-friendly, but it's the prototyping process that also creates a lot of value. Sometimes, a full-fledged game isn't the goal at all, but knowledge acquisition through the process is most important."

This process requires patience and, if necessary, taking a step back. Dijkstra: "People often want to rush to a solution, leading to a quick diagnosis of a change management issue. As a static picture. We have identified this-and-that, now let's make the solution. But when using a serious gaming strategy, the development process with end-users may stir up all sorts of things along the way, changing the perspective on the problem or simply requiring the problem to be peeled back layer by layer."

Case: Ondersteunde Communicatie Game Platform: Android & iOS Client: Stichting Deelkracht Implementation: 8D Games BV Release date: October 2023

Spelend leren over Ondersteunde Communicatie (SOG) is a mobile game for therapists and parents of children with complex communication needs (CCN). The game was developed in two phases: first, a design and research phase with a co-creative approach, followed by the graphical and technical implementation. It proceeded through iterative steps, allowing for insights gained during the creation process.

Giel Hekkert, creative director at 8D Games, was in charge of the research phase. Hekkert: "We went through various sessions with therapists and parents. Initially, the idea was to create a game that would 'teach ACC' to people. However, during sessions with end-users, we discovered that there was a problem behind the problem: there are already many suitable AAC tools, but the barrier to starting to use them is simply too high. Therapists and parents experienced difficulties in choosing from the multitude of options: what exactly would fit their situation?"

"This shifted the original question from 'How can we teach people to use AAC?' to: 'How can we lower the barrier for finding the right AAC tool?' This shift of focus allowed us to develop a game that precisely targets the aspect where we could make the most impact: accessibility."

"We created a cheerful game that quickly engages you on your mobile device, brings joy, and then guides you to more information about specialized AAC tools. We wouldn't have achieved this focus without the sessions involving experts and end-users, where they contributed to the design and thinking process."

These practical examples provide insight into the ways gaming is currently used as a scientific method. However, serious gaming and science intersect in many more ways.





TABLE 1: INTERSECTIONS BETWEEN SERIOUS GAMING AND SCIENCE

Development phases and examples

Based on your expertise, do you have any suggestions or additions to this table? We would love to hear from you! For our whitepaper series, we are always looking for interesting real-world examples.

Please contact us at info@8d-games.nl

Phase			
	Concepting	Development	Implementation
Examples	Scientific research results in a game prototype. The development is approached methodically, and the results are documented and studied.	Testing sessions or co-creation sessions with end-users are utilized to collect data. This can be done with both analog and digital games.	Effect measurement after (long- term) implementation. Are the players learning what they need to learn? Are they exhibiting the intended behavioral changes?
	Design-based research: rapid (game) prototyping to gain clarity about a problem statement. Well- known approaches include design thinking or double diamond.	Studying the (functioning of) game mechanics, level of knowledge transfer, behavior control, and motivation.	Utilization of the game to gain more knowledge about the subject and/or the target audience, for example by attending play sessions or studying gameplay data.
	The game concept arises from well-founded scientific insights. In other words, the game translates theoretical knowledge into an applied product.	Application of motivational theory, game theory, and behavioral theory in game design.	Collaboration between researchers and game developers on the development of new features, based on insights and findings from the implementation phase.

It would be too extensive to explore all these roles and layers of serious gaming in a single whitepaper. Therefore, in the next chapter, we will first zoom in on application of motivational theory, game theory, and behavioral theory in game design. Why do people effortlessly spend hours playing a game, while it can sometimes be challenging to muster motivation for things that 'must' be done?

3. PSYCHOLOGY AND GAME DESIGN

In his book on The theory and practice of Game Design, Richard Rouse stated: "Understanding what is enjoyable about a game experience is not knowledge that can be taught; on some level it must be an innate sense that a designer possesses." Is game design indeed a matter of intuition and talent? Or can and should it be learned by delving deep into behavioral psychology and motivational theory? We asked two experienced game designers: Arjan van Houwelingen and Bas Altenburg.

Arjan van Houwelingen is a board game developer and game design lecturer at Hanzehogeschool Groningen. After obtaining his master's degree in Psychology, he worked for several years as an organizational psychologist and career coach. In his work as a game designer - both as a creator and as a lecturer - all of these experiences come together: "I actually can't choose what I like the most; it's the mix of experiences that works very well. Ultimately, it's all about people and learning from each other." Some of his recent games include Monster Problemen (a board game about poverty for primary schools) and GRUNN (a leisure game about the history of Groningen).

Colleague Bas Altenburg works as a game designer at 8D Games. In recent years, he has observed a shift from fullon digital serious games to offline games. For example board and card games, but also gamified team events. "With an analog game, you have the prerequisite that players are physically in the same space. This provides ample opportunities for game mechanics focused on collaboration and social rewards, which is very interesting especially for serious games." Altenburg designed the board games Om Tafel and AI+Hospital, both intended for use in a professional setting.

> "In an analog game, you have the precondition that players are physically in the same space. This offers opportunities for mechanics around collaboration and social rewarding - and that is very interesting for serious games."

The importance of context

The work of a serious game designer doesn't begin with wild ideas, brainstorming and free associations. After all, a game never exists in isolation. It is played by a specific target audience, who are in a particular place, with either limited or unlimited time, and with or without the assistance of a game facilitator. This so-called 'play context' has many implications for the design and the game mechanics that are possible.

Van Houwelingen: "Roughly speaking, I see three main 'flavors' in serious gaming: games with a prominent learning objective where a game facilitator is present, variations with a lighter learning objective that are playable independently, and – at the other end of the spectrum – complex simulations with a pronounced learning objective that are playable independently, such as flight simulations for pilots. It's obvious that the latter form requires a huge budget, while the other variations are accessible to many organizations and companies."

"I myself have mainly developed board games with an educational twist that are playable independently," says van Houwelingen. "An example is Monster Problemen, a card game for primary school-aged children about poverty, developed in collaboration with Robert Brouwer. If you want children to be able to play independently, it really has to be fun and easy to start with. No complicated gameplay, but intuitive play based on what children already know. For example, Monster Problemen challenges children to connect different colored Monsters – representing different problems – with suitable solution cards. It sounds basic, but it works. Children immediately engage with the content in such a game. They make connections and articulate them to their classmates. It's learning in a very broad and active way."

Serious board games that have a more prominent learning objective often come with a game facilitator. This allows the designer to delve deeper into the learning objectives and implement more complex gameplay.

Altenburg: "The board games I've designed in collaboration with domain experts and master's students in Serious Gaming were aimed at adults from specific professional groups. With such target audiences, you often see that intrinsic motivation is already in place. They want to learn, and they especially want to delve deeper into the subject at hand. In such cases, a game with a facilitator is a good choice. The facilitator explains the gameplay and can adjust course based on the players' knowledge level and preferences as the game progresses. Additionally, it's valuable to empower the facilitator to engage in post-game reflections with players. This helps ensure that participants really

internalize what they've learned." However, serious games with facilitators still have their own practical limitations that a game designer must take into account. "This mainly concerns the available playtime," says Altenburg. "How much time does the facilitator have to set up the game? Does it need to be played quickly, for example during a lunch break with colleagues? Or is the game intended to be played for two hours at a leisurely conference? These are all factors that influence the mechanics and gameplay you can implement."

Theory during the design process

Suppose the play context is clear. Do you start off your design based on knowledge of human behavior? Or is it a more creative, intuitive process? In other words, is there a merit to Richard Rouse's words? Van Houwelingen: "Initially, I don't start 'by the books'. Designing a game is more of a creative and intuitive process for me. Theory and frameworks mainly help me to interpret or understand why a game turns out the way it does. For example, I find the Quantum Foundry Gamer Motivation Model a useful tool to gain insight into different motivations of different types of players. Additionally, there's motivation theory - and as a psychologist, I have experience with human behavior. But that knowledge doesn't necessarily sit 'at the forefront' of my mind when I enter a creative process. My work as a game designer is much more about intuition and observation during user testing."



Box 1: The Quantic Foundry Model

The **Quantic Foundry Gamer Motivation Model** was developed by Nick Yee and Nicolas Ducheneaut, the co-founders of Quantic Foundry, a research firm focused on understanding gamer motivations and behavior in the context of video games. The model was first introduced in mid-2016.

The model classifies players based on various motivation categories, including:

1. Achievement. Players who are motivated by achieving goals, winning, and improving themselves.

2. Exploration. Players who enjoy exploring new worlds, stories, and gameplay possibilities.

3. Social. Players who primarily enjoy interaction with others, such as collaborating or competing with fellow players.

4. Self-expression. Players who use games to express themselves and realize their own creative vision.

5. Destruction. Players who derive pleasure from chaos, destruction, and conflict in games.

6. Immersion. Players who immerse themselves in the fictional worlds of games and experience strong emotional engagement.

7. Power. Players who enjoy control, leadership, and influence in the game world.

Altenburg follows a similar approach: "In the concepting phase, my focus is on creating a fun game, not on applying formal psychological theories. However, 'what makes a game fun' can often be traced back to motivation theory. Think about stuff like: being able to make choices, feeling productive, seeing your progress and trusting you'll achieve the goal eventually. These are aspects of self-determination theory that I may not consciously focus on during the design process, but they do arise from my desire to create a game that people genuinely want to keep playing."

You could question whether 'not forcing' the application of theory - and yet successfully integrating that theory simply means that you have successfully internalized all that theoretical knowledge. After all, an essential condition for creativity is the ability to combine or apply existing knowledge, experiences or skills in new and original ways. Serious game designers excel at this. And moreover, they constantly test theory (design) in practice (playtests). However, another similarity between Altenburg and Van Houwelingen is... modesty! They themselves don't find this skill particularly remarkable, or sometimes consciously try to avoid unnecessary embellishments.

Van Houwelingen: "The strength of game design often lies in simplicity, especially when creating something for a target audience that may not have much "The strength often lies in simplicity, especially when creating something for a target audience that doesn't necessarily have a lot of experience with games."

experience with games. Then you're best off tapping into the associations they already have. Think about scoring points or adding randomness with a dice; such simple interventions already accomplish a lot. Feature creep – making a game too complex – is always a risk."

Altenburg: "Perhaps the same applies to 'over-theorizing' game design, especially early in the process. Then there's this tendency to cram everything in, while ultimately the most important thing is to see how your game turns out in practice and learn from that."

FIELD OBSERVATIONS

Both Altenburg and Van Houwelingen enjoy testing their designs with the target audiences. And if something has become clear over the years, it is that each playtest yields surprising knowledge and results. No game and no session are the same, because it involves people. Yet, there are some recurring observations that both game designers recognize. Are people perhaps a bit predictable after all?

1. Children require something different than adults

Children love randomness and novelty

Van Houwelingen: "Children often love randomness in games. Stuff like rapid changes in gameplay based on luck, such as rolling dice. They enjoy it when something new and unpredictable happens continuously; it keeps their attention. That novelty is sometimes found in the form itself – at school, for example, the fact that they get to use a game instead of a textbook. Take Monster Problemen, for instance. Its gameplay is quite simple, but the excitement of discovering those cards – which ones are there and how do they work together? – naturally engages children. Altenburg enjoys incorporating elements that activate and stimulate children's creativity: "I like to include activating and creative elements for children, such as challenging them to write or draw something fun for a challenge, or asking them to sprint on the schoolyard. This can also work very well with digital games, especially when there is a game facilitator. You can then do fun things with offline play and online rewards. An example of this is Missie Master, a hybrid game we created in collaboration with Sportbedrijf Drachten."

Adults appreciate having a sense of control (and they are a bit scared)

With adults, Altenburg often encounters some skepticism when they are asked to give a serious game a chance. "Adults often need a little push to embrace playfulness – deep down, there's usually a voice saying: this isn't useful. However, that always changes once they've played

> "Children often love randomness in games: quick changes in the course of the game based on luck, for example, by rolling a dice."



Box 2: Self-Determination Theory and the 'Theory of Fun'

The **Theory of Fun** and the **Self-Determination Theory** are concepts from different disciplines that complement each other in the context of game design and human motivation.

The Theory of Fun, primarily developed by game designer Raph Koster, focuses on the nature of enjoyment and why people enjoy games. It emphasizes the idea that games are appealing because of the learning process they offer. According to this theory, games tend to be enjoyable because they challenge players and enable them to acquire new skills in a safe, challenging environment.

On the other hand, the Self-Determination Theory – developed by Deci and Ryan – focuses on human motivation and posits that people are intrinsically motivated when they experience a sense of autonomy, competence, and relatedness. Autonomy refers to the feeling of control and freedom of choice, competence relates to the sense of ability and effectiveness, and relatedness pertains to social interactions and relationships with others. the first level. The skeptical types can suddenly become the most enthusiastic players. That's when you know it's been successful."

This aligns with Van Houwelingen's experiences: "In my experience, adults enjoy making strategic decisions – they want to see that their actions influence the course of the game or that they improve in some way. For them, it's more about practicing skills and mastering the situation. There's often more emphasis on skill mastery and less randomness, but a bit of both is always necessary to keep the game interesting."

Altenburg adds: "Perhaps there's also a sense of comfort in it, the feeling of exerting influence or making progress through effort. That's simply not always the case in real life. Or it's a very long and abstract process that's difficult to notice. Duolingo does this, for example, in the realm of language learning, which is a long-term process. You know that if you practice every day, at least you'll get that streak or badge – even if you're far from mastering the language perfectly."

2. Use anticipation and curiosity (instead of building a dopamine jackpot)

The choice between 'randomness' and 'skill' is not an either-or situation, according to Van Houwelingen. Rather, a bit of uncertainty about the outcome "A bit of uncertainty about the outcome is what makes us experience playing as fun and engaging."

ensures that we experience play as enjoyable and engaging: "Experiments show that anticipation of a reward triggers a dopamine boost - not the moment of reward itself. A 50% chance of a reward maintains motivation at its highest: maximum uncertainty. But it shouldn't lead to chaos, too little sense of influence, then the game becomes frustratingly boring."

The perfect balance between uncertainty and reward brings along ethical dilemmas. After all, this is also the mechanic that unhealthy, addictive games and apps attribute their success to. Van Houwelingen: "I prefer to use these effects to stimulate healthy curiosity and playfulness, not to design a compulsive gameplay experience. And ultimately, as a player, you benefit much more from an intrinsic experience than from that dopamine jackpot. Especially when the experience is shared with others."

An example of this is Van Houwelingen's game GRUNN, developed with colleague

Robert Brouwer for the National Program Groningen. At its core, it's a puzzle and collecting game that challenges players to delve into the history of the Groningen landscape and visit museums. Scenario cards – available at the participating museums – are used to influence the course of the game.

Van Houwelingen: "I did wonder beforehand how long the game would remain engaging. It's just collecting and puzzling with cards available at different locations. But the game is very popular; the participating museums increasingly need more cards. I think it's mainly about curiosity and anticipation. People keep wondering: 'What's behind the hill?' You can harness that human tendency to want to keep playing for healthy goals – in this case, discovering and learning in the province of Groningen."

3. Players of all ages have a need for connection

The beauty of board and card games is that you play them together with others, according to both Van Houwelingen and Altenburg. This offers various educational benefits. Collaborative learning is seen as beneficial for performance and selfefficacy from cognitive developmental theories. Moreover, it also addresses a thoroughly human need, namely the desire for connection. Van Houwelingen: "When testing Monster Problemen, we saw that many children clearly didn't prioritize competition. Instead, they would help others who had more difficulty connecting the Monsters to the correct solutions. This social aspect is very important and is highlighted in analog games. You are physically close to each other, which makes it easier to articulate your thoughts and considerations about the game. And that contributes to internalizing the knowledge you gain from the game."

No matter how many 'dopamine hits' a game may contain, it does not compensate for a lack of connection, thinks Van Houwelingen. "Some time ago, Mark Zuckerberg of Facebook developed an application that was perfect from an educational perspective – but it nevertheless became a complete failure, because there was no sense of connection or social aspect implemented in the design. That feels very lonely for people, no matter how good the setup of personalized learning otherwise was."

Altenburg also emphasizes the importance of the social factor in serious games: "Just like Arjan, we always work together with the target audience. This quickly filters out all your assumptions. For example, one of my colleagues worked on a game about sexuality and pregnancy for Eritrean newcomers in the Netherlands; one of the motivations for this game was that there is a lot of shame in this group about discussing such matters. But when presenting the game concepts, one thing became very clear very quickly: participants wanted to be able to play the game as a group. We hadn't expected this beforehand, precisely because of that shame. Even the most sensitive topics seem to become perfectly discussable when placed in a gaming context. Especially when you attach sensitive issues to fictional characters with whom players can identify. This allows players to share experiences through these characters, instead of talking directly about themselves."

"In a gaming context, it's easier to discuss sensitive topics – especially when they are attached to fictional characters with whom players can identify."



4. CONCLUSION

In this whitepaper, we provided insights into the many facets of serious gaming. Serious gaming is not just a finished product, but also a thorough research and change strategy. The field has educational offerings at the master's level and is increasingly well-documented and studied. Design, science, and psychology intersect within the game development process. This presents opportunities!

Furthermore, we outlined why gaming works the way it does. Above all, we discussed how much knowledge of human behavior is actually involved in designing a game. Game designers translate – often unconsciously – motivation theory from psychology into practically applicable game designs. These designs are extensively tested in practice. Thus, new interdisciplinary theories about human behavior – and all the ways in which this behavior can be influenced through play – gradually emerge.

Serious gaming is applicable to anything that affects people. Therefore, it is a fantastic tool for examining and solving the challenges of our time. It's not about being into games. It's about change!



And now? What does this mean for you and your field of work? What possibilities do you see? For our whitepaper series, we're always looking for inspiring experts with ideas about the application of serious gaming—both as a change strategy and as a final product.

Input is welcome via *maarten@8d-games.nl*. Together, we'll give serious gaming the place it deserves. In healthcare, research, the social domain, the business world - **gaming is here to stay.**

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