

# LEARNING MECHANISM IN GAME TUTORIALS – FOR ENTERTAINING GAMES

Bachelor`s thesis in Informatics

Oscar Nilsson  
Mathias Ruuska  
Carl Sjösten

2023KANI03



UNIVERSITY  
OF BORÅS

**Title:** Learning mechanism in game tutorials - for entertaining games

**Year:** 2023

**Author:** Oscar Nilsson, Mathias Ruuska, Carl Sjösten

**Supervisor:** Gideon Mbiydzennyuy

## **Abstract**

Investigating the crucial elements in game tutorials that have a significant impact on users' learning experience is fundamental to understand and improve game tutorials. By examining factors that could influence the players' learning, it's possible to find valuable information to enhance the learning process in gaming tutorials.

The primary goal of this study is to improve game developers' understanding of how people interact with entertaining games and gain knowledge from them. This can provide valuable information that can be used for possible improvements in future game developments.

The study focuses on the two most popular video game tutorials and tries to identify underlying factors that might promote or hinder learning. The research evaluates how effective these games are in relation to existing theoretical learning frameworks. The study includes interviews and playing simulations with 15 new players and the information is used to analyze their experiences to determine when the games either hindered or contributed positive learning behaviors. The analysis involved the use of both qualitative and quantitative research methods.

The research concluded that none of the chosen games used a tutorial that was well-designed or optimized. Although one game performed better than the other, both tutorials were too basic and did not allow the user to utilize an effective learning method. To encourage a player to learn more, a tutorial should act as a motivator, inspiring them to discover new ideas, knowledge, given the option to repeat game instructions, utilize different learning styles and guide them into making right decisions through captivating visual illustrations.

How effective and informative a game tutorial can be is limited by the tutorial resource requirements for the game. To understand the game in an effective learning way, the constructed tutorial guidance system must understand the users' weaknesses and direct them towards the best path to learn.

**Keywords:** Learning, Entertaining Game, Serious game, League of Legends, Overwatch, Tutorials, Artificial Intelligence.

## List of Figures

Figure 1: Kolb's four distinct learning cycles

Figure 2: Game layout.

Figure 3. League of Legends motivated interview questions.

Figure 4. Overwatch motivated interview questions.

Figure 5. Results League of Legends Observation.

Figure 6. Results Overwatch Observation.

# Table of Contents

<b>1. Introduction</b> .....	3
<b>1.1 Games and Tutorials</b> .....	3
<b>1.1.1 Human Strategy</b> .....	4
<b>1.2 Statement of problem</b> .....	4
<b>1.3 Research question</b> .....	4
<b>1.4 Purpose of study</b> .....	5
<b>1.5 Target group</b> .....	5
<b>2. Theory</b> .....	5
<b>2.1 Coaching system</b> .....	5
<b>2.2 Machine and human Learning</b> .....	6
<b>2.3 Layout to construct a game tutorial</b> .....	6
<b>2.4 Fundamental AI functions in games</b> .....	7
<b>2.4.1 Decision making</b> .....	7
<b>2.4.2 Strategy</b> .....	7
<b>2.4.3 Self-Learning</b> .....	7
<b>2.4.4 Goal setting theory</b> .....	8
<b>2.4.5 Risk taking and avoiding negative consequences</b> .....	9
<b>2.4.6 Just-in-time &amp; on demand</b> .....	9
<b>2.4.7 System thinking</b> .....	9
<b>2.5 Human learning style</b> .....	9
<b>3. Methodology</b> .....	12
<b>3.1 Selection of theoretical basis</b> .....	13
<b>3.2 Selection of respondents</b> .....	13
<b>3.3 Interview questions</b> .....	14
<b>3.4 League of Legends and Overwatch observation questions</b> .....	17
<b>3.5 Data Analysis</b> .....	19
<b>3.6 Game Selection</b> .....	19
<b>3.6.1 The game League of Legends</b> .....	20
<b>3.6.2 The game Overwatch</b> .....	21
<b>3.6.3 Heroes and roles</b> .....	21
<b>3.8 Ethic</b> .....	21
<b>4. Empirical Evidence</b> .....	22
<b>4.1 Interview questions result</b> .....	22
<b>5. Theoretical result</b> .....	29

<b>5.1</b>	<b>Self-learning systems</b> .....	29
5.1.1	League of legends .....	29
5.1.2	Overwatch .....	30
<b>5.2</b>	<b>Risk taking</b> .....	30
<b>5.3</b>	<b>Avoiding negative consequences</b> .....	30
5.3.1	League of Legends .....	31
5.3.2	Overwatch .....	31
<b>5.4</b>	<b>“Just-in-time” &amp; “On demand”</b> .....	31
5.4.1	League of Legends .....	31
5.4.2	Overwatch .....	32
<b>5.5</b>	<b>System Thinking-Goal setting theory</b> .....	32
5.5.1	League of Legends .....	32
5.5.2	Overwatch .....	32
<b>6.</b>	<b>Analysis and Discussion</b> .....	33
<b>6.1</b>	<b>Self-learning systems</b> .....	33
6.1.1	League of legends .....	33
6.1.2	Overwatch .....	34
<b>6.2</b>	<b>Risk taking</b> .....	34
<b>6.3</b>	<b>Avoiding negative consequences</b> .....	34
<b>6.4</b>	<b>“Just-in-time &amp; ”On-demand”</b> .....	35
6.4.1	League of Legends .....	35
6.4.2	Overwatch .....	35
<b>6.5</b>	<b>System thinking and Goal Setting theory</b> .....	35
6.5.1	League of Legends .....	35
6.5.2	Overwatch .....	36
<b>6.6</b>	<b>Observation questions discussion</b> .....	37
<b>7.</b>	<b>Conclusion</b> .....	40
<b>8.</b>	<b>Future Research</b> .....	41
<b>9.</b>	<b>References</b> .....	42

# 1. Introduction

## 1.1 Games and Tutorials

Entertaining computer games has been existing since the invention of the first physical computers. Back then, games were often very basic because the computers had limited processing capabilities. As a result, players could more easily understand the game mechanics due to their simple nature. Precision and timing were instead often the most important factors that made a player stand out from others. (Baer 2015)

As time moved on, new games emerged with more complex elements. Understanding how to play the games became significantly harder and some sort of tutorial had to be constructed to illustrate the fundamental functions for the game. In the present, games have now reached an incredible level of complexity, where the limits of elements and functionalities are only determined by the user's ability to understand the game. The actual steps a player takes to succeed in a new game are frequently seen as uncertain process. Most game developers are, however, utilizing some sort of tutorial system that instructs players how to learn the game mechanics in order to better succeed. (Andersen, E, *Et al*)

A tutorial works as a tool to help someone learn the system by offering support and guidance. Tutorials can take many different forms, ranging from giving instructions, completing tasks, and interacting in problem solving environments. In the field of computer-based education, tutorials are specialized that help users navigate the system. There are three different kinds of software tutorials, video tutorial, interactive and webinar with real-time lecturing. (Department of Computer Science & Engineering 2012) This study will focus on interactive tutorials used specifically in entertaining games.

Software tutorials can be used as an effective learning tool because they utilize different forms of media as illustrative tools.

The multimedia principle is a supported research concept that concludes people tend to learn better when they are presented with new information using the combination of both words and pictures (Mayer & Anderson 1991)

This derives from the dual channel theory which explains how pictures and words get processed separately but also simultaneously in the brain. The brain can convert this information to any of the channels. This means that words can be converted to pictures and pictures to words. Computer tutorials can make it possible to illustrate new information from media channels into complex understandable illustration. This expands the multimedia principle in even moare ways to improve people's learning. (Mayer & Anderson 1991)

The rapid evolution and success of video games stems from their improved ability to provide increased entertainment experience to the users. (Nabi & Oliver 2006)

Games have an impressive capability to combine education and amusement. These activities are often referred to as “serious games” where the main goal is to acquire useful educational knowledge with the help of the game environment. (Amroy, naicker, vincent & Adams, 1999)

The perception of gaming in society has undergone a significant shift in the last decades, recognizing the many benefits it can offer as an entertainment tool. Gaming is no longer seen

as a pointless activity, but rather as a tool to encourage personal growth and a sense of belonging to a community. Games can play a big part in many lives as it connects them with hundreds of millions of people around the world. According to another study made by (Medieutveckling, 2015) 98% of boys and 97% of girls aged 9 - 12 played computer games. This indicates that the use of computer games is becoming a part of everyone's life for the younger generation. As games become more popular, it raises the question how they affect the people who play them.

Modern games use tutorials to teach new players the fundamentals of the game. These tutorials play a big role in how successful the game will be since the game can only be liked and appreciated if it's understood correctly. A well-thought-out tutorial system should therefore be considered to maximize the users' understanding of the game.

### **1.1.1 Human Strategy**

Humans and computer artificial intelligence both use various learning methods to gain new knowledge and skills to overcome obstacles. In human history, we have relied mainly on books and spoken instruction to learn new information. This all changed in the 20th and 21st centuries when modern learning techniques reached new heights. (Warschauer 2007)

The development of new technology such as computers, smartphones, and the internet, has opened new opportunities for learning. One area of this is video games, which allow individuals to acquire new skills in a different learning environment. A study by the University of Rochester in New York found that gamers have significantly better room awareness than non-gamers. This enabled them to keep track of many objects in complex situations. These skills are not typically taught in traditional educational settings, but they are equally as important. The Gamers who played action-based video also demonstrate a unique ability to quickly develop strategic approaches when they are faced with new challenges under pressure. (Bavelier 2014)

## **1.2 Statement of problem**

Interactive tutorials have become increasingly popular in video games to improve players' understanding of game mechanics. Game developers create tutorials that are tailored to their specific game design and functionality. However, human learning is a complex process, and when combined with the importance of also enjoying the game, it might get compromised. This raises the question if entertaining games tutorials follow established frameworks that aim to improve the player's learning experience fully. Therefore, it is important to further explore the factors that could contribute to the effectiveness or ineffectiveness of interactive entertainment game tutorials. The result can help in developing more impactful and effective educational learning experiences for gamers.

## **1.3 Research question**

What are the key factors that affect the players' learning through interactive tutorials in the video game Overwatch and League of Legends and how can they be improved to increase learning?

## **1.4 Purpose of study**

The purpose of this study is to examine how effective interactive tutorials act as educational tools in two of the most popular video games. From this we hope to identify key factors that contribute to their success or failure.

The goal is to offer a deeper understanding on how interactive tutorials can be designed and used to teach players new skills and knowledge more effectively. This information can be valuable for game designers, educators, and researchers who are interested in using games and interactive tutorials as an educational platform. By understanding the key factors that contribute to the effectiveness of interactive tutorials, it may be possible to design more engaging and effective learning experiences for players, which could have a positive impact on their learning outcomes and enjoyment of the game.

## **1.5 Target group**

The research target group is mostly directed to assist game developers improving their game tutorials, specifically relating to the entertaining games genre. While it already exists many recommended methods to improve learning in serious games, this research hopes to transfer some of these methods to the entertaining games industry.

This paper will also be useful for researchers who want to explore human learning within entertaining games. The study will provide findings on how games affect human learning and analyse the factors that might influence it.

## **1.6 Delimitations**

During interviews and play simulation, personal learning styles from the players will not be considered. Instead, the players will be viewed as a random user playing the game. Their performance and answer will be used as the main reference to see how well game tutorials are performing and not regard the individual learning style. Learning styles will instead later be investigated as a possible factor that affected the player's performance once the data is collected. We hope from this to find interesting correlations that can be further examined in a future study.

# **2. Theory**

## **2.1 Coaching system**

The most important function of a tutorial is to assist the user in making correct decisions so they can create viable strategies while solving the problems faced. It's possible to achieve this by developing a successful coaching system that actively coaches and gives the user feedback. For a computer coaching system to be effective, it must be able to determine the correct moment to pause the tutorial and what message to display during this interruption. (Burton & Brown 1979)

To achieve this outcome, it is crucial to implement technology that can actively evaluate the user's knowledge during the tutorial. This knowledge must be done in real-time since the computer does not have access to any older data for analysis. Instead, it must extract data from the players ongoing performance and mistakes they make in the game. Interpreting this



information correct can however be proven to be difficult due to the binary nature of many variables involved. If a player for example does not use a certain ability, the computer could assume that they were not aware of its function. The player was however in reality intentionally avoiding using it for strategic purposes. To overcome this issue, computers must identify the user's weaknesses in the game well by understanding their actions and decisions and see if it was intentional or a knowledge gap. (Burton & Brown 1979)

## **2.2 Machine and human Learning**

Comparing how humans and computers learn can give some insight into the unique benefits of computer learning and how tutorials can potentially benefit from this. Good human learning is a slow process that can take years to develop. Unlike humans, machine learning methods are highly efficient and precise. Complicated formulas and equations can be difficult for humans to commit only to memory, and many times memorization is not always necessary to achieve effective learning. Remembering and understanding complex methods requires a high mental activity, which humans often struggle with. Instead, we often use computers to store step-by-step procedures and rely on our own memory to navigate through the programs. (Kao, Y-K & Venkatachalam, R 2021)

Because human learning is slow and limited, computer learning machines can be used to improve our ability to learn in important areas. How the computers should be programmed and what functions should be prioritized are future interesting questions that could improve future machines learning interfaces. (Spronck, Ponsen, Sprinkhuizen-Kuyper & Postma 2006)

Another human limitation is that we cannot always replicate a memory perfectly. Even when trying it's not guaranteed that the information will be understood correctly. Computers can however once they have a working algorithm, easily make many copies and share the knowledge without any limitations and mistakes. (Carbonell, Michalski & Mitchell 1984)

## **2.3 Layout to construct a game tutorial**

To understand entertainment games and how it can be used to improve its learning tutorials, it's important to take advice from the similar field, serious game. Serious games are carefully made with interfaces that help the players' needs that help create an optimal learning experience. These games have guidelines in the game development process where it must reach certain aspects of learning. The principles of serious games require the acquisition of skills and knowledge, encouraging players to adopt new behaviours and providing motivational support throughout the game. By using these elements in the game design, players are not only entertained but also encouraged to improve their learning abilities. (Connolly, Boyle, MacArthur, Hainey & Boyle 2011)

Connolly argues that it can however be difficult to find which elements of games contribute to its success and it's generally hard to prove where games are effective in learning. Unfortunately, there is currently not enough research within the field how games promote personal learning behaviours. Backlund and Hendrix note that the reason for this might be from the practical barriers game learning gives. Implementing such systems requires investing resources in educating teachers and providing suitable materials, which can be economically risky. Based on this, accurately measuring the effectiveness of games as learning tools requires significant investments and extensive reforms will be needed within the educational system.

Every game is unique and utilizes its own set of gameplay mechanics that determine the rules and gameplay. A game can use various methods, such as images, actions, dialogues, and personal experiences to teach and demonstrate its mechanics beyond just using words.

The ability to understand texts is not only based on the literal meaning of the words, it also involves the interpretation a person makes based on their experiences. This is a process that is generally referred to as the text principle. This principle is an important element when a user is trying to understand the gameplay of a video game. During the game, a unique textual understanding is achieved which determines how well the learning process within the game is managed. Games provide a more entertaining environment that can increase the user's involvement and engagement which can further improve their overall experience.

A successful game tutorial can from this use the text principle to make the players understand the rules and story of the game without reading it in detail, also known as intertextual reading. (Feldmesser, K 2009)

## **2.4 Fundamental AI functions in games**

There are many different functions that make up a computer game. Many of these parts can influence the player's decision making and interaction. A game's artificial intelligence (AI) system can play a big role in the player's learning process. This comes from the unpredictability AI has on the player. (OpenAI 2017)

### **2.4.1 Decision making**

In modern entertaining video games, characters usually have a wide range of options available to them. These options might include attacking enemies, hiding, using special abilities, restocking ammunition, retreating from danger, staying in one place, and many others. Once a decision is made, the game will execute the input through a sequence of movements and animations to the player.

When it comes to the AI decision-making mechanisms in games, most of them rely on true or false conditions. This approach is preferred because it is easy to implement and reduces the risk of potential failures or errors in the system's decision-making. (Millington & Latham 2009)

### **2.4.2 Strategy**

In many games, having a functional AI opponent requires only movement and active binary decision-making. However, if you want the computer to control a group of enemies to reach a common goal, you need a sophisticated AI called strategic AI. This strategic aspect can refer to enemies working together, such as surrounding or flanking your character. Each enemy character has its own movement and decision-making capabilities, but they are all guided by a collected group strategy. A good example of this can be seen in the game Overwatch [Blizzard Entertainment, Inc., 2016] The computer enemies are united by a shared objective: to eliminate the player while defending a specific location on the map. Even when each enemy uses individual movements and decisions, they are constantly influenced by the strategy AI, which creates coordinated play mechanics. (Millington & Latham 2009)

### **2.4.3 Self-Learning**

AI has the potential to impact an individual's learning ability and technique by constantly challenging the player. An example of this is through OpenAI where a program was developed

and managed to win over several professional players. This is considered a major step within self-learning because the program taught itself how to play and build strategies by simulating millions of games. (OpenAI 2017)

When it comes to self-learning programs in games, it is very important to have clear and specific guidelines. If a program is constructed to learn on its own, it may end up learning things that are not relevant or not competitive. This could result in the game being too difficult or the program focusing on the wrong objective. Being very careful when defining the parameters for learning is the best way to ensure that the program performs at its best. (Millington & Latham 2009)

Self-learning in games helps the user to get a more adaptive and flexible gameplay interaction with the computer. It can make the player more active in the game and with the variation of gameplay it can enable better learning behaviours.

#### **2.4.4 Goal setting theory**

A game can influence a user's learning process with the help of self-regulation. This is the process when the main goal of the game gets compared with a player's performance. This allows the user to better understand how well he is doing in the game and what things need to be improved. (Locke 1968)

The goal setting theory is a motivational theory that explains how goals can be made to increase any personal performance. According to this theory a person's motivation to learn new things and understand it better can get improved if there is feedback of progress towards a certain goal. (Ambrose and Kulik 1999).

Some goals can however be less effective. A thoughtful and realistic design of the goal is necessary to keep it useful. To maximize outcomes, the framework SMART goals which breaks down to specific, measurable, attainable, realistic, and time bound goals can be used to create a goal. (Doran 1981)

There are examples when a goal is set according to the recommended guidelines and instead promotes a decreased learning behaviour. A goal setting attitude can encourage incorrect behaviours when for example a student focuses on getting the maximum points on the test. The most obvious alternative is for the student to cheat, and this seems like a valid option according to the SMART goal setting. The goal will still be accomplished but the main point of the goal which was learning was lost in the process. To avoid this problem, a goal should only be set if the reason is to learn something in the process. (Seijts and Latham 2005)

In games the goals and rules need to be understood clearly so the user can start learning effectively. The goals and rules must still be relatively interesting so the player can stay focused in reaching the main goal. Garris notes that the goals also must be flexible, so the players have a range of options when playing. It's the flexibility in the rules that enables the players' learning process and creates unique play styles for each individual. Garris et al. (2002) Rules and goals directs the player to act and behave according to what they are allowed to do. It can influence particular learning behaviours and attitudes that are relevant in order to learn the game. When playing the game, it's still important that the player feel that they are following the set rules and goals willingly. This removes the learning pressure and helps the player feel entertained while learning new things.

### **2.4.5 Risk taking and avoiding negative consequences**

In general, a good and enjoyable game encourages players to take risks. Risks are important so the players are willing to explore more and face new game interactions. This is however only practical if the consequences for failing are not too severe. Not falling too much behind the enemy when dying and not having to restart a whole level for example, helps the player to keep exploring. Using feedback from previous failures is a fast and effective way to encourage learning. As a result, players can understand how the enemy operates and develop effective countermeasures to avoid the mistake.

An article written by the International Journal of Computer Games Technology also states that an important factor for success when people are learning new things is to avoid negative consequences in the game, because of low performance. It can discourage the players to interact with the game due to its relation with a negative psychological effect. (Laamarti, Eid, Saddik, 2014)

### **2.4.6 Just-in-time & on demand**

Game tutorials are typically created so that the player isn't presented with too much information at once, as too much data can cause confusion.

Therefore, tutorials are constructed so that the player gradually learns and can focus on one concept of the game at a time. When choosing the order in which these situations and problems will be illustrated to the player it should initially not be based on the perceived difficulty. Instead, it is crucial that the situations and problems are designed to guide a player to discover and practice patterns and generalizations regarding different skills and strategies. These generalizations should be useful both for playing the game and as a basis for when encountering more difficult situations and problems. (Gee 2003)

### **2.4.7 System thinking**

System thinking is explained as the game encourages the player to think of actions and their consequences and not just isolated events, facts, and skills. It is important that a game brings attention to this so that a player can adapt to different situations and strategies as the game progresses. (Gee 2003)

## **2.5 Human learning style**

Humans learn and solve problems in different ways and understanding a person's learning style can play an important role when developing a game or tutorial.

The term learning styles covers a broad spectrum of definitions and in order to better identify the term, it's been widely recognized to use it as how an individual perceives and processes information in different learning situations. (Brown, 2000)

The concept of human learning styles has been documented comprehensively in many theoretical models. They all map a unique preferred way an individual approaches a learning situation or task. The number of existing frameworks can cause great confusion as to which is the most suitable to use for each learning environment. Because of this, (Cassidy, 2004) argues

the best option is to find the most appropriate type of learning style by comparing existing frameworks and using what they all have in common. Incorporating all available learning styles may result in an excessively broad research scope and undermine the accuracy of the data. (Cassidy, 2004)

Due to the large quantity of learning style frameworks available, we have chosen to prioritize reliability by focusing only on the most commonly used ones in academic literature. A recent study was made comparing 415 articles on which learning style framework was preferred to use in Health Science Education. The results showed that VARK was the predominantly used one followed by Kolb Learning Styles. (Childs-Kean, L, Edwards, M. Smith, D, M. 2020)

This correlates with (Abrea, A, C 2021) paper on Learning Styles and Preferred Learning Modalities where it is stated that researchers often utilize the VARK model as their primary framework.

The type of learning style a person has can influence how they handle tasks and various issues society brings. An example for this is the interaction with new technology. Some might understand it by reading the instructions alone from start to finish while some prefer a trial by error which might be pressing different controls in order to learn what their function is. (Murphy, Tay, 2017)

Entertainment games are typically not designed with a particular learning style in mind and are usually firstly created to appeal to a specific group of people who enjoy playing the game. Understanding the game mechanics is something that comes when playing and in this process, it needs to be balanced with a moderate amount of support and help. For new players in a game, support can be given by providing small hints in the form of picture, voice or text. This support is often given in a careful and discreet way to not discourage the player to find the solution. It's important to avoid being too helpful and not give the answer directly as this can discourage the players' engagement and will to play. (Becker. 2005)

Maintaining a highly engaging game is important as it might broaden the spectrum of different learning styles. (Malone, 1981)

#### **2.4.8 Learning style: The VARK model.**

VAK is a learning model that categorizes people into three different kinds of learners, visual which absorbs information best by sight, auditory which absorbs new information using sound and kinaesthetic that absorbs new information by touch. (Huda, 2015)

This model was later in 1992 expanded into VARK by (Fleming, Mills, 1992). which includes an additional learning style learning style, read/write. The learning style includes people's preference of learning something by taking notes by writing or reading.

Fleming, who is the creator of the VARK model, believes that it's important for an individual to focus more on sensory outputs and inputs to improve the learning process instead of responding to the situation directly through experience. (Fleming, Mills, 1992).

Research with the VARK model has been widely used where (Rambe, Zainuddin 2014) proved Fleming's model to be correct after observing significant improvements in the students' writing by implementing the proposed learning styles into his teaching.

#### **2.4.9 Learning: Style Kolb's Model.**

A person's success in understanding new information does not only depend on its skill and talents, but the types of learning styles also used plays a crucial role in this process. (Kolb, 1984).

Kolb developed a 4 stage-model still used today which recognize students have a 4-way learning cycle followed by 4 separate learning styles.

The cycle includes concrete experiences which is the process of doing something yourself to learn. The second stage is reflective observation which is the act of reflecting and reassessing one's thoughts to gain a deeper understanding. The third stage is abstract conceptualisation and is the process of trying to put everything learned into already existing knowledge. The last stage is active experimentation and is the process of putting everything into practice.

The 4 separate learning styles in this model, starts with Divergers which are individuals that practice a unique method of learning by observing and using their hands to face the problem. They enjoy to fully immerse themselves in the subject by discussing various phenomena with others through open reflections. By working together and sharing their experiences, they often gain a more profound and complete understanding of the subject.

Accommodators is a feel and do learning style that prefers to solve problems using a trial by error approach. Active participation in practical work is often preferred over passive listening.

Assimilators is characterized by a learning style that involves thinking and observing. They often approach a problem from a different perspective to discover a new way of understanding the subject.

Convergers is a think and do learning style category where learners prefer to first tackle the problem with a conclusive understanding before any direct practice is used. (Kolb, 1984).

According to (Kolb and Kolb, 2005), these 4 learning styles get implemented continuously in a unique order during a student's learning experience. When they are used, and which order is what determines a student's individual learning style.

As seen on figure 1, the learning cycle is restarted from the centre of the axle when a new learning style is started. This means that students that prefer one learning style can consequently avoid using others during a learning experience. (Hamdaoui et al., 2018).

While Kolb learning style offers a more detailed view of each individual learning preferences based on experience. The term "experience" is however quite extensive which might impact predictive powers and reliability. (Willis, S. (2017)

It is advantageous to use both frameworks as a point of reference for this research. Playing entertaining games is an experience where the player does not necessarily need to understand their learning preferences.

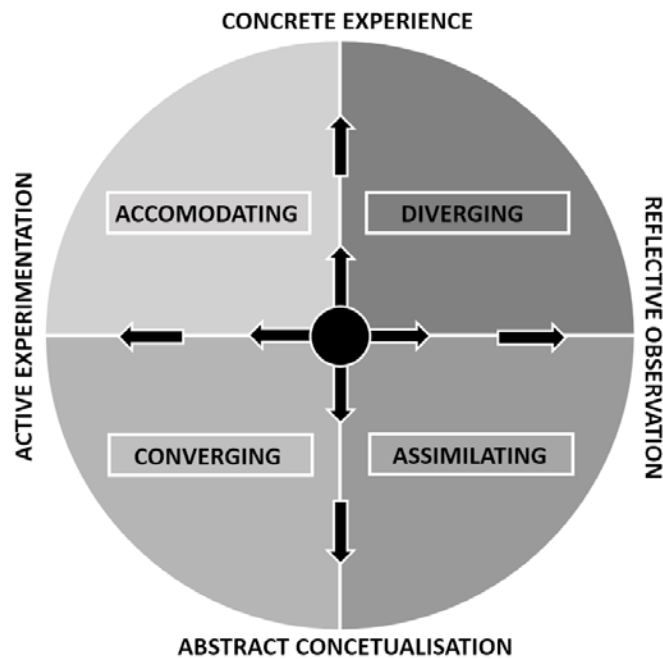


Fig. 1. This figure illustrates Kolb's four distinct learning cycles and the corresponding four separated learning styles. Each learning experience starts from the very centre of the circle, and if a new learning style is used, it will be returned to the centre. Inspired illustration from (Kolb and Kolb, 2005)

### 3. Methodology

According to Jan Recker in the book scientific research in information systems, qualitative research can be better understood if compared with quantitative research methods.

Quantitative techniques concentrate on numerical data obtained from numerical units, while qualitative methods concentrate on textual responses to what the participants said or did. (Recker 2013)

#### 3.1 Research method

This study will use both qualitative and quantitative research methods. It could be a risk to only use a quantitative approach as it will only briefly cover a player's performance in the game. We believe that using quantitative observation data and qualitative interview data is necessary to get a more realistic view of the player's performance in the game. The method for the data collection is quantitative in most aspects but there are some parts that need a qualitative evaluation. This is because the guidelines to determine a qualitative data result sometimes is generalized and requires a personal evaluation.

Qualitative techniques can be useful when a subject is too complex to be answered by a simple yes or no hypothesis (Maxwell 2013). The questions asked to the respondents will be complicated and need to be evaluated before understanding their answers. Our own interpretation of their answer will form data that will be used as a result.

Compared to quantitative study, our research question cannot be answered with short answers since we are looking for a discussion and different point of views on the matter of what kind of

learning strategy a mainstream person uses when interacting and gathering information from object reality. (Bryman & Bell 2011)

### **3.1 Selection of theoretical basis**

The sources used in this research come from scientific articles, and books. The literature focuses on learning behaviour, learning styles, serious & entertaining games, game tutorial layouts, system thinking and various AI functions in games.

### **3.2 Selection of respondents**

The respondents were chosen from a stratified selection, which means that a criteria had to be met to be able to participate in the study. This was important in order to ensure that our respondents had not interacted with the concerning games before, which could have improved their performance. The chosen respondents in this research are students with no or limited experience with video games. The study's main focus is to investigate what mechanism in tutorials that can stimulate learning behaviours. Selecting amateurs can ensure a higher need for learning and understanding the game. Experienced players' results will be unpredictable from the fact that some game information will already be understood without the need of a tutorial. (Aczel 1999)

All participants will perform the tutorial trial in Borås using the same computer. This is important to ensure the players have identical working conditions to increase the results reliability.

#### **3.2.1 Questionnaire layout**

15 individuals were chosen to participate in our case study. The participant will play 2 games and the total time for both games will be approximately 1 hour. 5 minutes for each tutorial, 25 minutes for each game and 10 minutes for the interviews that will be concluded in the end. Every respondent will be given around 5 minutes to play each of the game's tutorials.

After the 5 min tutorial, a playing trial that lasts 25 min will be put in motion for the player. This trial will be testing the players and observe how well they understand the game. In this timeframe we will observe how the player is performing in the game.

Once a player finishes a game session, an interview will take place for that specific game, asking questions that will give more in depth knowledge on how well the player understood the games basic functions and objectives.

#### **3.2.2 Research results method**

The study will give results based on the participant's knowledge and performance in the game, by observing the players during the game we hope to find areas where the game fails or succeed to educate the player. The results will be reviewed with theoretical background to see how this could or might have influenced the game experience.

The first result section will go over how the 2 games used the theoretical backgrounds models in the tutorials. We will see if the games use similar models in their tutorials. This will give



insight if the game uses recommended tutorial functions in their games and promotes learning behaviour.

The second result section will go over how the 15 respondents performed in the games. A detailed analysis of their performance and experiences can give suggestions to which game promotes better learning behaviours.

### **3.3 Interview questions**

Following questions will be asked to each player once they finish playing a game. The player's answer on the questions is rated on a scale 0-2 based on their answer. 0 is considered low, 1 moderate, and 2 high.

#### **What was the purpose of the game?**

- 0- Fundamental flaws in understanding the game.
- 1- Some flaws but with a good general understanding of the game.
- 2- Clear answers according to the games purpose.

This question will give an understanding how well the game tutorial presented the goals of the game. If the player doesn't understand the game's purpose, then this might cause complications on the player's overall performance in the game. If a player does not understand the purpose of the game, then the decision the player makes might not be correctly motivated and wrong objectives could be prioritized.

#### **Was the game enjoyable?**

- 0- Disliked the game entirely.
- 1- Mixed emotions.
- 2- Liked the game and would like to play more.

This question will investigate whether or not the player finds the game entertaining. Comparing the player's performance in the game can give us suggestions on what type of tutorial layout is more entertaining. This is important as increased game enjoyment can improve players' focus in the game and produce a higher learning curve. Understanding what factors make the game less enjoyable can give important feedback to where the game mechanics might be failing.

#### **What strategy would you use to win this game?**

- 0- No insight or competitive suggestions.
- 1- Suggestions that were decent relating to gameplay improvements.
- 2- Gave competitive strategy suggestions.

This question will give an insight to how well the player understands the game from the tutorial and use the given game rules to reach a certain goal. The player's answer will give information on how well the game rules are understood and could be used to win the game. The different strategies could tell how well a person understands the game logic, with its rules and functions.

The knowledge will tell which parts in the tutorial layout are working and also which parts that are not, which could show features that are good utilities in a tutorial system.

### **What happens when you die? What implications will this have to the game?**

- 0- No suggestion to any game implication.
- 1- Addresses a problem but without any thorough explanation.
- 2- Gives one suggested consequence and how this can affect game performance.

The question goes over how well the player understands the risk/punishment the game has when dying. It's important that a player understands the penalty for dying so a committed effort is put out to avoid it. Dying often can punish/slow down the game progress and which is crucial for the player to avoid. Slow game progress can damage the learning efficiency for the player.

### **What are your abilities and what can they be used for?**

- 0- Doesn't know any ability attributes.
- 1- Can explain some abilities.
- 2- Good and detailed understanding of the abilities.

This question gives a better understanding of the player's detailed understanding for the abilities that the champion can perform. The use of abilities plays a vital part in how a player performs in the game. If a player abstains from using abilities the game will become significantly harder. It is important that a player understand how and when to use abilities in order to improve and progress throughout the game.

**The selected games share different goals and objectives and to highlight this we have decided to also include questions related to each game only.**

*League of legends questions.*

### **How do you use gold and how do you earn it? (Exclusive league of legends)**

- 0- Can't recall more than one way to get gold and how to use it.
- 1- Can't recall more than two ways to get gold but has a general knowledge how to use it.
- 2- Said more than three ways to get gold and how to effectively use it.

This question will give insight into how well the player understands to make game progress and become stronger. If a player is aware of how to earn and make use of gold, then they will be able to set up goals and strategies to beat the game more efficiently. If a player is not aware of how to earn and use gold, then the game will become increasingly hard.

**What are items used for, how can this change the outcome of the game? (League of Legends exclusive)**

- 0- Can't give any insight how items can help the gameplay in a certain way.
- 1- Gave limited insight.
- 2- Gave one practical example how different items can affect gameplay.

This question will give greater understanding on how the player recognized character improvement and progression. It will also give us an understanding of how the player perceived the champion's general traits and abilities. Buying items plays an important role to progress through the game and if a player does not use items properly then it will become harder. Being aware of the champion's general traits is also important in order to purchase the most relevant items for the specific champion.

*Overwatch questions.*

**How important is positioning in the game?**

- 0- Can't give any insight how positioning can improve gameplay.
- 1- Gave limited insight.
- 2- Provided examples how positioning could affect the outcome of the game.

This question will give a greater understanding on how the player utilized positioning to improve and progress through the game. It also gives us an insight in the strategies a player used in relevance to the enemies positioning.

**Tell us in detail what your ultimate does and how to obtain it.**

- 0- Doesn't know how to obtain the ultimate or what it does.
- 1- Can explain how to obtain the ultimate with limited knowledge on its function.
- 2- Good and detailed understanding of how to obtain and use the ultimate.

This question will give a greater knowledge to how the players were able to recognize their ultimate abilities and how to obtain it. The use of an ultimate can directly affect the outcome of a game and it is therefore important to know.

The above questions will cover a general understanding of each player's game knowledge that we identified as important. Once the tutorial is completed a real time play trial will be put in motion. This trial will go through a quick playing test in the game to display the player's knowledge and performance in practice. During the game, a detailed observation over the player's different interactions will be monitored. The paper will in detail write down how the player interacts with the game based on pre-selected game functions.

### 3.4 League of Legends and Overwatch observation questions

Following questions will be implemented as a model to use when giving the players a performance score. The player's performance in the game will be rated on a 0-2 scale. 0 is considered low in relevance to the question. 1 moderate and 2 high.

Character awareness, how well is the player operating the character? Positing based on enemy, health etc.?

- 0- is given if the player failed to show any character movement based on the enemy's behaviour.
- 1- is given if the player moved the character occasionally in reaction to the enemy but not in competitive way.
- 2- is given if the players moved according to the enemy behaviour and is used as an advantage.

Use of abilities, are they used and executed at appropriate times?

- 0- is given if the player does not use the ability or very rarely during the game.
- 1- is given if the player used the abilities but frequently not in a competitive way.
- 2- used the abilities in the correct situations competitively.

Map awareness, is the player taking advantage of the map?

- 0- Does not use the map or displays wrong map positioning.
- 1- Player sees the map but does not predict enemy movements from it.
- 2- The player makes at least 1 strategic move based on the map awareness.

Is the player buying any items and is there any logic behind the purchase? (League of Legend Exclusive)

- 0- The player buys random items without any logic.
- 1- The player reads the items and try to select the right one but choses an uncompetitive option.
- 2- The player understands and buys the correct item to stay competitive.

How is the player interacting with towers, does the player understand their function (exclusive for League of Legends)

- 0- The player never understands what towers do and dies repeatedly without improving.
- 1- The player manages to attack the tower and avoid taking damage but still dies and does not understand its function.
- 2- The player stops dying and steps under the tower multiple times correctly.

Is the player prioritizing capturing the objective? (Overwatch exclusive)

- 0- Player can't focus on the objective and prioritize other interactions.
- 1- Player follows the objective but makes basic mistakes that prolong the gameplay.
- 2- Player follows the objective all the time and tries to capture it without making unnecessary actions.

Is the player using his ultimate in an efficient and strategic way? (Overwatch exclusive)

The ultimate plays a larger role in this game and is therefore separated from the general ability questions.

- 0- The ultimate is used rarely with low impact.
- 1- Ultimate is used but in the wrong way and is not effective.
- 2- Ultimate is used correctly and makes a competitive impact in the game.

Is the player learning from previous mistakes?

- 0- Players make the same identical mistakes without improving.
- 1- Player makes similar mistakes but less frequently over time.
- 2- Player changes play style and manage to avoid the same mistakes in an efficient way.

Is the player trying new interactions in the game?

- 0- Player makes the same actions and moves to the same place the whole game.
- 1- Player tried small changes in movement positing but only for a limited time.
- 2- Exploring new areas or functions for a significant amount of time.

Does the player understand the punishment of dying?

- 0- The player is not afraid of dying and low efforts are used to avoid it.
- 1- The player tried to survive in some situations but generally fails.
- 2- The player is very careful and displays a dedicated effort to not die.

Is the player committed to the game, trying to do well?

- 0- Players attitude in the game is low and doesn't want to improve.
- 1- Player is active in the game, but mistakes can be associated with lack of commitment or awareness.
- 2- Player is active, improves and is clearly aware of the game surroundings.

### **3.5 Data Analysis**

When all data is gathered from selected methods it's important to have a clear strategy to analyse everything and give it value. Linking data from the interviews with our literature findings is essential. This will find interesting relations and tendencies which can further and strengthen statements gathered from the interviews. Literature reading is one of the main information sources that shaped the research question. Comparing the interviews with this literature can give the text more credibility.

We have chosen to use the grounded theory as our main approach in this research. This will allow new emerging theories to take root during the research process. The data analysis must from this be reviewed constantly and compared with previous findings. (Corbin, J. & Strauss, A. 1990) This makes it possible to create more fixated and improved questions in our future interviews. It also helps to modify the method strategy if the data acquired generated low information value. Redesigning the information approach needs to be easy and very flexible. Having an open research method like the grounded theory makes this possible.

Assembling data and understanding the useful information is very important in this report. Filtering out unrelated data or orthodox proclamations etc. might be necessary to get a more focused answer. If data seems irrelevant it's however important to clarify the reasons for this.

### **3.6 Game Selection**

The chosen games in this study are currently one of the most played in the world. In an interview published 2016 by the website Polygon.com to the creators of League of Legends, it was mentioned that the game had surpassed 100 million monthly players (Kollar 2016). Overwatch which is a relatively new game had in October 2017 surpassed 35 million active players which was confirmed by Blizzard via Twitter (PlayOverwatch 2017).

We have selected these two games because of their widespread popularity. We aim to investigate the effectiveness of their tutorial systems as we believe could be a promising research topic taking into consideration the large number of players. It is important for a popular game to have a solid tutorial system that can cater to its diverse audience.

The large impact these games have in our society as an entertainment tool creates a need to understand how the game affects the players. Understanding the game's learning logic can give useful information on what interactions and functions these players practice and learn.

Our two chosen games share very different game mechanics. The goal of the game and the graphic environments are different which can potentially highlight any factors in the games that promote or hinder learning behaviours. Comparing these games can give us an understanding how tutorials for simple and advanced games differ from each other. What types of learning tools are selected depending on the difficulty of the game? How well new players interact, learn and enjoy the games in comparison can tell us how the tutorials differ from each other. This is important so you can see if the learning in the games can be different even if some functions are similar.

### 3.6.1 The game League of Legends

League of legends is a multiplayer online battle arena, also called MOBA, which was developed and published by Riot games, Inc. The game is a team-based matchup between two teams of five. It has been one of the most popular PC games for almost 9 years. In a game that usually lasts between 30-45 minutes, there are three different lanes, each protected by 3 turrets where NPC armies march towards each other to engage in battle. The human player controls one champion with unique abilities with the goal of helping the NPC advancing towards the enemy base and destroying it. When the player successfully has the last hit on an enemy NPC or neutral monsters they receive gold, which in turn is exchanged for items that make their champion stronger. The player can also try to defeat enemy players to earn gold and push further towards victory.

The teams start on different sides of the map and use a multitude of strategies to achieve their goal to destroy the enemy base. Within the map there are also neutral monsters that give different buffs for your team if they are defeated or give the player some extra gold.



Figure 2: This figure illustrates the layout of the map with blue and red showing the different team's territory. The blue and red circles show the many positions of the turrets, which protect the lanes. In the top right and bottom left corners, you can see the main base. Destroying any of this base will make you victorious. The purple circles show the position of the neutral monsters that give buffs for your team. The section of the map that is not highlighted is called the jungle and contains monsters that will give any player gold if defeated. (Riot Games 2019)

### **3.6.2 The game Overwatch**

Overwatch is a team-based first-person shooter game developed and published by Blizzard entertainment, Inc. It was released in 2016 across several platforms and grew in popularity quickly. Within one year of its release Blizzard received several awards, e.g., Game of the Year at The Game Awards, and created several professional leagues for the game.

Compared to League of Legends, Overwatch is a much faster paced game. A game of Overwatch consists of 12 people divided into two opposing teams. Each team's goal is to capture a certain objective to win the match. The team composition can vary and there is no requirement to fill all recommended roles. (Overwatch 2018)

### **3.6.3 Heroes and roles**

At the start of each match the player needs to choose several different heroes that all have unique abilities and roles, they can also change their hero during the game to adapt for different situations. A hero is a character the player controls during every moment of the game. All heroes have 5 unique abilities that can be used when the player feels and it's not on cooldown. The abilities differ from which hero has been chosen. The heroes are divided into four different roles: Tank, Support, Offense and Defence. The roles are there to easily see which heroes have similar abilities and how it should be played within the game. Tank heroes are usually in front of the rest of his team and soak up damage. They differ from others by having a lot of hit points and abilities that negate the enemy team's damage. Support is the one who empower their squad or heals, shield and/or boost them in different ways. Their main goal is to keep the team alive. Offense will be the prime damage dealer. They have high mobility, high damage but low amount of hit points. Defence are the ones who control the battlefield and have the best abilities to stop any enemy team's advances. (Overwatch 2018)

## **3.8 Ethic**

This study has followed the research principles developed by the Swedish Research Council in its publication Good Research Practice, the Swedish Research Council, 2017, regarding the information requirement, the confidentiality requirement, the utility requirement, and the consent requirement.

Every participant has been briefed on the objective of the research and they all gave verbal permission to take part. Additionally, we have informed the participant of the full confidentiality of their responses and that the data will only be used for this study. From this, all of the necessary principles have been met.



## 4. Empirical Evidence

### 4.1 Interview questions result

Summarized data on how well the respondents understood the games.

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15
What was the purpose of the game?	1	1	1	0	2	2	1	0	1	0	1	1	1	0	0
Was the game enjoyable?	0	0	2	1	1	2	0	0	0	0	1	1	0	0	1
What strategy would you use to win this game?	0	0	2	0	2	1	1	0	1	0	1	0	0	0	1
What happens when you die? What implications will this have to the game?	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
What are your abilities and what can they be used for?	0	1	2	1	1	0	0	0	0	1	1	1	1	1	1
How do you get gold and use it?	0	0	1	0	0	2	1	0	1	0	1	0	0	1	0
What are items used for, how can this change the outcome of the game?	0	0	1	0	0	1	1	0	0	0	2	1	0	0	0
Total score	1	2	9	2	6	9	4	0	3	1	7	4	1	1	3

Fig. 3. League of Legends interview questions.

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15
What was the purpose of the game?	2	2	2	2	2	2	2	1	2	1	2	2	2	2	2
Was the game enjoyable	2	2	2	2	2	2	2	1	2	2	2	1	2	1	2
What strategy would you use to win the game?	2	2	2	2	1	2	1	2	1	2	2	2	2	1	2
What happens when you die? What implications will this have to the game?	0	0	0	0	1	1	0	2	1	1	1	2	1	0	0
What are your abilities and what can they be used for?	1	1	2	1	1	2	1	2	1	0	1	2	1	2	2
How important is positioning in the game?	0	1	1	0	1	2	1	1	1	0	1	2	0	1	1
Tell us in detailed what your ultimate does and how to obtain it.	0	0	1	1	1	2	1	1	1	0	0	0	0	0	1
Total score	9	8	10	8	9	13	8	10	9	6	9	11	7	8	9

Fig. 4. Overwatch interview questions.

#### What was the purpose of the game?

##### *League of legends.*

More than 50% of the players understood the game's purpose. Seven players gave an overall good description of the games main objectives and they all scored the rating 1. Two players managed to give a clear and flawless description of the game's purpose and were given a rating of 2. Six players failed to understand the purpose of the game based on their feedback and were given a score of 0.

##### *Overwatch.*

More than 85% of the participants understood the game's purpose perfectly. 13 players managed to explain the games with a good and clear description and were given a rating of 2. Only two players had some flaws in their descriptions but still with a good overall understanding and were scored the rating 1. Zero players failed to understand the purpose of this game entirely.

#### Was the game enjoyable?

##### *League of Legends*

More than 50% of the players did not find the game enjoyable. 8 players disliked the game entirely and did not want to play it again. These players were given the rating 0. Five players had mixed emotions regarding the enjoyment, and they were given the rating 1. Only two players liked the game and showed interest in playing it again. These players were rated 2.

### *Overwatch*

More than 80% of the players found the game enjoyable and would like to play it again. Only 3 players had mixed emotions. Twelve players were given a rating of 2 and the three players with mixed emotions were given the rating 1. 0 players disliked the game entirely.

#### What strategy would you use to win this game?

### *League of Legends*

Approximately 50% of the players could not give any strategy suggestions to win the game. Five players gave decent strategies suggestions for gameplay improvement and were given the rating 1. Two players managed to give competitive strategies from the tutorial and were given the rating 2 while eight players could not give any strategy insight or suggestions to win the game and were rated 0.

### *Overwatch*

Almost 70% of the players managed to give competitive strategy suggestions while the remaining 30% still provided decent input. Ten players suggested competitive strategies they learned from the tutorial and were rated 2. Five players gave decent suggestions for gameplay improvement and were given a rating of 1. In this case zero players suggested strategies with no insight or sign of competitiveness.

#### What happens when you die? What implications will this have to the game?

### *League of Legends*

More than 90% of the players showed lack of understanding of the implications of death. Only one player managed to address a problem with limited explanation. This player was given a rating of 1. Fourteen players showed no understanding of the implications of dying and were given a score of 0. Zero players gave suggestions on the consequences of dying and how this affected the game performance and these players were given a rating of 0.

### *Overwatch*

In this case 40% of the players showed an understanding of the consequences of dying in the game. Six players managed to address the problem but with no in-depth explanation and these players were given a rating of 1. Only two players gave suggestions on consequences and how this affected the game performance and these players were given a rating of 2. Seven players gave no suggestions on any game implication when dying and were given a rating of 0.

#### What are your abilities and what can they be used for?

### *League of Legends*

More than 50% of the players were able to explain their abilities and its functions. Eight players gave a basic explanation of their abilities and these players were given a rating of 1. One player showed a good understanding on how the abilities worked and gave a detailed description, this

player was given a rating of 2. Six players did not know any of the ability attributes and were given a rating of 0.

### *Overwatch*

More than 50% of the players were able to explain their abilities and its functions. Eight players gave a basic explanation on some abilities and were given a rating of 1. Six players gave a detailed explanation and showed a great understanding in how they could be used, these players were given a rating of 2. Only one player could not explain any ability attribute and were given a rating of 0.

### How do you use gold and how do you earn it? (League of Legends exclusive)

60% of the players could not recall how to earn gold or how to benefit from it. Nine players could not recall more than one way to earn gold and had no idea about its real value. These players were given a rating of 0. Five players mentioned 2 ways to earn gold and showed a general understanding of its use. These players were given a rating of 1. Only one player mentioned 3 ways to get gold and explained how to use it in an effective way. This player was given a rating of 2.

### What are items used for and how can they affect the outcome of a game? (League of Legends exclusive)

Two thirds of the players could not offer any insight in how items could potentially change the outcome of a game. Ten players failed to provide any explanation for the use of items and its potential and were given a rating of 0. Four players were able to give a limited insight with the use of items in the game and these players were given a rating of 1. Only one player could explain and give a practical example of how items affected the gameplay and were given a rating of 2.

### How important is positioning in the game? (Overwatch exclusive)

60% of the players were able to give an insight concerning the importance of positioning in the game. Nine players offered limited insight and were given a rating of 1. Only two players could provide examples of how positioning could affect the outcome of the game and these players were given a rating of 2. Four players were unable to provide any insight on how positioning affected gameplay and were given a rating of 0.

### Tell us in detail what your ultimate does and how to obtain it (Overwatch exclusive)

Almost 50% of the players were able to give insight about the ultimate ability. Seven players could explain how it was obtained, but not necessarily how it was used, these players were given a rating of 1. Seven players could not explain how to obtain the ability or how to use it, these players were given a rating of 0. Only one player could provide a detailed understanding on how to obtain the ultimate and use it in an effective manner. This player was given a rating of 2.

## 4.2 Observation Results

How well our respondents performed in the game and displayed learning behaviours.

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15
Death punishment awarness	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0
Commitment to the game	1	1	1	0	2	2	1	0	1	0	2	2	0	1	1
Character awarness	0	0	1	0	1	1	1	0	2	0	1	1	1	0	0
Learning from previous mistakes	1	0	2	1	1	2	1	0	1	1	2	1	0	1	1
Map awarnesss	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0
Buying items	0	0	1	0	0	1	1	0	0	0	1	0	0	0	0
Trying new interactions	1	1	2	0	2	2	2	1	1	0	1	0	2	1	0
Use of abilites	0	1	2	1	1	0	0	0	0	1	1	1	1	0	1
Gold income	0	0	1	0	1	2	0	0	1	0	1	1	0	0	0
Tower interaction	1	0	1	1	1	2	1	0	1	1	2	1	0	0	1
Total score	4	3	11	3	9	13	7	1	8	3	12	9	4	3	4
<5 = Poor game play and understanding	<10 = Moderate game play and unders 10=> = high gamplay and understanding														
9 Subjects total	4 Subjects total				2 Subjects total										

Fig. 5. Results League of Legends Observation

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15
Death punishment awarness	0	0	0	1	1	2	1	2	1	1	1	2	1	0	0
Commitment to the game	2	2	2	2	2	2	2	1	1	1	2	2	1	1	1
Learning from previous mistakes	0	0	0	0	1	1	1	1	0	0	0	1	0	0	0
Character awarness	1	2	1	1	1	1	1	1	1	1	1	2	1	1	2
Map awarnesss	1	1	1	0	1	2	2	2	1	0	0	0	1	1	0
Trying new interactions	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
objective focus	2	2	2	2	2	2	2	1	2	1	1	2	2	2	2
Use of abilites	1	1	2	1	2	2	1	1	1	0	1	2	2	2	2
Stratigical use of ultimate	0	0	2	0	1	1	1	0	2	0	1	1	1	0	1
Total score	7	8	10	8	12	14	12	9	10	4	7	12	9	7	8
<5 = Poor game play and understanding	<9 = Moderate game play and underst 9=> = high gamplay and understanding														
1 Subject	6 Subjects					8 Subjects									

Fig. 6. Results Overwatch Observation

Is the player committed to the game?

*League of legends.*

Almost 50% of the players were often distracted with a lack of focus and commitment to the gameplay, seven of them were scored with a 1 and four with a 0, only 25% of them were engaged ending in many mistakes and decisions seemed to be related to the players lack of interest as they did not fully understand how to play the game.

*Overwatch.*

60% of the participants were highly committed to the game and withheld a steady focus and interest. Nine out of fifteen players were active when playing the game and paid close attention and were given a 2 while the other six were also in the game and displayed an overall enjoyment reason why they were given a 1.

### Map awareness, is the player taking advantage of the map?

#### *League of Legends*

80% of the players presented no map awareness or use of the mini-map. Failure to predict attacks by looking at the map and the lack of any movements outside their own character confirmed this reason why no player scored a 2 and twelve out of fifteen were scored a 2.

#### *Overwatch*

The character's map awareness on Overwatch was decent; the positioning needed for taking the objective successfully was understood by 50% of the players but with limited knowledge of the different variations. Taking advantage of high ground and using buildings that the map offered was only considered by two players who scored a 2. The majority of the players (seven out of fifteen) generally stood at the main objective during the whole game with limited movements.

### Use of abilities, are they used and executed at appropriate times?

#### *League of Legends*

The use of abilities in the game were divided in two main blocks, 50% of the players either forgot how to unlock them or didn't know how to activate them correctly. The interface for unlocking the abilities was confusing and six players didn't understand how to use it and were given a 0, while the remaining eight players who were scored a 1 used the abilities with correct pressing but it gave no results as it had not been unlocked successfully. Other players faced problems activating the ability and tried wrong combinations to cast it. The two selections needed to use the abilities were not understood and many tried to cast them by only pressing 1 key. Only one player managed to use the abilities correctly.

#### *Overwatch*

The use of abilities in this game was good as 50% of the players understood how to execute them and the other 50% players used the abilities consistently and not always in correct situations, but they still maintained relatively high competitiveness, for this reason they were still given a 1.

### Is the player learning from previous mistakes?

#### *League of Legends*

A majority of the players made some changes to their gameplay after dying. Doing appropriate changes to their playstyle to counter the previous mistakes efficiently, were however rarely seen. Only three players managed to make an improvement based on their mistakes in the early stage of the game. Most players made identical mistakes numerous times and only improved after many failures. The time it took for the players to understand their mistakes made the gameplay overall uncompetitive and less enjoyable.

### *Overwatch*

In Overwatch, there was no apparent observable change in any of the player's gameplay. Some players did some small adjustments based on the enemy's behaviour but these were minimal and often did not affect the overall gameplay. The majority of the players never changed their initial approach to the game and succeeded without having to adjust any of their mistakes.

#### Is the player trying new interactions in the game?

### *League of Legends*

During the gameplay, one third of the players explored the map and tried new things that were not presented in the tutorial. The exploration was still very limited as 10 out of fifteen players were most of the time positioned around their initial dedicated area. Players that underperformed in relevance to the competitiveness in the game seemed to try new and different interactions. The new interactions through exploration often proved to impact the game negatively as it would pause the players focus to work towards the game objective. Boredom and a general lack of the game understanding seemed to be an underlying reason why they explored at least for a third of the participants.

### *Overwatch*

Two thirds of the players (10 out of fifteen) did not try to explore the map, go to new places, try different strategies etc. The simplicity of the game mechanics could explain this behaviour as it removed the player's need to question the gameplay if the player was already winning.

#### Does the player understand the consequence for dying?

### *League of Legends*

90% of the players died many times which affected the gameplay negatively. Dying was frequent because of an aggressive desire to take objectives. Thirteen out of fifteen players prioritized killing and taking objects rather than trying to survive. The consequences of dying were not illustrated in the tutorial which could be an underlying reason for this kind of behaviour. The positive effect the enemy gets from killing the player with gold was not understood or cared for.

### *Overwatch*

This game doesn't punish the player that much when dying compared to League of Legends. The only thing the player loses is time which does not affect the competitiveness in this practice against the computer. It was also much harder to die in this game which made the avoidance of death less needed ending in only 20% of the players being given a 0 in this category. Almost 50% of the players still failed to play defensively but only because the game encouraged them to play more aggressively. From the positive results it gave reason why they were still given a 1. Dying was a very which ultimately made aggressive gameplay more competitive. This was one factor that boosted the players' general score in this game.

Character awareness, how well is the player operating the character? Positioning based on enemy, health etc.?

### *League of Legends*

Almost 50% of the players had a hard time controlling their character. Seven out of fifteen died numerous times from bad positioning and character health management. The other 50% still failed to move according to the enemy's behaviour and died without making a countermove to defend themselves. There was only one player that managed to position the character strategically well based on the enemy's current health.

### *Overwatch*

90% of the players operated the character in a relatively competitive way, which is the reason why they were given a 1 despite they misused many of the characters functions but still managed to win against the opponent. The positioning against the enemy was aggressive and never defensive. None of the players seemed to utilize the character's full potential strategically. It was common for players to stand completely still and not look at their health status, which displayed a lacking knowledge of the characters fragility.

Is the player buying any items and is there any logic behind the purchase? (exclusive for League of Legends)

All subjects had to be reminded how to buy items in the game after 5 minutes as can be seen in the results, none scored a 2. 90% of the players failed to remember the buying process in the tutorial which indicates the tutorial system might not be working as intended. When the players did buy items for the character it was usually random items found at the first page. Four out of fifteen players did investigate and read the item's description but the choices were still not good to improve their competitiveness in the game.

How is the player interacting with towers, does the player understand their function (exclusive for League of Legends)

The player's understanding of the tower's functions was mixed. 25% never understood how it worked and died numerous times. Even with the user interface showing red colour in the tower area the players didn't understand why damage was taken. 60% of the players died 1-2 times under the tower before they learned to avoid it. Even if the player avoided the tower to take damage, they still didn't understand the rule when they could attack it. The information given from the tutorial seemed to be lost and instead the players displayed a trial by error behaviour by slowly trying to see when the tower attacked and adapt according to it.

Is the player using his ultimate in an efficient and strategic way? (exclusive for Overwatch)

The use of ultimate in this game had a poor ending with 40% of the players not understanding its function. Using it in wrong situations and executing it wrong by pressing the mouse instead of holding down the key was a common mistake. The ultimate is the game's most important ability and a better illustration in the tutorial seems to be needed. Taking into consideration that players failed to use the most impactful ability and still play competitively indicates that this game mechanics were easy for beginners.

## **League of legends observation results (figure 5)**

The performance from the players oscillated remarkably depending on the game. In League of Legends, 60% of the players got a low performance score (9 out of 15). 27% got a moderate rating (4 out of 15) and 13% got a high (2 out of 15).

## **Overwatch observation results (Figure 6)**

In Overwatch, the play performance amongst the players was generally high. Only 7% scored a low performance score. 40% got a moderate score and 53 % of the players got a high. This was a big increase in performance compared to the League of Legends result. Most of the players managed to put up a competitive gameplay and generally understood how to play the game.

# **5. Theoretical result**

*How the chosen games used recommended learning mechanisms in their tutorials.*

## **5.1 Self-learning systems**

Self-learning systems can substantially improve a person's learning behaviour. This comes from its ability to understand situations and adapt according to it. The OpenAI program that won over professional DOTA players confirms this action is possible. If a computer can change its behaviour according to the user's actions, then it can guide and help the users to meet new challenges. This could be made possible by evaluating the user's decisions and making appropriate corresponding responses. The system can then in theory distinguish amateur players from more talented and experienced ones and further change the game to benefit them all individually. The system can perform certain actions that might encourage learning behaviour in areas where the amateurs show weakness. Flaws in the player's character control can be improved by giving direct suggestions to the player when an action should be made.

### **5.1.1 League of legends**

In League of Legends, no self-learning AI system was found. The computer understood the game's rules and goals but without any critical thinking. The computer commands could be; run away when low on life, use ability in certain conditions and by item. The ability to read situations and change playstyle according to the opponent was not displayed. Many times, the computer made poor decisions such as not killing the other opponent because it was low on health. It seemed like predefined scripts on how the computer should behave overruled other decisions. A list that covered an order of importance seemingly told the computer what to do and when to make certain decisions. This would explain why the computer stopped trying to kill or take certain objectives and instead retreated when the health was low. Behaviours such as these indicated that the game was using scripts instead of any active cognitive situational thinking.

In the case study, the majority of the users failed to give the bots any competitive gameplay and all players lost even when they lacked rational thinking. The computer displayed no changes in



the play style changes regardless how well the players played. No signs of any assisted guiding during the main gameplay could be found. The tutorial had a narrative that told all rules and information needed to play the game but this information was not shown again when the real game was tried. When the player forgot something from the tutorial there was no option to gain that knowledge again without closing and restarting the tutorial.

### **5.1.2 Overwatch**

Overwatch did not have any self-learning system in the game. The computer AI understood the game and the rules of it but lacked any type of critical thinking. Because of the game's simple rules and functions the computer did not have to use many inputs to become competitive. In our observation, the majority of the players performed exceptionally well. The bots were clearly not optimized to offer any variation of gameplay to the player. The limited movements and lack of aim to damage the players made the game very easy. The allied champions who also helped the player gave an overwhelming healing support that prohibited them from dying.

## **5.2 Risk taking**

The game Overwatch encouraged players to take risks. Killing an enemy does not grant any gold but instead gives more time for the team to take the objective. This means that even if you die there are still chances to come back and win the game.

Rewarding players continuously for taking high risks seemed to improve their enjoyment of the game. The high-risk reward did however seem to limit the alternative mechanics the game had to offer. Players played the same without the need to change as they were never punished in a meaningful way.

League of Legends handles risks very differently where it either rewards the player greatly or punishes them. If a player gets killed, important time is lost and less gold can be collected. As a result of the kill, enemies get more gold which will make the player less competitive. The frequent risk taking and deaths seemed to be caused from the players' will to explore and test different game interactions.

The players did learn the consequence for dying but the option to make gameplay improvements from it were often not realized. This was because even though the player made better gameplay decisions against the bot, it was now too strong to be defeated. When a player does not get rewarded for understanding the game better, this new strategy might no longer be encouraged to use. A lack of commitment to the game where the player feels lost and does not understand the rewards from taking risks could hinder the learning process of the game.

## **5.3 Avoiding negative consequences**

League of Legends uses a scaling system where improvements to the character can be made from the start to the end of the game. If a player gets behind in the beginning the risk to get further behind is greatly increased.

When it comes to Overwatch, having a bad start does not increase the difficulty of the game. It's possible for players to still be strong as there are no items or levels that could affect the

competitiveness of the game. A bad start will affect the teams' objective controls but not the players' character in itself.

### **5.3.1 League of Legends**

When comparing players that had a good or bad start, there is a clear difference in how they answered the question; "did you enjoy the game?" The players with a better start consistently stated that the game was more enjoyable. This indicates that a good start might improve the players' game learning.

This was further displayed when the players with a good start often seemed to try more gameplay variations and when it did not work they tried to comprehend why. A common example of this can be seen when they tried to use abilities on towers and structures. This is an action that is not possible but they still tried and later read the ability description to understand why it was not working. The new information gained was later used to purchase better items which ultimately made them more competitive.

### **5.3.2 Overwatch**

Avoiding negative consequences is something that Overwatch manages to do significantly better amongst the players. Even when a player had a bad start it was nothing that hindered them from playing competitively again. An objective could be lost early in the game but still be retaken at any time using the same skills and abilities. It seemed that players were more motivated to play even when losing as the chance to win was always possible. Many players felt that they had a bigger impact in the game compared to League of Legends.

## **5.4 "Just-in-time" & "On demand"**

### **5.4.1 League of Legends**

The League of Legends game tutorial consists of fifteen different parts that must be completed in order to be finished. Each step of the tutorial is explained by sound, visual effects, and textual information. The beginning goes through the objectives of the game together with a short summary of the champion you will be playing. It later continues to cover the core game mechanics such as how to move and attack your character. By the end of the tutorial the player will have learned to control their character, using different abilities, managing resources, purchasing items, killing an enemy champion and the main objective of the game.

The League of Legends tutorial seemed to be lacking the option to repeat the knowledge given. Once certain steps were completed, the game moved to the next stage and you never had the chance to read or try it again. This caused players to easily forget one or more of 15 learning parts.

A general lack of knowledge after the tutorial was something that was observed amongst all players. Most had to be reminded how to use basic mechanics such as purchase items and level up abilities. It was observed that many players only understood how to level up the ability and never its function. The same trend was observed for purchasing, where players were unaware why it was needed.

## **5.4.2 Overwatch**

The Overwatch tutorial consists of ten different steps that have to be completed in order to be finished. Each step is guided by sound, visual effects and textual information. The tutorial starts by teaching the player how to move the character and how to jump. To finish the first part, the player needs to follow a moving character that acts as a “guide” throughout the rest of the steps. The guide will show targets that the player needs to shoot down in order to progress. By the end of the tutorial the players should understand how to control their character, how to shoot, aim, reload, take over and control objectives and use abilities.

The players seemed to understand the rules and purpose of the game well where most used their abilities and ultimate frequently. They competed to control objectives and had a clear strategy to win. It seems that the game's easy mechanics helped the player understand the tutorial very fast. The controls learned in the tutorial were immediately practiced and exercised in the game which seemed to help the player remember them better. Small details such as how to reload was forgotten but did not affect the performance as the game would do this for you automatically.

## **5.5 System Thinking-Goal setting theory**

### **5.5.1 League of Legends**

The tutorial in League of Legends showed significant flaws in providing fundamental information about champions, items, and in-game situations. For example, the tutorial only displayed one item when explaining how to purchase them, without explaining its purpose or potential use. This lack of information can limit a player's understanding of the item and negatively impact their gameplay. As a result, many players randomly selected items based on the cost, without realizing that different items have unique abilities. This wrong selection of items can negatively affect the competitiveness of the game. In contrast, computer-controlled enemies consistently selected optimal items, giving them an unfair advantage.

The tutorial covered various aspects of the goal-setting theory, allowing the player to think for themselves by using the provided information. The game offers a diverse range of graphical interfaces that guide the player through the game's progression. Feedback indicators such as gold accumulation, slain minions and champions, acquired items, elapsed time, and death summaries can be used to improve the player's competitiveness. Total gold is used to display current performance and identify gaps between the player and their enemy. The number of slain champions is used to assess one's own performance, while the quantity of killed minions indicates how well the player is farming gold. Obtained items based on the time can be tactically used for victory, and time can inform players about their power levels. Death summarization provides valuable insights into a player's death, allowing them to adapt and make necessary adjustments. These goal-setting functions may not have been adequately explained in the tutorial, as they require advanced game knowledge.

### **5.5.2 Overwatch**

Overwatch did not offer many methods to track a player's progress in the game. The main objective was to capture the objective, and players were constantly informed of their progress towards this goal. Although players could succeed by capturing objectives and getting kills, the game's rules were relatively simple, leading to a sense of easy competitiveness among players.

Even if a player died, they could easily regroup and make changes to their playstyle. The computer-controlled opponents were however not very challenging, and players experimented less with new tactics. Winning against the AI the same way often meant relying on familiar strategies. The lack of direct consequences in the game seemed to limit the motivation to learn new strategies.

Each character in Overwatch has a specific ability that can be used when engaging the enemy. Tanks and defensive heroes hold the objective control area and absorb damage, while support and offensive heroes maintain control over enemies from outside.

During the tutorial, players used the role of an offensive character, whose primary role is to deal significant damage. However, the tutorial's focus on only capturing the objectives made players miss position by only staying within the objective area. This led to a high mortality rate as the area is heavily used and guarded by the enemy.

Players often found themselves caught in the middle of the objective area, becoming easy targets for the enemy fire. The cycle of respawning and rushing back into the objective control zone led to repeated failures and deaths. Players believed running into the middle of the objective area during intense fire was the only path to victory because of the limited guidance and information the tutorial system provided.

The game's interface adapts a goal-setting theory by using a progression bar that indicates progress toward winning or losing. It displayed the status of objective capture and remaining time until a team gains control. Players can track their kills, deaths, and assists for valuable performance insights. The use of a progression bar towards the player's ultimate ability helps the players plan when and how to use it for a maximum impact.

## **6. Analysis and Discussion**

*Analysis where the game tutorial failed and succeeded. Suggested solutions to improve game learning.*

### **6.1 Self-learning systems**

#### **6.1.1 League of legends**

Customized suggestions based on a self-learning system can contribute significant progress on a player's learning experience in League of Legends. These suggestions can include advice on how to deal damage or purchase specific items based on the situation, which can ultimately help players make better decisions. By providing personal recommendations, players can easily adopt effective gameplay behaviours without having to search for the information themselves. This approach might not only help individuals grow but also to reduce the reliance on other players and potentially attract more users to the game.

The use of a self-learning system within League of Legends can further enhance the gaming experience by adjusting the difficulty of the gameplay dynamically. The system could encourage players to use different abilities, tactics, and movements, which give more improved tutorial sessions and speeds up their understanding of the game mechanics. However, finding the right balance is a crucial element in order to avoid hindering the learning process. Too much

information or computer interference could make the player less encouraged to learn or play the game.

This mechanism could be more beneficial towards beginners as it can provide the player rewards despite their limited skills and early game performance. Professional players could potentially also use this system to improve their skills by practicing perfected movements and strategies. Although advanced system self-learning AI algorithms could face technological limitations, many essential functions could easily be integrated using scripts.

In summary, personalized recommendations and a well-structured self-learning system AI have great potential in shaping the League of Legends experience. By using continuous improvement suggestions and tailored guidance, players regardless of their skill can utilize competitive gameplay while advancing their skills and understanding of the game's mechanics.

### **6.1.2 Overwatch**

Creating customized and adaptable conversations, similar to those suggested for League of Legends, could play a valuable role in identifying weaknesses that a player may have in Overwatch. Although these conversations might be direct and easy due to the game's relative simplicity, they can still be highly effective since most players understand the game's rules very well. This does however, limit the potential for the game's AI to significantly contribute any new information to a player. Nonetheless, the importance of a dynamic playstyle with the characters' interactions with enemies gives a highly variable aspect of gameplay that could be improved. By using a computer-assisted system that helps players avoid specific actions based on their unique playstyle can provide personalized tips and suggestions. This could help the players navigate through the game with greater competitiveness.

## **6.2 Risk taking**

In League of Legends, new players who took risks or tried to learn through experimentation were often punished which hindered any further success in the game. The discouragement to use any risk-taking impacted a player's learning curve. Calculated risk taking is a fundamental game mechanic needed to understand the game and play competitively. This is something experienced players achieve by understanding the consequences of failure and adapting their strategies according to it.

A risk and reward systems are used in Overwatch as well, but in this game, the results showed the opposite where player was given too many rewards. To encourage learning, it is important to punish the player for playing in a way that is not competitive in the long run.

## **6.3 Avoiding negative consequences**

When reviewing the results, it became clear that a large majority of players faced difficulties. In the game League of Legends, performing poorly in the beginning of the game resulted in severe punishments. As a result, a player's struggle with a bad start would significantly impact their performance for the rest of the game. In contrast, a poor start in Overwatch did not necessarily have the same negative impact. Despite the initial setbacks, players could still recover and regain their strength because the game did not have items or levels that increased the difficulty. While a bad start may affect the team's control over objectives, it did not directly

remove the player's abilities to stay competitive. Therefore, Overwatch does not have the same negative consequences as League of Legends.

## **6.4 “Just-in-time & ”On-demand”**

### **6.4.1 League of Legends**

The League of Legends tutorial has the potential to improve its Just-in-time model by having an option to repeat a learning step as player’s progress. This approach would allow players to become more comfortable and familiar with the game's mechanics and concepts. Currently, the tutorial only focuses on one aspect at a time, leading the players quickly forgetting what they just learned in previous steps. By introducing the option to repeat certain steps, the tutorial can reinforce important knowledge and ensure better learning.

Gradually increasing the difficulty of each step would also be beneficial, as it would create a sense of constant progression and provide stimulating challenges for players. Allowing players to decide when they want to move onto the next stage would also be advantageous, as it would help the player decide the pace of the needed learning. By implementing these improvements, the League of Legends tutorial can be a more effective and enjoyable learning environment.

### **6.4.2 Overwatch**

The Overwatch tutorial uses a different design that focuses on teaching players how to control their characters and boosting their confidence. Unlike League of Legends, it doesn't immediately throw players into gameplay situations. This approach proved to be a very successful "Just-in-time" method, where players instead were gradually introduced to the real environment. Even the players who have never played a game before showing remarkable confidence in controlling their characters and working towards the game's objective.

## **6.5 System thinking and Goal Setting theory**

Both games had shortcomings in encouraging beginners to take risks, indicating it was lacking in the self-regulation process for the players. Without clear guidance on identifying and correcting mistakes, it was challenging for players to understand the complex rules and interactions in the game. In contrast, real game professionals utilize an effective self-regulation process. The game's mechanisms allow them to analyse their progression towards the main objective constantly. Their good understanding of the game's rules can enable them to interpret and use the provided data more effectively.

### **6.5.1 League of Legends**

By using principles of System Thinking into the League of Legends tutorial it could be possible to improve the overall learning experience for players. One of the main issues players faces after completing the tutorial was their lack of understanding that certain actions lead to severe punishments. For example, the tutorial could explain better that when a player is killed, they will be unable to play the game for a specific amount of time and will then be respawn in their

base. This action gives an advantage to the opponent, allowing them to gain more gold and experience. By understanding this concept, players can better understand the importance of survival and strategic decision-making during gameplay and stay more competitive.

Additionally, the tutorial should emphasize the significance of using itemization in achieving victory. Items play a crucial role in shaping the outcome of a game and unfortunately, the current tutorial only presents one item option that is impractical and should not be purchased for the champion in use.

A better approach would be to offer players a choice between different items, each explaining their distinct gameplay scenarios it might offer. This way, players can learn about itemization and its influence on their champion's performance much better. The tutorial can also provide clear explanations why each item is valuable and when it can be used.

By using these changes, the League of Legends tutorial can provide players with a deeper understanding of the game's mechanics. This will most likely lead to a more engaging and rewarding gaming experience for all players, regardless of their skill level.

To the players, notifications about gold earned, kills, and items bought appear frequently on the game interface. These updates help players understand how well they are performing compared to others in the game. Many players did however not realize the importance of killing minions to earn gold. This provides the player with feedback to monitor their performance in the game and encourages them to set goals, which is similar to the goal setting mind-set discussed by Seitj and Latham. Unfortunately, many players do not fully understand the game mechanics and fail to use this information in a meaningful way and fail to understand the self-regulation process of the game. They overlook important data such as total gold earned, and items purchased. This indicates that League of Legends could improve by providing more informative resources to help players learn and improve their gameplay.

### **6.5.2 Overwatch**

The Overwatch tutorial did not effectively apply any System Thinking. While players were instructed on how to take over objectives, they were not given guidance on how to apply efficient strategies or with the associated risks and opportunities. A well-defined strategy is essential for a successful objective control since it can ensure a player's survival by being tactically better positioned than the enemy.

The Overwatch tutorial system can benefit from using System Thinking principles in a way that explains the different assignments each role has when contesting for objective controls and how these different strategies used can produce different outcomes in fights.

The game's interface was however helpful and enabled players to set goals. The objective progression bar continuously provided indicators of the game's direction. This knowledge helped players to create better strategies and decisions. By continuously keeping players informed by showing the progress of the objective, Overwatch encouraged strategic thinking, giving a more engaging and rewarding gaming experience.

## 6.6 Observation questions discussion

### Is the player learning from previous mistakes? League of Legends

Many players learned important lessons from their mistakes, which can be attributed to the game's strict punishment towards errors. The players eventually realized this and worked to avoid similar situations.

### Is the player learning from previous mistakes? Overwatch

Even though the overall performance score was impressive, this specific aspect was low on all players. This seemed to be caused by the game's forgiving nature, which enables players to make forgiving errors without affecting their overall gameplay performance.

### Player commitment League of Legends

Many players did not show high commitment to the game. Numerous lacked competitive skills and fundamental knowledge of the game mechanics. The overall low understanding of the game seemed to be an underlying factor to their inability to enjoy it. Without basic practical understanding of the game, confusion often occurred which limited the entertainment factor. As a result, players may become less interested in learning new skills or new important knowledge.

### Player commitment Overwatch

The majority of players found enjoyment from playing Overwatch. The game's high action, entertainment value played an important role to engage the players. Overwatch is known for its easy-to-use character controls and clear rules, making it an enjoyable gaming experience, particularly for beginners. This accessibility allowed beginners to quickly learn the game and develop a strong commitment.

### Map awareness and trying new interactions League of Legends

Very few players took advantage of the map in League of Legends, even though it is a crucial strategic tool. Despite the game tutorial's clear explanation of how to use the map, most players did not. The cause for this seemed to be from the game's complex nature, where players are expected to learn too many different functions and mechanics.

If a player is unable to progress and acquire new skills from a complicated game, this limitation could be explained using Kolb's learning style model. According to him, only one learning style can be utilized at a time and the learning cycle must be started from the beginning before a new style can be used. The player may prefer the accommodator's learning style, which involves learning through trial and error. Problems might however occur if this style is consistently used throughout the game, important information may be overlooked as other styles are not fully utilized.

### Map awareness and trying new interactions Overwatch

During the game, most players demonstrated good knowledge of the map but had lacking information on how to position themselves differently. The game had a variety of strategic options, but players did not try them out, making the game feel very simple. This lack of



experimentation prevented players from learning and improving their skills. To make the game more engaging, players should be held accountable for their lack of map awareness and be encouraged to try new strategies.

#### Use of abilities Overwatch

Unlike the playing performance in League of Legend, the players managed to use different abilities to address specific situations. The frequency of using health regeneration when in danger indicates that players make quick and active decisions. The game's abilities are designed to be user-friendly, with clear and noticeable effects. This display helps players understand the benefits from the abilities, making it easier for them to remember how they work.

#### Use of abilities League of Legends

A large number of players used their abilities, but it was apparent that many of them were completely clueless how these abilities functioned. They were often used in a way that wasn't effective or not used at all. The ability that the players used and relied on the most was the same they learned during the tutorial. If the tutorial had covered all the available abilities, we might have seen more players using a wide-ranging use of their abilities.

#### Death punishment awareness League of Legends

It was very clear that most players did not understand what would happen if their character died in the game. This was because the tutorial did not explain it well enough. As a result, many players died early, putting them very far behind. Since players could not restart the game, it eventually reached a point where dying or killing did not matter anymore because they had no chance of winning.

#### Death punishment awareness Overwatch

Most players noticed that the punishment for dying in Overwatch was not as severe as in League of Legends. The main penalty for dying was only the inability to control objectives. This information was also well-known among most players as it was emphasized during the game's tutorial clearly.

#### Character awareness League of Legends

In League of Legends, it was observed that players had limited awareness of their in-game characters. The interface provided the player with important information which should have allowed better character control. This however proved to be a significant challenge for many players. It seemed that inexperienced gamers and players found it difficult to manage the overwhelming amount of information presented to them through the interface and information was forgotten.

#### Character awareness Overwatch

Most Overwatch players presented a good understanding of their character's abilities. The game's interface was user-friendly and enabled players to keep track of their health, ammo, and abilities while simultaneously controlling their character. Players did however struggle with making strategic decisions and positioning themselves correctly. The reason for this could be the tutorial never tried scenarios that would force players to consider and adjust to these factors.

### Buying items League of Legends exclusive

Many players missed the important task of buying items, and when they did buy something, it had little relevance to the champion. The reason for this could be that the tutorial does not give enough importance to item purchases, only briefly mentioning it at the start and displaying only one item as an option. Considering the substantial amount of information that is given to players during the tutorial, it is understandable why the tutorial might have overlooked this important aspect.

### Gold income League of Legends exclusive

Many players were not aware of the amount of gold they were earning. This was likely caused from the general lack of game knowledge as they did not know how to use it, resulting in them ignoring its value.

### Tower interaction League of Legends exclusive

Some players had difficulty understanding how the towers worked while others were able to comprehend them easily. Fortunately, an interface during the game was shown highlighting and explaining its function. Most players were helped and reminded through this user-friendly interface.

### Objective focus Overwatch exclusive

Every player had a strong desire to compete and reach the game goal. The purpose of the game was centred around objective control, and it was very clear the players had understood how to play.

### Strategic use of ultimate Overwatch exclusive

Most players demonstrated strategic capabilities when using their ultimate ability. The ultimate, which was presented as an important tool during the tutorial, can make a significant difference in the game. As a result, many players wisely saved their ultimate for these important moments, using its power to the best benefit.

Having a computer making accurate assumptions on the users' weaknesses in games are important steps to improve any learning behaviours in tutorials. A computer coaching system could be a solution to this problem.

## 7. Conclusion

Tutorials are useful tools for learning because they utilize a range of different media to illustrate information. (Fletcher, J. D., & Tobias, S. 2005).

When analysing the League of Legends and Overwatch tutorials, it was found that both games used many previously covered theoretical models that can enhance the learning experience. These included elements from the Just-in-time model, active System thinking, and Goal Setting theory. However, their implementation seemed to lack certain key components to make them fully successful. The games displayed different risk-taking layouts, but they still managed to create negative learning consequences. Comparing the "Just-in-time" & "On demand" model, League of Legends fell short in granting learners the option to review and revisit new information presented. Once a specific objective was reached, the game immediately advanced to the next stage, not giving the players any opportunity to review or practice the new knowledge.

In contrast, Overwatch provided players the opportunity to apply their newly acquired knowledge by allowing them to practice freely within the game without any limitation. Comparing the Goal Setting theory, League of Legends displayed flaws in successfully explaining critical information related to champions, items, and in-game scenarios. This often-made players confused, misleading them to make decisions that hindered their progress towards the game's objectives. In comparison, Overwatch's game design is very simple, leading to a minimized need for progress indicators to reach the goal.

League of Legends uses a high-risk, high-reward system that could greatly benefit or punish the players. The system and its consequences were unfortunately not well-explained in the tutorial, causing players to take unnecessary risks and lose quickly. In Overwatch, players were encouraged to play aggressively without it affecting the gameplay. Because of this, many players became comfortable using repetitive strategies and had almost no interest in exploring other aspects of the game.

No active self-learning systems were discovered in any of the tutorials. The outcome of the players' performance and understanding suggest that implementing such a system could significantly help the learning process at a more individual level. Dynamic play suggestions working as a coaching system can be used to provide players with live instructions based on their performance and guide them to play better. (Burton & Brown 1979)

Additionally, before the tutorial begins, questions can be asked by the system to identify what learning style each player prefers in various situations. The answer can then be used to reshape the tutorial layout and enforce new types of learning methods.

Improving the way players understand the tutorial can be further accomplished by gaining a better understanding of how each individual prefers to learn. By using well-known models such as Fleming's VARK or Kolb's Model, the tutorial can be customized to meet the specific learning needs of each player.

The result indicated that players often used repeating learning styles, such as trial by error. While it is good that a learning style is used by the player, it is important that the game aids the player so it can reach the objectives using this style primarily. If a game cannot be understood or played using only one learning style approach, it should then encourage the player to use alternative learning styles options.

## 8. Future Research

Connolly argues in his article (Connolly, Boyle, MacArthur, Hainey & Boyle 2011) that one of the major difficulties in creating a game tutorial is acquiring accurate information on how it affects personal learning behaviours. This research has investigated more closely at how two game tutorials help with learning. However, it's important to acknowledge that these results are only initial indicators that future tutorials might benefit from. The study's limitations mean that more extensive research is needed to confirm that these features can improve the learning experience. Further research is also necessary to understand how to incorporate the suggested learning improvement into the system without sacrificing the entertaining aspect of the game.

Kolb and VARK use different approaches to define learning styles, Kolb focusing more on the process of learning through experience and VARK emphasizing the importance of making use of sensory inputs and outputs. Investigating which model is most effective to improve self-learning systems in tutorials could generate interesting findings and lead to even better learning experiences. This can also further research in the gamification field by providing an indicator which learning style framework can be the most accurate for game learning.

## 9. References

- Aczel AD. (1999) *Sampling methods. Complete business statistics* fourth edition. Boston: Irwin/McGraw-Hill; pp 826-53.
- Ambrose, M.L., Kulik, C.T.(1999) *Old friends, new faces: motivation research in the 1990s*. J. Manage.25(3), 231–292
- Amory, A Naicker, K, Vincent, J, & Adams, C (1999). *The use of computer games as an educational tool: Identification of appropriate game types and elements*. British journal of education Technology, 30(4), 311-321
- Andersen, E. O'Rourke, E, Liu, Y. Sinder, R. Lowdermilk, J. Truong, D. Copper, S. Popovic', Z. (2012) *The Impact of Tutorials on Games of Varying Complexity*. Center for Game Science Department of Computer Science & Engineering, University of Washington
- Baer, R. (2014) *Genesis: How the Home Video Games Industry Began*. Ralph H. Baer Consultants. ([http://www.ralphbaer.com/how\\_video\\_games.htm](http://www.ralphbaer.com/how_video_games.htm))
- Bejjanki, V. R., Zhang, R., Li, R., Pouget, A., Green, C. S., Lu, Z. L., & Bavelier, D. (2014). *Action video game play facilitates the development of better perceptual templates*. Proceedings of the National Academy of Sciences of the United States of America, 111(47).
- Brooks, A, R. (1986) *Achieving artificial intelligence through building robots*, Massachusetts, MIT
- Bryman, A., Bell, E., (2011), *Business Research Methods* New York: Oxford University Press
- Bundy, A. (2017) *vol.60 no 2 "Smart machines are not a threat to humanity"* Viewpoint
- Burton, R., R., & Brown, S., J., (1979) *An investigation of computer coaching for informal learning activities*. International Journal of Man-Machine studies. Volume 11, Issue1, Bolt Beranek and Newman, Inc., Cambridge, Mass. U.S.A.
- Clariana, R. B., & Lee, D. (2001). The effects of recognition and recall study tasks with feedback in a computer-based vocabulary lesson. *Educational Technology Research and Development*, 49(3), 23–36.
- Connolly, T.M., Boyle, E.A., MacArthur, E., Hainey, T., Boyle, J.M. (2011) *A systematic review of empirical evidence on computer games and serious games*. Comput. Educ. 59, 661–686
- Copeland, J. (2000) *What is Artificial Intelligence?* B.J. Copeland ([http://www.alanturing.net/turing\\_archive/pages/reference%20articles/what\\_is\\_AI/What%20is%20AI11.html](http://www.alanturing.net/turing_archive/pages/reference%20articles/what_is_AI/What%20is%20AI11.html)) [2018-04-22]

Corbin, J. & Strauss, A. (1990). *Grounded theory method: Procedures, canons, and evaluative criteria*. *Qualitative Sociology*, 13, 3-21.

Department of Computer Science & Engineering (2012) *The Impact of Tutorials on Games of Varying Complexity* University of Washington

Dolgov, D. (2016) *Google Self-Driving Car Project Monthly Report* On the road

Doran, G.T. (1981) *There's a SMART way to write management's goals and objectives*. *Manag. Rev.* 70(11), 35–36

Feldmesser, K (2009) *A Video Game, a Chinese Otaku, and Her Deep Learning of a Language*, University of Brighton, UK

Garris, R., Ahlers, R., Driskell, J.E.(2002) *Games, motivation, and learning: a research and practice model*. *Simul. Games.* 33, 441–467

Gee, P., J. (2003) *What Video Games Have to Teach Us About Learning and Literacy*. New York: Palgrave/Macmillan

Google Brain, Google Inc, Verily Life Sciences, Mountain View (2017) *Detecting Cancer Metastases on Gigapixel Pathology Images*, CA, USA

Kao, Y-K & Venkatachalam, R (2021) *Human and Machine Learning*, Computational Economics volume 57

Kollar, P (2014) *The past, present and futures of league of legends studio riot games* (<https://www.polygon.com/2016/9/13/12891656/the-past-present-and-future-of-league-of-legends-studio-riot-games>) [2018-04-19]

Laamarti, F., Eid, M. & Saddik, E., A. (2014) *An Overview of Serious Games*. *International Journal of Computer Games Technology*

Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting & task performance*. Englewood Cliffs, NJ, US: Prentice-Hall, Inc.

Locke, E. A., & Latham, G. P. (2013) *Developments in Goal Setting and Task Performance*, pp. 3–15. Routledge/Taylor & Francis Group, New York

Locke, E.A. (1968) *Toward a theory of task motivation and incentives*. *Organ. Behav. Hum. Perform.* 3(2), 157–189

Malone, T.W. (1981) *Towards a theory of intrinsically motivation instruction*. *Cogn. Sci.* 4, 333–369

- Maxwell, A. (2013) *Qualitative Research Design An Interactive Approach*, SAGE Publications, Inc. California
- Mayer, R. E., & Anderson, R. B. (1991). *Animations need narrations: An experimental test of a dual-coding hypothesis*. *Journal of Educational Psychology*, 83(4), 484–490.
- Michalski, S., R. Carbonell, G., J. & Mitchell, M., T., (1984) *An Artificial Intelligence Approach* Machine Learning. Berlin Heidelberg GmbH
- Millington, I. & Funge, J. (2009) *Artificial intelligence for games* Morgan Kaufmann Publishers. MA, USA
- Moor, J. (2006) *The Dartmouth College Artificial Intelligence Conference: The Next Fifty Years*, *AI Magazine*, vol. 27, no. 4, pp. 87-91.
- Myndigheten för press, radio och tv (2015) *Medieutveckling 2015 (Rapport 2015)* ([medieutveckling-2015.pdf \(mprt.se\)](#)) [2023-07-27]
- Nabi, R. & Oliver, M.B. (2006) *Handbook of media effects*. Thousand oaks, Ca: Sage.
- OpenAI (2017) *Dota2*  
(<https://blog.openai.com/dota-2/>) [2018-04-22]
- Overwatch (2018) *Welcome to Overwatch*  
(<https://playoverwatch.com/en-us/game/overview/>) [2018-04-19]
- PlayOverwatch (2017) *35 million players and counting*  
([https://twitter.com/PlayOverwatch/status/919925924769906688?ref\\_src=twsrc%5Etfw&ref\\_url=https%3A%2F%2Fwww.pcgamesn.com%2Foverwatch%2Foverwatch-sales-numbers](https://twitter.com/PlayOverwatch/status/919925924769906688?ref_src=twsrc%5Etfw&ref_url=https%3A%2F%2Fwww.pcgamesn.com%2Foverwatch%2Foverwatch-sales-numbers)) [2018-04-19]
- Recker, J. (2013). *Scientific Research in Information Systems: A Beginner's Guide*, Springer-Verlag Berlin Heidelberg
- Riot Games (2016) *What is League of Legends*  
(<https://na.leagueoflegends.com/en/game-info/get-started/what-is-lol/>) [2018-04-19]
- Robson, C. & McCartan, K. (2016). *Real world research*. 4, edition. West Sussex: John Wiley & Sons Ltd
- Sainato, M. (2015) *Stephen hawking, Elon Musk, and Bill Gates Warn About Artificial Intelligence* Observer  
(<http://observer.com/2015/08/stephen-hawking-elon-musk-and-bill-gates-warn-about-artificial-intelligence/>) [2018-04-22]

Seijts, G.H., Latham, G.P. (2005) *Learning versus performance goals: when should each be used?* Acad. Manag. Perspect. 19, 124–131

Spronck, P., Ponsen, M., Sprinkhuizen-Kuyper, I., Postma, E., (2006) *Adaptive game AI with dynamic scripting* Machine Learning

Tegmark, M. (2017) *LIFE 3.0 being human in the age of artificial intelligence*, New York, Penguin Random House LLC p155-p170

Warschauer, M. (2007) *Computer-Mediated Collaborative Learning: Theory and Practice*. Department of ESL, University of Hawai'i at Manoa.





# HÖGSKOLAN I BORÅS