Why gamers don't learn more

An ecological approach to games as learning environments

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ABSTRACT

This paper criticizes the argument that video games by their nature are good learning environments. By applying the ecological approach to perception and learning to examples of game play, the paper shows that games can be designed so that players are able to see and utilize affordances without developing skills. Compared to other practices, gaming demands less learning of the practitioner since progress can be built into the system. Contrary to the arguments put forth by James Paul Gee in his book *What video games have to teach us about learning and literacy*, this paper comes to the conclusion that good games do not necessarily imply good learning.

Keywords

Video Games, Computer Games, Learning, Ecological Psychology, Affordance, Interaction Analysis

1. INTRODUCTION

Just like movies and television were said to have some unique educational potential, digital technology is now seen as having a number of things to offer educational practices. Games are said to have qualities that increase student motivation, provide a more authentic learning experience and facilitate collaborative problem-based learning [2, 8, 14]. Shaffer [14] argues that games can simulate a practice in such a way that the players talk and conceptualize in ways that are very similar to a professional practice. In so-called epistemic games, Shaffer claims that students think in the same way as they would in the knowledge domains of professionals. Shaffer's approach to games and learning presents the idea that it is possible to create specific educational games that would be superior to other instructional approaches. Historically, this has been the dominant view of games and learning, an idea that games can and should be used in different educational practices [8]. In the last decade, another kind of argument has begun to live side by side with the idea of games as educational tools. In his seminal work, *What video games have to teach us about learning and literacy*, James Paul Gee [3] presents the idea that games have properties that makes them excellent learning environments. Gee [3] does not explicitly suggest that games should be used in schools, nor does he say that leisure gaming teaches school subjects. Gee [3] states that:

> "The argument in this book is not that what people are learning when they are playing video games is always good. Rather, what they are doing when they are playing good video games is often good learning." (p. 199).

The idea is thus that schools could learn from the game industry about how to facilitate learning. The qualities for learning that Gee suggests games have are described in a list of 36 learning principles. These learning principles are rather different in nature, having to do with diverse matters such as motivation, identity and multimodality, but many of them share a common feature, they fall back on the *design* of games as learning environments. According to Gee, good design is crucial for good learning. Gee takes the example of well-designed training modules in games i.e. the first level in many games, the tutorial, where the player is supposed to learn the basic game play. These modules are designed to give the player just a subset of the domain she/he is training for. In relation to these training modules and other well-designed learning environments, the real world without improvements made by designers has, according to Gee, little to offer. He states that:

> Neither players of games nor children in school can learn by 'playing' (i.e., immersion in rich activities) if they are forced to operate in poorly designed spaces. And the real world – that is. The world without game designers or good teachers, themselves designers of virtual worlds in classrooms – is not in and of itself well designed for learning. Leaving children to the mercies of the real world by just letting them loose to think and explore is not education. ([3] p. 137)

Gee wants to map the properties that make games good learning environments in order to see if these properties can be utilized in educational practices. Wanting to improve the school system by looking at other practices seems like a creative and good idea, and certainly game design might have some properties that could be used in educational design. Now the problem with asking *why* people playing games can learn so much is that it presupposes that they actually learn a lot. It presupposes that what seems to be highly qualified performances has to do with the skill and knowledge of the player. The discourse of the competent gamer, a discourse that Gee gives a voice to, is not based on systematic studies of what gamers learn (such studies are rare with a few exceptions, see [1, 15]). This discourse is, rather, based on everyday observations and anecdotes (Gee's own line of reasoning starts with an anecdote about a six-year old boy playing *Pikmin*, [3] pp. 19-21; pp. 39-46). We have heard stories about how low achievers in school are motivated to sit for hours with games. We have seen gamers learn school-like subjects such as English as a second langue from chatting in games, learning math when doing calculations for optimizing a World of Warcraft character or picking up some historical facts from a game set in medieval Europe or World War II. And watching an eight-year old child play

World of Warcraft reaching the higher levels in a game that seems enormously complex to a non-gamer makes us wonder how someone that we would never expect to read a book like *War and Peace* can play a game like *World of Warcraft*. Observations like this suggest that there is something almost magical about games. Buried in the design of video games lies a hidden educational grail just waiting to be found and utilized in schools.

In this paper, I present a rather different take on how to understand why people who play games seem able to handle tasks with a level of complexity that they would not be able to do in other practices. By going beyond the question of *why* players learn so much, I instead raise the question of *if* players actually learn as much as the popular arguments suggest. Maybe there are other ways of making progress in a game than learning? Looking at gaming through the lens of James and Eleanor Gibson's ecological approach to perception and learning [5, 6, 7, 12, 13], I claim that successful performance in gaming does not necessarily have to do with learning. Instead, the ecological approach shows how games can be designed in such a way that successful performance requires very little learning compared to other practices.

2. THE ECOLOGICAL APPROACH TO PERCEPTION AND LEARNING

Side by side with the cognitive, rationalistic perspective on learning, Greeno, Collins and Resnick [9] identify what they label as a situated, pragmatist and socio-historical perspective as an influential contemporary learning theory. One of the theories that are placed in this family is the ecological approach to perception and learning. This theory rests on strong anti-cognitivist assumptions. It rejects the existence of mental schemata and the computer metaphor of an information-processing mind. Instead, the fundamental assumption in this theory is that learning and perception is a process of differentiating and making distinctions and not a process of *enriching*. We do not add mental schemata to stimuli in order to make sense of the world; we make sense of the world by becoming attuned to our environment, being able to make finer distinctions [5].

2.1 Affordances

The distinctions we make when we look, hear and touch in our environment are driven by the fundamental interest in learning what *affordances* the situation has. Affordances are the core concept in ecological psychology. Now this concept has been so ill-used and is so misinterpreted that some have claimed that the concept has become useless. The thing is that if one studies the original references, the concept is rather well defined so even though it is a challenge, since people have heard about affordances in the most peculiar ways, I will use it in its original meaning as the concept derived from James and Eleanor Gibson's work [5, 6, 7].

The main idea is that an environment with buildings, nature, different objects, humans and animals offers the individual different ways of acting. These offers are called affordances and they are relative to an organism (relative between species as well as between individuals). Water affords breathing for a fish, but not for a human. A chair affords sitting for an adult, but not for an infant.

An affordance is thus always relative to an agent; it is not an objective property of the environment. I find that the most illustrative metaphor, a thinking aid for illustrating the original meaning of an affordance is that of an empty space between two fitting jigsaw pieces. The environment must have certain properties in relation to the acting animal; its bodily constitutions and its capabilities.

2.2 Perception and action

The theory presumes that perception and action are closely related. We take actions to perceive what our world around us affords and we act upon these affordances, sometimes in ways so that new possibilities open up for us [5, 6, 7]. Actions can either be *exploratory*, functioning primarily to yield knowledge, or an action can be *performatory*, having certain expected results, and it is performed to produce these results. For instance, walking in a supermarket looking for a special brand of cereals, searching for a light switch in a dark room or scrolling down a webpage looking for information would all be exploratory actions. Exploratory actions are about learning what a certain situation affords while performatory actions depend on and confirm already learned affordances. As Gibson and Pick [5] points out:

> Perception and action are closely intertwined in both exploration and performance, and learning is an important outcome of both types of actions. Perception guides action; action makes information available for perception. Exploratory actions seem especially useful for learning by a novice, but the conformational consequences of expectant performances are essential as well. (p. 21)

2.3 Learning

Learning, in the ecological approach, is about becoming attuned to perceiving and being able to utilize specific sets of affordances that belong in specific practices. Professionals in different domains are able to perceive things in their surroundings that remain invisible to novices. A trained soccer player can see opportunities that someone who is not familiar with the rules of soccer would not see. Their exploratory work, the actions the soccer player and the novice perform, will have different outcomes. It is only the player who is attuned to making the necessary distinctions that show the possibility of luring the opposing team into an offside trap, i.e. the player can by means of exploratory actions (actively looking at the playing field) gain information about the affordances for the offside trap. Gaining the ability to discover specific affordances is called perceptual learning in the ecological approach. Perceptual learning is the outcome as well as the predisposition for exploratory actions. We gain abilities to differentiate among all available information so that we can "see" specific affordances. But learning is also involved in performatory actions. Gibson and Pick [5] point out that experts in a certain domain have learnt to utilize affordances that are not available to non-experts.

> Humans, at least, must learn to use affordances. Some affordances may be easily learned: others may require much exploration, practice, and time. /…/ Further development of expertise may involve learning to realize affordances unavailable to non-experts. A three-inch-wide beam affords performing back flips for a gymnast, but the affordance is not realizable by others; rock climbers learn to use certain terrains for support that do not appear to others to provide a surface of support. (pp. 16-17)

According to the ecological approach, we learn to *see* and *utilize* affordances. We refine our exploratory and performatory actions in

order to achieve a new relation to the world. Through learning we gain new ways of interacting with the world, we can see and utilize affordances that were not available to us before.

2.4 The use of tools

According to the ecological approach, learning is not the only way to gain new ways of interacting with the world. Affordances are also affected by the use of tools. When we use a tool, we can take performatory actions that would be unavailable to us without these tools. Tools become an extension of our bodies, we can do things we could not do without them [7]. If we use a snorkel, we transcend the boundaries of our bodies and can breathe under water. If we use a ladder, we can reach the same spot as the rock climber without having to learn the skills she or he has.

In the ecological perspective, using tools is a way to shortcut learning. The use of calculators in schools can transform school math into being more about problem solving and less about learning to do calculations. Yet calculators are seldom allowed in primary schools where the idea is that children should learn to perform basic calculations. Primary school teachers know that if they allowed calculators, children would be able to solve the tasks they have without learning how to perform basic calculations. They would gain access to performatory actions without having developed any skill. In this paper, I suggest that this perspective on learning, action and the usage of tools is a powerful way of conceptualizing what is unique about games as a learning environment.

3. GAMING AS A PERCEPTION-ACTION CYCLE

In the project *Boundary Crossing Online Games* (Gränsöverskridande onlinespel), 14 hours of gaming sessions where children played with adults were video recorded. The aim of this data collection was to map how game mechanisms can support or ruin boundary-crossing play over age barriers and this will be reported elsewhere. The material also lends itself to illustrating some of the points made in this paper. Here, two excerpts from one session are analyzed in order to illustrate how gaming can be seen from the ecological perspective.

The analytical method employed here was Interaction Analysis (IA) as Jordan and Henderson [10] describes it. IA may be defined as an approach/method for studying how people interact with each other and with the objects they have available in the environment. The aim of interaction analysis is to identify regularities and depict mechanisms in how people interact and conduct their affairs. IA is based on the assumption that knowledge and action are social phenomena, situated in social and material settings. IA is carried out together with video data, which the researcher transforms into detailed transcripts.

In the session analyzed, Carl and Maria are playing the game *LEGO Indiana Jones 2: The adventure continues* on a PlayStation 3. Carl is eight years old and an experienced gamer who has played the first LEGO Indiana Jones game as well as other LEGO games on a Wii. Maria is 36, an experienced gamer from PC shooters, but she has little experience of LEGO games. This is the first time they have played this game. The level they are playing is an adaptation from a scene in the movie *Indiana Jones and the Kingdom of the Crystal Skull* where Indy and his associate Mac are captured by KGB agents in a warehouse. Maria is playing Indy while Carl is playing Mac.

3.1 Excerpt 1.

The players have Mac and Indy standing to the left on the screen on some crates in the warehouse. It is possible to jump down from the crates into an area with special crates, LEGO coins and LEGO bricks the players can build with. In this area, there is a puzzle that the players must solve in order to advance in the level. First they must get some LEGO parts and use them to build an ancient statue. Then they must find magical staffs that they use on the statue in order for it to come alive. If they do this, the statue will run and smash into some crates on the right side, setting them on fire. With the parts from the smashed statue the players can build stairs, but in order to get up onto the crates on the right side they need to put out the fire by throwing water bottles on it.

In the background of the puzzle area there are some non-animated guards. They have nothing to do with the puzzle and they cannot be interacted with; they simply mark that this is an area that cannot be reached by the players.

Figure 1. Turn 1: Carl attempts to shoot the guards

1. Carl has Mac stand on the ledge of the crates to the left and shoot down on the non-animated guards but he cannot hit them. He says: *Down here, there are guards.*

2. Carl jumps down from the ledge saying *Yah*, while Maria has Indy search another area, saying to Carl: *Look here.* Meanwhile, she has Indy using his whip in many different directions without anything happening. Carl has Mac jump his way towards the guards.

3. Carl steers Mac right in front of the guards. He jumps and shoots at them but with no result. Carl says: *Aren't you supposed to kill those?* Meanwhile, Maria has moved Indy further to the right on the screen.

Figure 2. Turn 4: *You cannot go that way*

4. Carl turns towards Indy with Mac and says: *You cannot go that way*. Maria has Indy run towards different objects and bump into them.

Figure 3. Turn 5: *You're supposed place something here, two things*

5. Carl steers Mac over a green flat LEGO brick lying on the warehouse floor saying: *You're supposed to place something here.*

6. Maria moves Indy even further to the left and another, similar green flat LEGO brick on the floor becomes visible on the screen. At the same time Carl, after a short break, finishes his sentence [*You're supposed to place something here*] with: *two things.*

7. Maria makes Indy runs towards a crate and bump into it as she says: *Here*.

Figure 4. Turn 8: Carl smashes a crate

8. Carl answers: *No you can only pick up stuff that has an arrow.* While saying this, he smashes a crate revealing a box full of bricks that has an arrow above it. He exclaims: *Here!* Maria has moved Indy to the arrow, Carl instructs her about which button to use on the PlayStation control in order to pick up the box: *Round!*

9. Maria has Indy carry the box to the flat green brick.

This first excerpt illustrates gaming as a cycle between interrelated exploratory and performatory actions. In turn 1, Carl has moved his game character so that the guards become visible. He tries to shoot at them from the ledge, but discovers that he cannot hit them from that position. These shots are exploratory actions, performed in order to yield knowledge about what the guards afford. While Maria in turn 2 is doing exploratory actions by simply moving Indy around, making more of the game environment visible, Carl approaches the guards; movement that is performatory in nature. In turn 3, Carl has positioned Mac right in front of the guards and tries again to shoot at them from this new angle. Since this fails as well, Carl does not know what the guards afford as he states: *Aren't you supposed to kill those?* In turn 4, Carl abandons the project of killing the guards. His exploratory actions have taught him that these guards are not in the game so the player should not fight them; they are there to mark the borders of the playable game environment. Instead, Carl has seen the green flat LEGO brick. While taking the exploratory action of looking at the screen, he identifies the affordances of these bricks. Based on his previous experience of playing other Lego games, he is able to differentiate between these bricks and other parts of the game environment. He is already attuned to perceiving their affordances. Maria's exploratory action of moving Indy around in the game then makes another green brick visible and Carl refines his conclusion about how to proceed, they need to find two objects to place on the two green bricks. After further exploration in turns 7 and 8, Maria makes a goal-oriented performatory action and moves the box to the green brick.

3.2 Excerpt 2.

This excerpt follows two and a half minutes after excerpt 1. Maria and Carl have now built the statue but they have not figured out what to do next. There is a big box on the left that Maria has tried to smash unsuccessfully. Then instructions appear on the screen saying: Switch to Mac to make use of his gun.

Figure 5. Turn 1: You should use your gun

1. Maria says: *You should use your gun*. And she reads: *Switch to Mac to make use…*

2. Carl says: *I have a gun!* At the same time, new instructions appear on the screen saying: Hold square to aim your gun at the target, then release the button to shoot.

3. Maria: *OK, square.*

4. Mac fights on the screen. Carl: *Then I am fighting.* Carl attempts again and successfully fires the gun and says: *Or no, a.. like that.* Carl fires more shoots and asks: *What should I shoot at*

Figure 6. Turn 6: Indy whips the bricks

5. Maria jumps on the spot where she was when the instructions came up, answering: *I don't know, something happens when you are here*. Meanwhile, Carl has Mac fire a shot at a target on the big box to the right. It opens and reveals some LEGO bricks. These bricks are glowing slightly.

6. Maria says: *Aa.* Both Carl and Maria have their characters move to the box which is now open. Maria has Indy whip on the bricks.

7. As the characters come close to the content in the box, one green and one blue arrow, which indicate that you can pick something up, appear.

8. Carl has Mac pick up a staff from the box and one of the arrows disappears. Carrying the staff Carl moves to the left, towards the statue. While doing this Carl, says: *Then I think you should lift.. I think I know what to do.*

Figure 7. Turn 9: Two highlighted spots on the ground

9. As Carl moves to the left, two highlighted spots on the ground with a white arrow above them appear on the screen. Carl stops talking in mid-sentence. Meanwhile, Maria has picked up the other staff with Indy and says: *What did I pick up now?*

10. Carl moves Mac to the highlighted spot and places the staff so a ray of light shoots out from it. He answers Maria: *No point*. He then has Mac turn the staff so the ray shoots around the room. Carl exclaims: *Ohh!*

Figure 8. Turn 11: The ray hits the eye

11. The ray hits the right eye of the statue and the eye starts to fizzle. Carl responds: *Oh you have to hit.. aim at his eyes!*

This excerpt further illustrates gaming as a cycle of exploratory and performatory actions. Turn 5, when Maria stands and jumps on a spot where she was when the instructions became visible, and turn 6, when she tries the whip the glowing bricks, are two examples of exploratory actions. This excerpt also illustrates how the game system helps the players with their exploratory work. The most obvious example where the players get help is the textual instructions, but they are also helped by the highlights and arrows. When Carl, in turn 8, pick up the staff he has seen the arrow. He then walks away with the staff until he discovers the highlighted spots. This discovery makes him stop in mid-sentence (when he was making a hypothesis about what to do next) and place the staff on the highlighted spot.

Arrows and highlights call for the player's attention and make certain things in the game environment stand out. In excerpt 1, there was no support to get concerning the guards. Thus Carl had to take many exploratory actions in order to figure out the affordances. This means that Carl has to learn to *differentiate* between the guards who are solely "decorations" and the other guards he has encountered before these excerpts who afford combat. It is different in the case of the staffs and the boxes with LEGO bricks. Here, the game highlights the items you can interact with. Thus there is no need to learn to differentiate between the bricks, crates or items needed to solve puzzles and bricks, crates or items that are not interactable and have only been put in the game to make it look good. The game does part of the player's exploratory work.

If we go back to the first turns in excerpt 2, when Maria is instructed to "Switch to Mac to make use of his" gun, there is another point to be made from an ecological approach. Here, the game is designed so that only one of the characters is able to take the performatory actions needed in order to solve the puzzle. Since it is Maria who gets the information, the game tells her to change characters, but as is the case here, in a two-player game there is no need to change characters. Instead, the players need to collaborate. From an ecological perspective, this kind of game design fits in with J. J. Gibson's ideas about tools [7]. The game character is an extension of the player's agency in the game world. And by changing and altering tools, one can gain access to new affordances. In this case, using Mac will afford the player to open the big box containing the staffs. The analytical point I want to make here is fairly simple and straightforward: changing and editing game characters in a video game is like getting a new tool. It changes the relation between the player and the game environment so new affordances become available, or in some cases unavailable.

4. GAME SYSTEMS SUPPORTING THE PERCEPTION-ACTION CYCLE

If gaming is seen as a cycle of exploratory and performatory actions, being about seeing and using affordances, then there is reason to look more closely at some specific design features in video games. As suggested in the excerpts analyzed here, games can be designed so that the system: a) helps exploratory actions by visually showing the affordances that needs to be acted on in order for the game to progress b) helps performatory actions by providing the player with new "tools". Looking more closely at some games, makes it possible to identify different designs for supporting exploratory and performatory actions. The designs mentioned here are based on personal experience of games and should be regarded as illustrations, not as complete lists of all possible design patterns supporting exploratory and performatory actions.

4.1 Designs for supporting exploratory actions

According to the ecological perspective, perceptual learning is about differentiating in an information-rich environment in order to see affordances. While many competitive games, such as *Counter-Strike*, require the player to make skilled distinctions, others have built-in support to help the player know what to do next. Some of the design features that do this are *highlighting*, *vision modes* and *point of interest*.

4.1.1 Highlighting

A fairly common way of helping players to see affordances in a game environment is to graphically highlight the things you can interact with. As shown in the excerpts analyzed, *LEGO Indiana Jones 2* uses this feature. Other examples are the computer games *Left 4 Dead* and *Left 4 Dead 2*. These games are highly collaborative and players need to help each other in order to succeed. If one player gets into trouble, other players need to come to her/his assistance. In the game, players are highlighted with a white/blue outline so it is easy to track teammates. When a teammate gets into trouble, the outline glows yellow, showing that the player needs assistance. In these games, you can play with a harder difficulty setting called *realism*. In realism mode, there is no highlight around other players. The fact that this mode is harder illustrates that highlighting offloads the amount of exploratory work the player has to do without this feature.

Figure 9: Highlighted teammates in *Left 4 Dead 2*

4.1.2 Vision Modes

Another way of aiding the player's exploratory actions can be found in games with vision modes. In these games, there is a built-in feature that the player can turn on or off in order to get another view of the game environment. When in this vision mode, interactable features of the game environment are highlighted. Examples of vision modes are *detective mode* in *Batman: Arkham Asylum* and *eagle vision* in *Assassins Creed 2*. Both these modes make the game environment turn into a single-coloured shade where interactable items glow bright red and orange.

4.1.3 Point of interest

Helping players see what they need to see in a game can also be done with the feature *point of interest*. This is a function in some games where the player can press a certain *point of interest* button on the controls. When pressing this button, the character turns and faces the direction in which the affordances for game progress can be found. An example of this design can be found in the game *InFamous*. When pressing the point of interest button on a mission, the player will face the direction that she/he needs to go to finish the mission.

Figure 10. Scene from Batman: Arkham Asylum

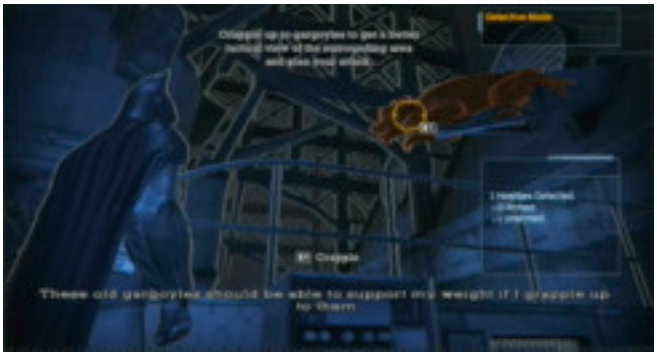

Figure 11. Same scene from Batman: Arkham Asylum as in Figure 10. Here, with Detective Mode on.

4.2 Designs for supporting performatory actions

According to Gibson and Pick [5], performatory actions in specific domains might require a lot of practice before it is possible to utilize certain affordances. A guitar affords playing a solo if you have two hands and can hold the guitar, but far from all humans are able to utilize this affordance. Just like playing a guitar takes a lot of practice, many games also require a lot of skill, especially older arcade games. In other games, the design is more forgiving and what a player lacks in skill is compensated for with new tools. The relationship between a player's skill and progress by getting new tools and resources is not something fixed, rather, it is fluid. In one and the same game, there can be occasions that require more or less skill. It is not as simple as saying that just because a game introduces new tools and resources the player never has to develop her or his skill. If the difficulty in the game increases with the introduction of improved abilities, the amount of skill it takes to play the game will be constant. In many games, this relationship is asymmetrical and takes a certain amount of learning, even though the game introduces objects such as new and improved weapons or gadgets. One example of this is the game *Doom 3*. At the beginning of the game, the player has a limited amount of ammunition and only a gun at her/his disposal. At this stage, the enemies you encounter are just zombies who can be defeated with the resources you have. After a while, new and harder opponents are introduced and after struggling through hordes of demons you finally encounter the devil himself. But in this final fight, you have both a rocket launcher and body armour to help you.

Note that the phenomenon scrutinized here is not unique to computer games, but something that is also present in sports where the equipment is of crucial importance; for example, in motor

sports and sailing, where the competitors' chances of winning are often dependent on the quality of the tools. This goes for all sports where some sort of equipment is used, like hockey sticks or tennis rackets, etc. The difference between these sports and a computer game is that the importance of the tools and resources are greater and are systematically introduced, thus opening up new affordances for the players.

New tools can be introduced in a game in a number of different ways.

4.2.1 Change of character

In some games, different game characters have different abilities and by switching between them, the player gets new affordances. Examples of this are the above-mentioned LEGO games where players sometimes must switch to another character in order to progress. A similar design can be found in the game *Overlord* where the player must send different types of minions to handle different tasks. In other games, like *Ultimate Alliance*, players can choose from a variety of superheroes. Some of these heroes are more suitable for certain tasks even though all characters technically can be used to progress through the game.

4.2.2 Character development

In many games, the character develops and gains new abilities. This is a typical feature in the role-playing genre (RPG). In these games, the character gets more hit points, a better chance of succeeding in combat, improved speed, etc. Examples of this can be found in single-player RPGs such *Fallout 3* or any Massively Multiplayer Online Game (MMOG) such as *World of Warcraft*.

4.2.3 Equipment

From an ecological point of view, getting new equipment in games is simply a form of character development. The tool becomes better and situations afford new things when the player has a bigger gun. The difference is simply the representation of a character learning or gaining new things. Many RPGs as well as first person shooters (FPS) rely heavily on designs where new equipment is introduced to the player. Examples are *Borderlands* or *Batman: Arkham Asylum*.

4.2.4 Temporary power-ups

A special case as regards equipment is temporary power-ups. Typically, these are shields or damage bonuses that players in competitive FPS games pick up to receive a temporary improvement. Examples of this can be found in *Timesplitters 2* or *Mario Kart*.

There are a number of different ways of designing the way in which new *tools* that lead to new affordances are given to the player. Game designers have different ideas about what kinds of experience they want the player to have. In some games, you gain new resources as a *reward for skill*. An example of this is the multiplayer game *Enemy Territory: Quake Wars* where the player gains experience points based on performance. These experience points unlock new abilities for the player like more health points, new weapons, etc. This kind of design can throw a game out of balance since the best players also obtain the best resources.

In other games, resources are handed to the players with the lowest scores as a *compensation for being unskilled*, thus making the game more balanced. An example of this is the racing games in the *Mario Kart* series. In these games, players who are falling behind pick up better resources and get a chance to catch up. In some games, tools are handed out randomly.

In MMOGs it is not unusual for the player to receive new tools by *collecting something over time*. The most common way is from experience points that the player collects by defeating monsters and undertaking quests in the game. These points are not a reward for skill since you can earn experience points from simple routine activities. Sometimes, the monsters have some kind of item that the player collects and can subsequently convert into different rewards like armour or weapons. This way of playing is called *grinding*. Grinding is not a challenge; it is not a question of whether or not the player will succeed and there is very little skill involved. Instead, you get new tools and resources by investing time in the game.

One of the more controversial forms of game design is when the player is able to *buy new resources or make investments with real money*. This is something that mainly happens in online games and is called a micro-sales system. Often the game as such is free and then the player pays for new affordances. An example of this is the game *Travian* (see www.travian.se). *Travian* is a strategy game where the player builds up a village using different natural resources and can then trade with, or make war on, other villages. The game is completely free, but it is possible to buy certain advantages that increase the production rate of your village or make your soldiers stronger in battle.

Collection over time and *paying for new resources* can sometimes be overlapping design principles. In MMOGs, the game company often charges a monthly fee and therefore has an interest in keeping game systems time consuming. By charging for time and making time an incentive for developing their game character, the player pays indirectly for getting new affordances. Some games have real-time delays for how often you can do certain things, like defeating a certain monster or undertaking a specific quest. This limits the number of times you can try to get an item and thereby encourages the player to keep her/his account.

5. CONCLUSIONS

When looking at games and learning from James and Eleanor Gibson's Ecological approach [5, 6, 7, 12, 13], a picture different to the one suggested by James Paul Gee emerges [3, 4]. Games can be designed to facilitate both exploratory and performatory actions. This means that progressing in a game, being able to take actions and reach built-in game goals is not solely a matter of learning. Since affordances can be shown in a game, the player does not always have to learn to differentiate between the available information in the gaming domain. Instead, it is enough to learn to differentiate between the pale background and the bright glowing object in vision mode. Compared to other practices such as identifying different plants in botany or reading notes on music sheets, gaming demands less learning by its practitioners.

Games can also be designed to facilitate performatory actions, the perhaps most obvious example being micro-sale systems where players can buy advantages that speed up game progress. Level systems for character development are also a good example of how games can progress over time without requiring that the player develops her/his skill in the game. If something is to hard to do in an RPG, the player can perform easy tasks to increase the level of the character and then manage the task without having to refine strategies or develop more skill in the game. The tool does the work for the player. Compared to performatory actions in other domains like playing an instrument, performing surgery, playing a sport, dancing, writing a novel or acting on a stage, such tools are

not introduced systematically. If I want to learn to play *Purple Haze* on an electric guitar I cannot sit and grind for hours and just pluck one string until I receive a magical glove that does the work for me.

Gee might be correct when observing that games have unique properties as learning environments. But with no detailed analysis of either gaming practices or game design, he fails to see what these unique properties are. From the ecological perspective, observations of someone being able to play and progress in a game cannot be taken for granted as constituting the outcome of advanced learning processes. What we see might just as well be progression that is built into the game system and a practice that, compared to other domains, requires very little learning of its practitioners. As mentioned, some games, like old arcade games and competitive games, do not seem to have the kind of built-in progression design discussed here. It is likely that learning to master a game like *Counter-Strike* is similar to mastering a sport or a musical instrument. Game design seems to be of crucial importance for the kind of learning experience the player has, and one should expect large variations in how and what gamers learn; variations that can depend on rather small details in game design. Thus the matter of games and learning needs to be seen more as an empirical question.

This paper attempts to illustrate that there are ways to design games so the player can progress through a system with very little learning occurring. Thus games have some system features that can hardly be used in schools where children need to master other domains. These domains will differ from games since progression here demands learning and skill development. Gee [4] states that part of the pleasure of gaming is to learn the game:

> Good videogames offer pleasure from continuous learning and problem solving. They are hard and complex and their difficulty ramps up as the game proceeds. If no one could learn them, the companies that make them would go broke. (p. xi)

But as this paper suggests, it is probably the undemanding nature of some games that makes them pleasurable and motivating. And the risk that a company would go broke due to a player not mastering a game is unlikely. It's always possible to throw new tools in the way of the player. Or even better: sell them.

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