A Framework for Games Literacy and Understanding Games

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ABSTRACT

Based on research that studied the challenges and difficulties faced by students taking games studies and game design courses, we propose that, while many students enrolled in games education programs are adept at playing games, they are usually neither games literate nor do they have a deep understanding of games. In this article we provide a framework that can be used to evaluate and assess games literacy. Using Gee's notion of literacy, we propose that a deep understanding of games involves having the ability to explain, discuss, describe, frame, situate, interpret, and/or position games (1) in the context of human culture (games as a cultural artifacts), (2) in the context of other games, (3) in the context of the technological platform on which they are executed, (4) and by deconstructing them and understanding their components, how they interact, and how they facilitate certain experiences in players. We describe each of these aspects and also discuss two educational lenses that can be used to help contextualize what it means to understand and learn about games as well as support games literacy in students.

Categories and Subject Descriptors

K.3.2 [**Computer and Information Science Education**]: *literacy*

General Terms

Human Factors

Keywords

Games education, games literacy, understanding games.

1. INTRODUCTION

Early definitions of literacy focused on the ability to encode (write) and decode (read) written text at a level adequate for communication [22]. The notion of literacy has been extended far beyond its original use in the medium of writing. As early as 1986, Spencer introduced the notion of "emergent literacies" in

describing young children's media-related play [36]. Since then we have seen discussion around the notions of television literacy [6], computer literacy [19], and procedural literacy among others [29]. One of the arguments given for an extended view of literacy is that communication in different media, such as television, film, and videogames, requires new forms of cultural and communicative competencies [11]. Can we speak of games in these terms? Speaking of games literacy implies that "games can be analyzed in terms of a kind of language – that they make meaning in ways that are similar, at least in some respects, to written language. It also implies that there is a competency in using that language that is gradually acquired" [7].

Gee's *What Video Games Have to Teach us About Learning and Literacy* argues that literacy, as a way of understanding and producing meaning, needs to be situated in the context of a semiotic domain. Gee defines semiotic domains as any set of practices that recruits one or more modalities (e.g. oral or written language, images, equations, symbols, sounds, gestures, artifacts) to communicate distinctive types of meanings [17]. If we take a sentence such as "The guard dribbled down the court.", and ask what it means to "read" it in the semiotic domain of basketball, at least two things are necessary: (1) the ability to decode the text, and (2) the ability to understand the specific meanings of each word in the sentence with respect to the semiotic domain of basketball. So, in the case of the above sentence, it is important to recognize the letters and words in addition to understand that "dribble" does not mean "drool", "down the court" probably means that the player with the ball was moving towards his opponents side of the playing area, and so on. In addition to the need for understanding meanings in semiotic domains, literacy requires the ability to produce meanings, in particular to produce meanings that, while recognizable are seen as somehow novel or unpredictable [17]. From Gee's perspective, literacy requires:

- Ability to decode
- Ability to understand meanings with respect to a semiotic domain
- Ability to produce meanings with respect to a semiotic domain

So, by this definition, what does it mean to be games literate? Gee argues that videogames are essentially a family of semiotic

domains [17].[1] For simplicity, we can consider videogames as a singular semiotic domain. The ability to decode is analogous to the ability to access the "content". For games, being able to decode is thus analogous to being able to play. Gee's second element, understanding meanings with respect to a semiotic domain, becomes understanding meanings with respect to games, and the third, produce meanings with respect to a semiotic domain, can be expressed as the ability to make games. Thus, games literacy can be defined as:

- Having the ability to play games.
- Having the ability to understand meanings with respect to games.
- Having the ability to make games.

It is arguable that playing precludes understanding, which in turn precludes making. However each part of games literacy is related to, influences, and is influenced by the others. These interrelationships can be complicated, especially when we consider additional literacies. For instance, the ability to play a game can often encompass more than just knowledge of the rules, goals, and interface of a game. Playing a game can also include the ability to participate of the social and communicational practices of play. As Steinkuehler shows in her analysis of inter-player communication in the massively multiplayer online game *Lineage,* playing this game requires, among other things, knowing the specialized language used by the players and the social practices they engage in [38].

From this perspective, can we assume that "gamers", for the most part, are games literate? Zagal and Bruckman [41] found that students taking game studies and game design courses at the university level have difficulties describing and understanding the games they study. For instance, students often confuse being insightful about a game with being successful at playing it. When describing a game, students also tend to focus on issues that aren't relevant to the learning objectives of the class they are in. For example, they might describe a game superficially, focusing on the features of a game or describing it judgmentally instead of analytically. In this sense, while most of these students have no difficulties decoding (playing) games and are learning how to make them, they have difficulties understanding meanings with respect to games. It would seem that "gamer literacy", the result of an avid interest and years of experience playing games, should not be equated with games literacy or the ability to understand meanings with respect to games. However, what does it mean to understand meanings with respect to games? In the following sections we will provide a definition for understanding games. This definition not only illustrates what it means to understand games in the semiotic domains sense that Gee refers to, but also serves as a framework that can be used to evaluate and assess a deep understanding of games.

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[1] Gee's argument for multiple semiotic domains is due the (arguable) distinctiveness of different genres of videogames.

2. UNDERSTANDING GAMES

Understanding games can be defined as having the ability to explain, discuss, describe, frame, situate, interpret, and/or position games:

1. in the **context of human culture** (games as a cultural artifacts),
2. in the **context of other games** (comparing games to other games, genres),
3. in the **context of the technological platform** on which they are executed,
4. and by **deconstructing them and understanding their components**, how they interact, and how they facilitate certain experiences in players.

Each of these aspects synthesizes some of the essential questions and problems that have been part of the game studies literature. For example, the ludology vs. narratology debates [16, 27] were essentially concerned with exploring games in the context of human culture. What kind of culture are games? Are they narratives? If not, what place do games occupy in the ecology of cultural artifacts? This work, together with our understanding of affordances of the computer as a medium, have led to the exploration of the technologies on which videogames are implemented, and how these technologies afford certain kinds of interactions and experiences (context of the technological platform) [4]. Also, a lot of the work done in defining games has also dealt with the similarity, or lack of, that certain games may have with others [15]. How are games related to each other? Finally, exploring the question "How do we create better games?" has led to work that focused on deconstructing games and identifying the components that make them work [2, 42].

From a games literacy perspective, the ultimate goal is for students to be able to engage all of the contexts for understanding games we describe and possibly others as well. Generally speaking, however, these fours contexts cover the spectrum of what is taught in most game studies courses.

3. GAMES AS CULTURAL ARTIFACTS

Understanding a game also means understanding its relationship, and the role it plays, within culture in general. A game is an artifact that occupies a place in a broader cultural context that includes other artifacts that aren't games. The meaning you can make from a game depends on understanding these relationships. Since cultural context can be quite broad, we will only discuss this issue from three complementary perspectives. The first perspective refers to the relationship that exists between games and other media. The second refers to relationships that can exist between games and certain media genres and/or artistic movements. Finally, a third perspective looks at how games can relate to certain cultures or sub-cultures in a broader sense.

Games often include references to and from other media such as print, film or television. Bolter and Grusin explain that "no medium today, and certainly no single media event, seems to do its cultural work in isolation from other media, any more than it works in isolation from other social and economic forces" [5]. For example, understanding a game such as *Peter Jackson's King Kong* would probably require explicating the relationship the game has with *King Kong*, the movie directed by Peter Jackson,

and in turn, the relationship with the earlier movies also released under the same name. In another example, the single-player game *The Thing* promises, and indeed delivers, the opportunity to play with and within the most memorable elements of John Carpenter's 1982 science fiction film *The Thing* [12]. The game is conceived as beginning shortly after the point where Carpenter's film left off.

Situation	Example
Game could be a part of a transmedia storytelling ecology	Some Star Wars videogames extend the universe and story beyond what is seen in the movies.
Game could remediate a cultural artifact from another medium	Some videogames are adaptations of comics, books, or movies.
Game could share in the thematic and aesthetic qualities of a broader media genre	Some videogames share the dystopian world-view and grim world outlook of the science fiction genre called cyberpunk.
Game could be part of a broader artistic movement	Surrealism, a cultural movement, uses games to provide inspiration as well playing games as a method of investigation.
Game could share discursive practices of a subculture	Some videogames are part of hip-hop culture.
Game could share values and viewpoint of certain cultures or societies	Many videogames set during World War II assume the perspective and values of the Allied nations.

Table 1: Situating games as cultural artifacts

In some cases, the relationship between a game and an artifact from another media may be primarily one of remediation, or representing one medium in another. For example, a game would remediate a movie if it allows the player to participate in the events depicted in the movie while maintaining the same narrative, characters and setting. Thus, understanding who the characters are and why certain events occur in the game is largely dependent on what is established in the movie. On the other hand, the relationship between game and movie could be complementary. Henry Jenkins describes transmedia storytelling as a "process where integral elements of a fiction get dispersed systematically across multiple delivery channels for the purpose of creating a unified and coordinated entertainment experience" [21]. For instance, a game could offer a novel experience that enriches and extends on the fictional universe of *King Kong* by allowing players the opportunity to control Kong and learn about the giant ape's motivations and existence before the story in the movie takes place. While the experience of playing the game would be self-contained, it could not be fully understood without understanding its place in the broader ecosystem of media artifacts that together bring *King Kong*'s fictional universe to life.

Games can also share aesthetic, thematic, compositional and structural elements from established artistic or expressive genres or movements. For instance, certain games have been described as sharing in many of the aesthetic and thematic qualities of noir film and literature [13]. Understanding *Max Payne* as a game requires situating many of the decisions made in the design of the game with respect to the noir genre (both film and fiction), understanding what the conventions of the genre are, and also recognizing when adaptations or exceptions have been made. Davis' analysis of the game *Max Payne* describes how "*Max Payne's* noir elements are clear. But much of the reason they are clear is because the game makes a concerted effort to make them obvious. Its self-referentiality is understandable when looking at the rather overt nature of the features of noir narrative in general, particularly the visual elements. *Max Payne's* self-referentiality makes up for its contemporary setting, which admittedly hinders its noir-ness." [13] Similarly, understanding *Rez*, designed by Tetsuya Mizuguchi, requires knowing the artistic ideas of the Russian painter Kandinsky. In the end credits of the game, the game is dedicated to Kandinsky [8]. *Rez* is a game whose carefully designed abstract visuals, highly layered musical soundscapes, and rhythmic pulsing game controller feedback all contribute to lulling the player into a mild trance that is evocative of Kandisky's ideas of synesthetic vision. In *Rez*, the perception of space and sound seem to become indistinguishable from each other as the player progresses, enabling the player to explore individual layers of tracks, add sound effects, and have it all blend effortlessly into a seamless whole [23].

Finally, games can also be understood as part of a broader culture or subculture where the aesthetics, language, music and other elements are those that are understood and valued by certain cultures or subcultures. For example, the *Tony Hawk Pro Skater* series of games are a relevant part of urban skater culture. The music in the games, the language used, the names of the characters, and even the locations available to the players can be significant to skater culture. The discursive practices of skater culture are reflected in the game, and making sense of the game requires an understanding of the broader discourse. There are other cases when these relationships are less evident and perhaps more complex. The historical simulation game *Civilization*, designed by Sid Meier, allows the player to nurture and guide a civilization from the Bronze Age until the Space Age (or more precisely, the year 2100). The game can be described as a historical simulation where the player chooses to control one of a series of authentic civilizations (i.e. Aztecs, Indians, Romans, etc.). However, the game assumes a Western (Eurocentric) perspective of history. For example, the game requires that "in order to pass from the Ancient to Middle Ages, you must develop monotheism, monarchy, and the alphabet- whether you're China or England" [9]. Regardless of the civilization you control, the player is forced to follow a linear progression of developments similar to those of the nations of the Western world. Thus, understanding *Civilization* implies realizing the relationship between what the game models and represents as a particular understanding of history, in particular that of the Western world. Another subtle example can be seen in *Animal Crossing: Wild World*. This game is ostensibly a "animal village simulator" where the player controls a human character in a village inhabited by kind animals [37] and can be understood in the context of Western capitalist and materialist culture. An important part of the game's gameplay is purchasing and collecting furniture and other virtual items with which to decorate their home. The only explicit measure of the player's success in the game is determined by the quality (rarity) of the "stuff" owned, whether or not the player has completed collections of items, and how they are organized within the player's home. Players quickly find that their

homes are not large enough to store all the items they own and are invited to take out loans to expand their homes. The tension between using money earned to pay off home debts or acquiring desired items resonates strongly with the issues of credit, consumerism and debt in modern capitalist society [3].

Table 1 summarizes some of the ways we can understand games as cultural artifacts. In summary, games exist in a broader cultural context, and it is important to use this cultural context in order to help understand a game and vice versa.

4. Games in the Context of Other Games

Understanding a game also means understanding its relationship to, and the role it plays within, the landscape of other games. In addition to videogames, there is a wealth of games such as boardgames, card games, collectible card games, strategy games, wargames, role-playing games, sports, and so on. Many modern videogames are influenced or derive from non-videogames. Some obvious examples include remediated traditional board and card games like chess, poker, and solitaire. However, there are other videogames whose non-videogame legacy is less apparent. For example, the genre of videogames known as real-time strategy games (RTS) came from strategy games, which in turn owe much to strategy board games and their brethren wargames [14]. Computer text adventures, including the original *Colossal Cave Adventure* (later renamed *Adventure*), computer role-playing games, and massively multiplayer online games (MMOGs) all share common ancestry with paper and pencil role-playing games (RPGs) that first appeared in the early 1970's.

Understanding the conventions and design decisions in many of these games requires making the connections to the original games, genres and creators. For instance, "experience points", "hit points", and "character classes" are all mechanics adopted from traditional paper and pencil role-playing games that are prevalent in many computer role-playing games today (see Table 2). Explaining the design rationale behind the decision to use "hit points" often requires balancing the historical legacy owed to other games with the fact that particular mechanics used will be familiar to players. In other cases, the adoption of certain mechanics from one genre to another can be explained by looking at the role they play, and then adapting them to the needs of the other genre. For instance, the use of "character classes" was first introduced in the paper and pencil role-playing game *Dungeons and Dragons* (D&D). *D&D* is a collaborative game, and the use of character classes encourages collaboration by bestowing different abilities and responsibilities upon the players [43]. Modern team-based first-person shooter games such as *Team Fortress*, *Battlefield 1942* and *Wolfenstein: Enemy Territory* that rely on collaborative gameplay have arguably adopted character classes for similar reasons.

Another way of understanding games in relation to other games refers to the relationship between games that share a common pedigree, either in terms of their creators, shared characters, sequels and prequels, or all of the above. The relationships between sequels can be complicated. For example, the first-person shooter *Quake II* is officially the sequel to *Quake*. Both games were created by the same company, iD Software. However, despite the similar name, the sequel has nothing in common with the original game other than the basic gameplay and similar technology[2]. *Quake II* is set in an entirely different fictional setting and was named a sequel of *Quake* due to trademark issues and to leverage the popularity of the original [10]. Other games, such as the real-time strategy game *Warcraft* and the massively-multiplayer online game *World of Warcraft* might share the same characters and setting, but vary significantly in gameplay. In the case of *Half-Life* and its expansions *Half-Life: Opposing Force* and *Half-Life: Blue Shift*, the creators decided to maintain the same gameplay and allow the player to experience the same story from three different perspectives.

Game Mechanic	Definition
Experience Points	Experience points (xp) are used as a meter of player progression in a game. They are usually awarded for accomplishing certain tasks. When enough xp are collected, the player controlled character is awarded with increased powers and statistics. The rewards for obtaining experience points are usually increasing and discrete. For example, the character might "level up" or get rewarded when obtaining 100xp, then 200xp, 400xp, and so on.
Hit Points	Hit points (hp) are a numerical indicator of how much health a character has. The idea is that attacks made upon the character will cause a certain amount of damage, which is then subtracted from the characters current hit points. The more hit points a character has, the more "powerful" he is due to the increased amount of damage he can withstand before dying or passing out.
Character Class	Character classes are a game mechanic generally used for arbitrating the skills, abilities and aptitudes of different characters in a game. For example, a character who is a "Mage" might be able to cast magical spells while characters who are "Warriors" are not allowed to. Different games often define their own classes and usually a character cannot belong to more than one class at a time.

Table 2: Influences from paper and pencil RPGs

In *Half-Life*, the player controls a character who tries to escape from the Black Mesa Research Facility after a laboratory experiment goes awry and the center is invaded by monsters followed by military personnel intent on containing the incident. In *Opposing Force*, the player controls a soldier charged with, among other things, neutralizing Gordon Freeman, the protagonist of the original game. *Blue Shift* presents a third perspective of the Black Mesa disaster, this time through the eyes of a security guard. Both expansions share events and locations with the original *Half-Life*, and the player gains access to places that are "behind the scenes" in the original game while also catching fleeting glimpses and references of Gordon Freeman's exploits. Finally, to make things even more confusing, it is often the case that games released simultaneously, yet on different hardware platforms, might share the same name but be completely different in terms of gameplay. For example *Rayman Raving Rabbids* was

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[2] The technology used in *Quake II* was based on that developed for *Quake*.

released in mid-November of 2006 on Nintendo's Wii and Game Boy Advance (GBA) platforms under the same name. The characters and visual design, technical constraints permitting, are largely the same. However, the Wii version of the game was ostensibly a collection of short mini-games, while the GBA version is better described as a platforming adventure game with occasional mini-games [28].

In summary, to understand a game, it is often important to understand its context with relation to other games as well as gaming conventions and mechanics that might be common across multiple games.

5. Games in the Context of Technology

Understanding a game in the context of the technology and platform on which it is executed means situating the game in the context of the platform on which it is played and understanding the role that platform may have on the design and play of the game. Technological platforms both limit and afford the implementation of certain kinds of applications. The case of videogames is no different, and the restrictions imposed by limited memory, bandwidth, processor power, and storage capacity have, among other things, shaped and determined the kinds of games that are created. For example, the video hardware of the Atari 2600 only allowed for two sprites (two-dimensional images that are integrated or composited onto a larger scene), thus limiting the number of moving objects that could be shown on screen. Although programmers were able to squeeze extra performance through clever technical tricks, the end result is that the video hardware still severely limits what Atari 2600 games can look like. The resulting visual style of these games, in particular the "stripe-colored" sprites, is a trademark of Atari 2600 games [4]. While hardware can limit, it can also offer new possibilities. Novel interface hardware often broadens the design space of games by allowing for novel gameplay and interactions previously unimagined. The motion-sensing capabilities of the controllers for Nintendo's Wii game console are but a recent example of how hardware innovations can broaden the possibilities for new types of games.

In summary, videogames are implemented on technological platforms that shape the form and functionalities and experiences they can offer. It is often important to understand the technological platform and its relationship to a particular videogame in order to better understand it.

6. The Structure and Components of Games

Understanding the structure of games is akin to being able to identify the different components that make up a game and how they interact with each other. If we go back to Gee's notion of literacy, this means understanding the design grammars of semiotic domains [17]. In other words, recognizing and understanding the principles, patterns and procedures to the construction of games. What are the underlying models? What choices and actions does the player have available to him or her? What are the core elements of gameplay? What are the basic patterns of the game and how are they combined or recombined? For example, understanding most of the games in the *Legend of Zelda* series includes understanding the cyclical nature of the activities the player is required to accomplish. The player is usually required to (1) find the entrance to a dungeon, (2) enter the dungeon, (3) discover a treasure, find keys, a map, and a compass, (4) defeat a monster at the "bottom" of the dungeon, and (5) obtain an item or power necessary for the next challenge. Usually, the item or power obtained at the end of a dungeon will be required to locate or gain access to the location of the next dungeon. In the beginning of most *Legend of Zelda* games, the player has no items and very few possibilities for action. Progress in the game depends on finding new items (the first item found is usually a sword that allows the player to fight enemies) and using them to gain access to new locations. As more items are obtained, the player must figure out how to use them in combinations that become increasingly more complex. By the end of the game, the player is usually quite adept at figuring out what item to use and when. As Gingold describes, "a key property of games is recombining familiar elements into novel configurations" [18]. In this sense, identifying what those elements are is an important aspect of understanding games structurally.

In addition to being able to able pick out elements of a game's design, it is important to understand how the interaction between these elements helps create a certain experience for the player. Understanding a game from this perspective is akin to being able to articulate why playing a game makes the player feel a certain way. From a game designer's perspective, this sort of insight and understanding is crucial when trying to map the design goals (I want the players to have this kind of experience) with a means of achieving those goals (I will use these elements, in these ways). Schell and Shochet describe how they designed *Pirates of the Caribbean: Battle for Buccaneer Gold* so as to provide an engaging five minute experience that was exciting to play, culminated in a climactic battle, and made players feel in control of their destiny [34]. *Pirates*, an interactive theme park ride based on the classic Pirates of the Caribbean attraction at Disneyland, allows four players to man a ship and attempt to defeat enemy pirate ships, forts, and monsters while collecting as much gold as possible. One player steers the ship, while the other three man six cannons used to defeat enemies. The designers used numerous elements, such as "special" enemy ships, sneak attacks, and architectural "weenies[3]" to guide the players towards the islands where "the coolest action takes place" [34]. Toru Iwatani, designer of *Pac-Man*, describes how the AI routines for each of the enemy ghosts that chase the player were designed so that the ghosts would get closer to Pac Man in a natural way and avoid discouraging the players by having them feel that they are constantly under attack [25]. Also, the ghosts alternate between chasing the player and dispersing, allowing the player some room to breathe, thus providing an experience of greater tension as the ghosts "attack" more frequently. In order to really understand *Pac-Man*, to understand the player experience and the player interpretations supported by the experience, requires a detailed understanding of the AI of the ghosts [25].

In summary, to better understand a game it is important to understanding its components, how they interact, and how they facilitate certain experiences in players.

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[3] "Weenies" are a technique originally used to guide stage dogs in movie sets. A classic architectural "weenie" is the castle at Disneyland which provides a reference point for park visitors as well as drawing the eye, and with it the visitor.

7. Supporting Literacy

What do people who play videogames really know and learn about videogames? Contrary to educational research in other areas, such as science or writing, there isn't a clear idea of what it means to understand videogames in general, or even what it means to a understand a particular videogame. The definition we have provided for understanding games can serve as a framework against which we can begin to explore how to support games education. What typical issues are learners confused about and what does it mean to have a naïve understanding of games? Save for a few exceptions [20, 31], the question of how do we learn about games, what skills and knowledge should novice game designers and scholars develop, and what challenges do they face has been largely unexplored.

Given these issues, what learning theories and pedagogies should we consider to better understand and support learning about games? We propose that focusing on the social and collaborative aspects of learning can prove especially productive. Generally speaking, people learning about games are interested or curious about pursuing careers that somehow revolve around, or include games. These are people who might be interested in working in the games industry or engaging in games research. Many of these people see games as playing an important part in their lives and identify themselves with a broader community for whom games are important professionally. Also, we are currently in a period where much knowledge is being created surrounding games, what they are, and what they could be. The current state of the field of game studies is but one example of this [26]. From this perspective, those learning about games are in many ways contributing to the definition and articulation of new ideas and concepts. For these reasons, theories and pedagogies of learning that focus on the social aspects of learning and collaboration may prove productive toward helping support games education. In the following sections we describe the notions of communities of practice and knowledge building and discuss some of the insights they can provide for games education.

7.1 Communities of Practice

Lave and Wenger [24] proposed the term "communities of practice" (CoP) to highlight the importance of activity in linking individuals to communities, and of communities to legitimizing individual practices. A CoP involves a collection of individuals sharing mutually-defined practices, beliefs, and understandings over an extended time frame in the pursuit of a shared enterprise [40]. These kinds of communities "are identified by the common tasks members engage in and the associated practices and resources, unquestioned background assumptions, common sense, and mundane reason they share" [30].

The literature on CoP's holds that learning involves participation as a way of learning – of both absorbing and being absorbed in – a "culture of practice" [24]. Answering the question "what does it mean to understand?" can be viewed as an issue of identity and awareness of one's role within the context of a broader community. Understanding goes hand in hand with the process of "becoming". If you are looking at a specific individual and want to gauge their understanding, you can explore how they identify with the community. Do they see themselves as members? Do they share of the goals and ideals of that community? Do they

know and engage in the practices of that community and what role do they believe they play?

Lave and Wenger describe the mechanism of "legitimate peripheral participation" (LPP) as a crucial part of learning in a community of practice [24]. Initially, a member will participate in activities that are important (legitimate) to the community, but are perhaps not the central focus of that community's practices. In their example of the Vai and Gola tailors of West Africa, the novices participate legitimately by sweeping the floors of the tailor shop, but peripherally with respect to the manufacture of articles of clothing. However, they are provided with the opportunity to observe the practices and engage in the beliefs of the community. It is important to note, however, that while peripherality can be a position where access to a practice is possible, it can also be a position where outsiders are kept from moving further inward [40]. Lave and Wenger propose that an extended period of legitimate peripherality provides learners with opportunities to make the culture of practice their own [24].

Education and learning, from a communities of practice perspective, involves " 'taking part' and 'being a part,' and both of these expressions signalize that learning should be viewed as a process of becoming a part of a greater whole [35]." From this point of view, individuals who identify with a community and engage in the beliefs and practices that are important to the community demonstrate a greater degree of understanding. Individuals who participate in the periphery can be presumed to be those with a lesser degree of understanding in contrast to those who are central members.

LPP and communities of practice, as an analytical viewpoint on learning and understanding, is especially useful in learning situations that have strong social and community-oriented characteristics. In the case of learning about games, the question then becomes one of identifying the community of practice within which "understanding" will be considered. Depending on the particulars of a games program, this might refer to the community of practice of game scholars and of game designers. Thus, a student's degree of understanding should be contextualized with respect to the beliefs and practices of these communities as they are currently understood and defined. The lens of communities of practice also highlights the tension that many students experience as they realize that being a "gamer" is not the same as being a game designer or a game scholar and that their knowledge and experience of games, while useful, doesn't qualify them as "expert" scholars or designers.

7.2 Knowledge Building

Knowledge building is a process by which ideas that are valuable to a community are continually produced and improved. For example, doctors who work on finding ways to cure cancer and engineers learning to design better engines, are all knowledge builders engaged in knowledge-building communities. Their collective goal is to advance the frontiers of knowledge as they perceive them. As they report their findings to each other and discuss their implications, they create and modify (as a community) public knowledge about their field. The result of knowledge building is the creation and modification of public knowledge-- knowledge that lives "in the world" and is available to be worked on and used by other people [33].

One of the central notions of knowledge building is that knowledge is not static and "given" but can be improved over time. Since knowledge building is a collaborative effort of multiple members of a community, it is important that participants also work on defining their shared values and goals. Knowledge building is guided by the following principles [39]:

- Working at the cutting edge
- Problems emerge from conflicting theories, models and findings that require further explanation
- Progressive problem solving
- Reformulate, re-investigate and deepen understanding
- Collaborative effort
- Importance of working on shared values and goals
- Meta-cognitive understanding is needed for knowledge building work

However, knowledge building is not easy to achieve. In the context of traditional learning environments, for example, Bereiter [1] points out that the main difficulty with conventional education is that students focus on understanding what has already been understood by others rather than contributing new ideas to the world.

Scardamalia and Bereiter explain that knowledge building is driven by discourse [32]. In particular, knowledge-building discourse focuses on problems and depths of understanding. For knowledge building, explaining is the major challenge. There must be encouragement to produce and advance theories through using them to explain increasingly diverse ideas and observations. The knowledge of those who are more advanced does not circumscribe what is to be learned or investigated while novices push discourse towards definition and clarification. Finally, knowledge-building discourse should interact productively within more broadly conceived knowledge building communities. For example, the knowledge-building that occurs in a high-school classroom should interact with that which occurs in a research institution.

In the context of games, the knowledge-building perspective highlights the importance and the characteristics that a learner's discourse should have with respect to gauging his level of understanding. Understanding can also be gauged by exploring the evolution and change of that discourse. This lens also highlights many of the challenges that students have articulating their ideas and thoughts of games [41]. By helping students understand that what we know about games is continually being challenged and expanded, they can begin to view the medium as something that can be built upon and that they can play an instrumental role in shaping what videogames are.

8. Conclusions

In this article we have presented a definition for games literacy and outlined a specific aspect of games literacy that is important to support in games education: understanding games. In particular, we have presented a four-part framework for understanding games that involves having the ability to explain, discuss, describe, frame, situate, interpret, and/or position games (1) in the context of human culture (games as a cultural artifacts), (2) in the context of other games, (3) in the context of the technological platform on which they are executed, (4) and by

deconstructing them and understanding their components, how they interact, and how they facilitate certain experiences in players. We have also highlighted the ontological issue of understanding as situated in a socio-cultural context and described two lenses, communities of practice and knowledge building. These educational lenses are used to help contextualize what it means to understand and learn about games as well as support this understanding in students. From the communities of practice perspective, gauging the understanding about games requires situating the individual with respect to the beliefs, goals, and practices of a particular community. Understanding in this context is linked to membership and identity. Knowledge building, as a process by which ideas that are valuable to a community are continually produced and improved, highlights the importance of focusing on discourse as a gauge of understanding and focusing on how discourse changes and evolves.

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