Video Games, Learning, and the Shifting Educational Landscape

Hong-An Wu
University of Texas at Dallas
800 W. Campbell Rd. ATC 10,
Richardson, TX 75080
+1 217 979 8040
HongAn.Wu@UTDallas.edu

ABSTRACT
Video games are changing our imagination of what constitutes as learning, what we should learn, and how we learn. In this paper, I describe the ways in which video games mediating our realities are reshaping parts of United States' educational landscape. Specifically, I focus my review on three slices of this larger educational landscape, including the discourses on literacy learning, informal learning, and game-based pedagogies. Here, video game playing is seen and argued as a form of literacy learning where players are learning to encode and decode meaning through this medium for active cultural participation in both societies at large and the specific video game cultures. However, when these cultural practices are situated within a stratified and hegemonic society operating under neoliberal logics, it is unclear who are we serving with these interpretations of learning.

Keywords
Games and learning, informal learning, game-based pedagogies, literacy learning

INTRODUCTION
In the last few decades, popular opinions about video games have gone from rejection towards acceptance of the growing video game industry as an integral part of contemporary leisure life (Dyer-Witheford & de Peuter 2009). However, the ways in which video games are reshaping our meaning-making process expands beyond the leisurely domain. As early as 2013, a Swedish school in Stockholm took video games a step further. They mandated *Minecraft* (Mojang 2009) lessons as part of the official school curriculum for middle school students, as they consider *Minecraft* as an educational tool that allows students to learn and think holistically across subjects like arts and science. In other words, the rise of video games is also reshaping our imagination of education and what counts as learning, along the vain that engagement with video games can be considered "productive" for both the player themselves and society at large. But what are they productive in terms of learning?

In this paper, I describe the ways in which video games mediating our realities are reshaping parts of United States' educational landscape. Specifically, I focus my review on three slices of this larger educational landscape, including the discourses on literacy learning, informal learning, and game-based pedagogies. First, I describe the theoretical expansion of literacy learning in the discourse of education that attempts to include and address the new forms of learning introduced by video games as popular mediating tools for meaning making nowadays. Secondly, I discuss empirical studies conducted by educational researchers framing, detailing, and describing learners' informal learning trajectories through leisurely video game play. These empirical studies are not only reflecting the wider shifting landscape of how

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individual learners outside of formal educational institutions are acquiring signs and tools for meaning making through video games, but they are also used to further validate and substantiate the larger theoretical expansion of literacy learning in the field of education. Thirdly, I categorize the various ways that educators have been appropriating elements of video games for curricular and pedagogical purposes in formal learning settings, which falls under the general umbrella of game-based pedagogies. These categories exemplify the ways in which instructions in formal educational institutions are changing to adapt to the assumed popular mediation of video games embraced by most students.

By video games, I mean the medium with game-like software based on digital devices that require human interaction to produce feedback. The term game-like is used here to avoid linguistic essentialism with absolute definitions and to gesture to the various ideas of games based on family resemblance (Wittgenstein 1953). The object of video game is considered a medium here as it mediates between the player as a subject and the connotative and denotative meanings in a given context. As Postman (1985) points out in Amusing Ourselves to Death, the medium dictates the discourses available. The form of a medium excludes and includes certain content, which influences the cognitive possibilities through that medium. The structural abilities and limitations of a new technology shape the way we interact with it, but just as important is the social history prior and after the introduction of a new medium. This paper hopes to point to this specific juncture and address how the introduction of video games is interacting with our existing perception of education. This paper does not aim to claim to be all-inclusive but modestly hopes to provide a review of a slice of current literature on the ways in which video games are reshaping our current educational discourse. It is only by understanding how video game play is being considered as a form of productive learning within existing educational discourses can we proceed to answer the next bigger question: how does these learning translate into fueling the drive and demand for greater productivity in United States' late capitalism?

VIDEO GAME PLAYING AS LITERACY LEARNING

Is video game playing educational? In the field of games and learning, proponents of video games argued for recognizing video game playing as educational by expanding our imagination of literacy (Gee 2007; Squire 2011). In the following, I will describe their argument that theorized video game playing as literacy learning through the framework of semiotic domains.

Gee (2007) postulated that the different governing ways to decode meaning in cultures can be considered in terms of semiotic domains. By semiotic domains, he meant, "any set of practices that recruits one or more modalities to communicate distinctive types of meanings" (19). Interpreting and acting in society involves employing different semiotic domains, as the various types of cultural practices constitute the contemporary life world. In other words, Gee used *semiotic domains* to describe systems of meaning. This system of meaning encompasses the interrelationship across the social structure of a group of people, the social context in which these people interact, the people as subjects interacting, the objects being interacted with, the mechanisms to which subjects interact with objects, and the medium of objects. For example, video game culture as a semiotic domain refers to the ways in which players organize amongst each other, the physical or virtual locations that players interface with each other, the player as a subject engaging in play, the specific video game title being played, the ways that a specific video game can be played, and the extent that video game as a piece of software can be interacted with.

Traditionally, literacy was understood as "the ability to read and write" (Gee 2007, 17). At the core of this ability is the process of decoding and encoding a given text to generate meaning. However, this simplistic notion that language can exist in a vacuum without connection to other forms of communication systems is challenged by New Literacy Studies (Duncan 2009). Images, sounds, symbols, and words all work together to convey meaning.

The understanding that language is connected to other forms of communicative systems calls forth a reconceptualization of literacy. Multiliteracy, which is informed by New Literacy Studies, is used to encompass complex meaning formation through the various ranges of media involved. One of the ways Jenkins (2006) used the term *convergence* was to describe this process whereby meaning emerges through a combination of media; convergence is "the flow of content across multiple media platforms, the cooperation between multiple media industries, and the migratory behavior of media audiences" (2). Literacy, then, could be understood as learning to encode and decode cultural texts in a given semiotic domain. Multiliteracy aims to encapsulate the various forms of literacy present in semiotic domains and to consider the complexity of cultures.

According to Gee (2007), the reason learning in the semiotic domain of video game culture is important is because it has important implications for learning in other semiotic domains. Gee (2007) explained,

> Semiotic domains in society are connected to other semiotic domains in a myriad of complex ways. One of these is that knowledge of a given domain can be a good precursor for learning another one, because mastering the meaning making skills in, and taking on the identity associated with, the precursor domain facilitates learning in another domain. (39)

In other words, learning in one semiotic domain is beneficial to learning in another semiotic domain. Duncan (2009) argued that learning in one semiotic domain is beneficial for learning in another semiotic domain in terms of domain mapping. Domain mapping is the process of transferring knowledge in one domain to another through the commonalities or similarities that the other domain shares. As various video game cultures constitute a family of semiotic domains, achieving proficiency in one video game enables learners to approach other video games and related activities, such as computational thinking or film analysis, with ease through domain mapping. An example of domain mapping is the way the mechanics of video games enable a form of learning to learn that would apply to any other semiotic domains (Parks 2008). It encourages the habit of learning through hands-on participation and experimentation (Squire 2011). "Game over" is never the end; instead it merely suggests ways to do better next time as failing or dying does not terminate the engagement (McGonigal 2011).

In summary, playing a video game is considered educational in the sense that it involves literacy learning, where literacy is expanded to include skills involved in encoding and decoding multimodal texts. Here, play is the mechanism by which players become literate in norms and values of this semiotic domain through interacting with the video game object; the video game object is the vehicle that embodies rules governing the semiotic domain it originates from, and playing it allows the player to internalize and acquire literacy in this domain, which may also open doors to other cultural contexts.

VIDEO GAME PLAYING AS INFORMAL LEARNING

What kinds of literacy are players developing through their leisure play? In this section, I turn my attention to reviewing empirical research that explores the informal learning trajectories of players through their leisure play.

Affinity Groups as Context for Learning

The first element that needs to be addressed is the context: what is the context for video game play to be educational? The various studies that examined video game playing addressed it in the context of affinity spaces and video game cultures, namely the various communities that emerge around different video game titles and genres.

Affinity groups are, "groups wherein people primarily orient toward a common set of endeavors and social practices in terms of which they attempt to realize these endeavors" (Gee 2007, 196). Most popular video games have developed, or are in the process of developing, accompanying affinity groups of active and/or even expert players. By devoting time to participate in particular video games, the player will move up from being a novice to an expert in both the game and the video game culture. As affinity spaces offer, "multiple interest-driven trajectories, opportunities to learn with experts, paths toward becoming an authentic participant, and ways to lead the group itself" (Squire 2011, 65), it is argued that they provide amateur players an accessible way to learn from others' experiences in navigating this semiotic domain. They "form the sorts of goals, desires, feelings, and values that 'insiders' in that domain recognize as the sorts members of that domain (the affinity group associated with that domain) typically have" (Gee 2007, 93). It is argued that becoming a member of an affinity group transforms the process of video game playing into a participatory practice, where people identify the community that they want to be involved with and actively pursue their passions (Duncan 2009; Squire 2011).

Research observed that the formation of abundant affinity groups has influenced many players to make the transition from consumers to producers, as participatory practices in these affinity groups entail the contribution of ideas and materials created by players. Gee and Hayes (2012) conducted a study on various affinity groups that were organized around "a passion for building and designing for *The Sims*" (133). Based on their observations, they theorized that players are able to learn various skills for the purposes of partaking in participatory practices because certain features characterize affinity groups.

According to Gee and Hayes (2012), the first key feature is that these groups are organized around a common passion instead of players' personal attributes such as race, class, gender, age, expertise level or disability. At the same time, participants share the same interaction space despite their various attributes outside of gameplay. Participants' interactions are not segregated by their ability or personal background. Instead, participants may congregate and self-organize with others in the space based on specific shared interests.

The second key feature is that there are various forms of participation and routes to status in the group, while various roles that participants play are always reciprocal. For example, one player may be an expert in 3D modeling. They may gain recognition in the group for their skill and mentor others interested in learning more about this topic. However, they may be considered a novice when it comes to audio editing, and others who are experts on that topic may mentor them.

The fluidity of participants' roles leads to the third key feature of these groups: "the development of both specialist and broad, general knowledge is encouraged, and specialist knowledge is pooled" (Gee & Hayes 2012, 138). These spaces host a wide

range of technical knowledge contributed by participants, and newcomers are encouraged to gather a broad sense of the various expertise involved in game production. At the same time, if one is interested in delving into a specific aspect of participatory production, other participants who are specialists are available for consultation and dispersed knowledge from sources outside of the communal space are linked and suggested.

The last key feature is the social interactions facilitated by these groups. Participants' learning trajectory is dependent upon their individual proactive, while asking for help from others is encouraged. Furthermore, "people get encouragement from an audience and feedback from peers, although everyone plays both roles at different times" (Gee & Hayes 2012, 144). This form of peer-to-peer feedback and encouragement-based learning was also observed in a *Minecraft* affinity space (Wu 2016). Through social interactions among participant of various backgrounds, content, either created by the original game designers or members of the affinity group, is constantly being transformed.

In addition, Freedman et al. (2013) studied what they characterized as visual culture learning communities, which can be also be considered as video game related affinity groups, and their study confirmed the focus on peer-to-peer informal learning in affinity groups as ways to better understand the processes of learning in current educational discourse. These communities ranged from physical to virtual, but they were still forms of affinity groups as they were formed based on similar interests in particular visual cultures, such as manga, demoscene, and video games. Freedman et al. argued for the importance of interest-based, peer-to-peer informal transmission of knowledge that de-centered the authoritative figure in traditional schooling. Even though the learning setting was informal, students demonstrated advanced development in art knowledge and skills, namely the ability to create and interpret visual materials. Echoing findings from Freedman et al. (2013), Duncan's (2009) study on video game affinity groups came to the same conclusion by detailing the process of peer-to-peer informal transmission of knowledge. Duncan studied the online community of video game title *The Legend of Zelda* (Nintendo Research and Development 4 1986), and observed that there existed much sharing of "know-hows" in the forums (85). Plenty of discussions were based on what more could be done to the narratives and how to create alternative narratives to complement the game. At the same time, the lively community of *The Legend of Zelda* encouraged consumers to produce. The readily available audiences in the community eliminated the fear that no one would ever read their self-publication.

In sum, these empirical studies in education suggest that the context of video game playing is affinity groups. Affinity groups are educational because they provide players with the opportunity to learn from one another, form alliances, and pursue common goals. However, the "education" that players are able to partake in discussed in these studies assume an equal access to cultural references and similar ability towards participation among players despite their various attributes. This assumption is highly debatable given studies in other fields vividly described different players' accounts of the varying cultural capital accessible and attainable to them, which influenced their ability and agency in choosing to participate in these affinity groups (Shaw 2012). It is possible that what these empirical studies in education were observing and projecting were only an idealized version of the common player with the most capital to access these learning trajectories.

Players and Prosumers as Subjects of Learning

After addressing the context for play to be educational in video game affinity groups, the next element that needs to be addressed is the subject of this process. In

researches that studied video game playing as informal learning, researchers identified a key characteristic among the players, which is that they often transition from consumers to producers of the object that they enjoy, namely video games. This transition is important because it demonstrates players' ability to not only internalize rules and structures as embodied in the game, but also to create and tinker with these rules and structures as producers. In other words, players are not only able to decode meaning but also further encode meaning through video game playing.

Players who have transitioned from consumers to producers have been termed "prosumers" (Toffler 1980). This term combines the words *consumer* and *producer* to conceptualize the media participation observed in many cultural exchanges between "youth who are producing their own imagery drawn from their consumption of popular mass media" (Duncum 2011, 24). Jenkins (2006) used the term "participatory culture" (3) to contrast contemporary media use to a previous "consumer culture," where media exchanges were comparatively one-way: from producers to consumers. In a consumer culture, producers and consumers occupied separate roles; media production was published and broadcast by specialized professionals and distributed to consumers for consumption. That was the end of the story. This cycle is modified by participatory culture. Participatory culture is built on the technological shift in media production where there exist low barriers for consumers to transition into media producers. One example he mentioned was the fandom production of various popular literature. Fans were not satisfied with the narratives produced by specialized professionals, and they took it upon themselves to write fan fiction that provided alternative narratives. This media production was then distributed to other fans through various methods, be it self-published magazines or online discussion forums. In some cases, the fan-produced alternative narratives became so popular that the original producers incorporated their fan fiction into the developing plot.

Though prosumerism is particularly popular among video game players, it can also be observed outside the realm of video games. Duncum (2011) observed youth prosumers remaking popular movie titles using the limited technology they had access to, and distributed them to other consumers through YouTube. He argued that even though this has largely democratized the cycle of production and consumption through the new means of distribution, these consumer-produced videos were still less popular compared to videos produced by specialized professionals. In most cases, large production companies still maintain the advantage of being able to produce sophisticated media and widely distribute them across platforms, where individual consumer-turned-producers have limited access to production and distribution avenues. This is to say that even though media productions have largely been democratized, existing power structures of media production still exist, which applies to the realm of video games prosumerism as well.

In terms of the learning trajectories of prosumers, Duncan's (2009) discussion of video game modder's development among players in modding affinity groups resembles Manifold's (2012) observation of fan artist's development within *Harry Potter* (Rowling 1997) fandom affinity groups. The fan artists that Manifold studied were devoted fans of the *Harry Potter* book series. They interacted with each other online in what Manifold termed an interest-based community, which was an online fandom affinity group where members shared an affinity for the *Harry Potter* series. These fan artists primary interacted with each other through creating, sharing, and discussing original fan artworks, including paintings and drawings, inspired by *Harry Potter*. Manifold studied their image-making development within the group. Duncan (2009), on the other hand, studied online affinity groups of video game on gaming platform Kongregate, where modding practices were the focus of the group. Even though the affinity groups that Duncan and Manifold studied differed in terms of the

affinities shared and the artifacts produced, Duncan and Manifold came to a similar theorization about members' learning trajectory in these groups.

In the beginning, fans or players enter the affinity groups as novice participants, and they do not consider themselves as artists or video game makers. They may participate, but participation is mostly through observing the existing community. Often, discussions in these affinity groups are focused on skill-sharing or collective brainstorming, whether it is coding techniques or conceptual frameworks for transforming stories into drawings. With these "know-hows" shared in an approachable format, novice participants are summoned by these discussions to share their own versions of modification or interpretation. Novices begin by copying existing cultural productions, such as the visual representation of *Professor Snape* drawn by other members or the code for making *Flappy Bird* (DotGEARS 2013) fly on demand.

By showcasing their mimicry of other prominent producers' work, novices become more involved and engaged in self-production. The transition from consumers to producers largely depends on social affirmation from other members of the affinity group. Other members may comment on how they can improve their practice or praise their work for its creative qualities. Through considering others' constructive criticism, the novice becomes aware of the various logics and possibilities for altering the play object for the purpose of improvement.

Through this confidence-building process, novices take their artist or producer roles more seriously and emerge as experts in their groups. Novices begin to see themselves as producers who have the ability to modify and design. In this sense, novices see themselves as designers in this context. These novices also begin to help other novices ease into the cultural context by acting as mentors. This cycle characterizes prosumers' participatory practices with media in these affinity groups.

Besides being socialized into prosumer practices, prosumers are also learning the values of the affinity groups in which they partake. Steinkuehler and Oh (2012) conducted a study on affinity groups in massively multiplayer online games, where an apprenticeship model for learning was apparent. A novice player, the apprentice, was paired with an expert player, the master, to learn about not only how to play the game better but also how to participate in the larger affinity group around the game. The one-on-one social interactions were key to the apprentice being able to gain instant feedback on not only their participatory practices but also their perspectives. As Steinkuehler (2012) summarized,

> Masters show learners the ropes not merely in terms of strategies and tactics for how to play well but also and as crucially in terms of adopting the "right" set of values and attitudes toward the game, its content, its goals, world, and other players. (125)

In sum, the above studies demonstrate the significance of prosumer development in understanding how video game playing is a form of literacy learning. However, in many of these studies, the development towards prosumers was uncritically celebrated, without consideration of prosumerism's wider political economic implications. As media studies scholars have pointed out, the development of prosumerism in gaming communities closely aligned with the demands of neoliberalism, where the normalization of uncompensated modding practices further energized the market at the expense of the modders (Hong 2013). In other words, it would be an over simplified interpretation that prosumerism is benefiting prosumers if only because they are gaining specific skills from these practices.

Video Games and Mods as Objects for Learning

After discussing prosumer development in video game affinity spaces, I now turn my attention to addressing the object that mediates between the subject and context. Here, the objects that players as prosumers are engaging with are not only video games but also mods.

Here, "mods" refer to players' self-created modified versions of existing video games. The modification can take the form of adding-on texture packs to change the visuals, or even entirely replacing the gameplay but keeping the storyline. Some video game players have been called prosumers, because they consume and appropriate aspects of existing video games to produce cultural artifacts—be they short stories, fan films, or modified video games (Hong 2013). Modifying video games is considered to be one aspect unique to video game affinity groups. As video games have moved out from the technologically savvy hacker culture, video game affinity groups have largely become "modding" communities (Dyer-Witheford & de Peuter 2009, p. 24). This cultural practice is an integral part of the video game industry's development, with the official publication of many popular modified games and recognition as stand-alone games.

The popularity of the modding practice is built into the technological aspect of the video game medium. By learning to think and process information through a video game, players are also learning the computational logic of other practices regarding digital media, such as digital computing or software operations (Taylor & Carpenter 2007; Sweeny 2010; Chien 2012). The ease of entering the practice of making through domain mapping makes the production of video game-related artifacts an essential process of playing and participating in video game cultures.

As a medium, the technological structure of a video game provides an effective approach to learning about the context in which it exists; that is, it embodies situated meaning (Gee 2007, 26). It is argued that the problem with most learning in schools is that what is learned is abstract to the point that students cannot build situated meaning in the specific context for which the knowledge exists. Video games playing, on the other hand, is argued to involve learning by doing (Jackson 2009). Pulos (2013) described video games as an ideal learning environment precisely because of their applied nature: "players learn best when they are in a social context that encourages them to put their knowledge to use" (7). The technological structure of the medium involves players interacting with the software or other players by actively inputting commands and using the feedback of the system to modify behavior. Bogost (2007) used the term, "procedural rhetoric," to describe how video games embody governing rules through "the practice of using processes persuasively" (28). The governing rules of specific games' social context are made aware to the player through the interactive process of participation. Such play captures a process called "reflective practice," which requires players to *probe* the game environment through inputting, form *hypotheses* about cause and effect, *reprobe* to test the hypotheses, and then *rethink* according to the feedback (Gee 2007). This process generates situated meaning, which connects to previous understanding of effective learning.

In sum, video games and mods are the objects that demonstrate prosumers' ability decode and encode meaning through video games as a form of mediation, which is used as evidence in many studies to indicate that learning, which involved decoding and encoding meaning, took place. Again, however, these same objects could also be interpreted as commodities produced by uncompensated players as laborers to further energize the game industry's circuit of productivity (Hong 2013), which is important to take into account when interpreting who is benefiting from prosumerism as learning.

VIDEO GAME PLAYING AS FORMAL LEARNING

How have educators mobilized video game playing in formal learning settings? In this section, I turn attention to reviewing the various game-based pedagogies that educators have developed in light of the popularity of video games. These various game-based pedagogies can be categorized into three different categories that emphasize different elements: students as players, classrooms for affinity, and lessons from video games.

Students as Players

The technological aspects of the video game medium have triggered educators to conceptualize new forms of instruction to position students as players (Jackson 2009). The first category of game-based pedagogy utilizes video games as metaphors to reimagine instruction and the mechanism of video game play to develop gamified lessons for students to play with various areas of study. In other words, students are positioned as players in this approach. By doing so, this approach aims to elicit students' voluntary participation in this learning process by mimicking how players are voluntarily participating in video game play.

This approach stems from the problem observed in many classrooms where the abstractness of school subjects alienates students from understanding and applying important concepts; the lack of motivation seen among youth in schools is in sharp contrast to their active participation in video game cultures (Jackson 2009). Furthermore, Marino and Hayes (2012) argued that certain well-designed video games embody principles of "universal design" (949) for learning instructional materials, such as providing multiple representation of information, avenues for student expression, and options for engagement, which existing in-school instructions should look towards to gain insights. Translating that into practice, some schools have begun to gamify existing school subjects. That is, using role-playing, point systems, and competition, teachers recreated the instant feedback system in games that helped students to learn from mistakes. Treatment of individual students is adjusted according to proficiency in a similar way to how video game players are allowed to choose difficulty levels. At the same time, this gamifying approach makes explicit the nature of social life; the curriculum becomes the cultural scripts for which social actors learn the cultural norms. Through the adoption of game-based instruction, schools are making explicit the social norms by which we tend to abide.

Classrooms for Affinity

The second category of game-based pedagogy utilizes students' out-of-school video game playing experiences to identify lesson content that will engage students. In other words, classrooms are transformed into affinity spaces for students to learn through playing with content that is relevant to their out-of-school endeavors. Recognizing that many students have already had exposure to and interest in video game playing, teachers have begun to build upon students' prior experience by drawing upon the cultural participation it entails. Instead of focusing on analyzing or extracting meaning from the actual content within gameplay, here, students are encouraged to make cultural artifacts that reference their experiences of interacting with video games. This approach values interest-driven learning, and it hopes to prompt students to develop related literacy skills.

Using students' out-of-school video game playing experiences as incentives for learning specific skills has been most popular among art educators, as the technical training plays an important part of any art making process. For example, Gill's (2009) high school classroom demonstrated that out-of-school experiences with video games played an important role in motivating, informing, and guiding students to learn about 3-D modeling and animation software, such as Autodesk Maya and 3-D CG. Patton

(2011) conceptualized a game-based art pedagogy framework that emphasized prompting students to learn complex thinking through game creation. Building on their prior experiences of gameplay, students manipulated video game making software *Game Maker* to develop their own video games and "learned that game rules and computer code are subjectively written and understood within the context of dynamic systems of play" (Patton 2013, 39). Alexander and Ho (2015) developed a game-based art pedagogy curriculum that focused on creating character prototypes for a game. High school students designed and created characters and narratives that were later implemented into a game by advanced programmers. Chien (2012) described cases where teachers incorporated game-making lessons using software *Scratch*. Students in these cases were said to able to overcome various design challenges. She stated that students were interested in the subject under study to begin with, and that motivation helped them push through the difficulties that arose from learning to design video games. This approach recognized the inherent value in out-of-school video game cultural practices and appropriating them into the school setting. They argued that the focus on art-making techniques, the ability to manipulate computer software in this case, allows students to learn how to make cultural artifacts that are relevant to their lives.

Lessons from Video Games

The last category of game-based pedagogy utilizes existing video game content to educate students about a variety of school subjects. In this case, the focus lies in extrapolating representational content from video games to educate about certain targeted objectives. One common approach involves using video games as a space for an integrated curriculum of various existing school subjects. This means bringing video games to schools and having students play them in classrooms. Students playing video games are engaging in multiple modalities at once and learning different disciplines of knowledge through a holistic integration of gameplay.

Published in 1991, Sid Meyers' game *Civilization* has been used to teach history, social science, and geography (Squire 2011). Schiller (2008) discussed how puzzle game *Portal* (Valve Corporation 2007) are used in classrooms for students to practice information gathering and problem solving. Virtual environment simulation games have been used in science classrooms to enhance students' scientific inquiry skills (Ketelhut 2007). Hutchison (2007) explored place-making practices in virtual game worlds as a way for students to experiment with maps, physics, and history through play and descriptive writing. *SimCity* (Maxis 1989) and *Tropico* (PopTop Software 2001) had been used to illustrate cause and effect in management and institutions (Squire 2011). *Second Life* (Linden Lab 2003) had been popular among art educators to explore the range of multimodal expressions through the open sandbox structure (Lu 2010; Han 2011). Open sandbox video games are video game worlds that are designed for players to free-roam and create their own gameplay (Harris 2007). Overby and Jones (2015) studied players' experiences in *Minecraft* and suggested that art educators incorporate *Minecraft* into classrooms based on design, identity experimentation, 2-D pixel art, collaborative community building, and 3-D modeling software manipulation. They argued that the sandbox structure also provides players with the liberty to create their own purposes and utilize the given environment for themselves. It is precisely this liberty to define gameplay and the ability to utilize tools in-game that educators have found particularly useful for teaching a variety of school subjects. For example, players in *Minecraft* can play in the survival mode, where players have to hunt for food, mine materials, and craft objects for survival. This provides educators with the opportunity to discuss issues around sustainability in our eco-system. On the other hand, *Minecraft* players can choose to play in the creative mode, where unlimited resources are available to the player with a click of the mouse. In these gameplays, the emphasis lies in building for self-expression, and

players utilize the unlimited resources to create various objects, such as houses or boats, in game.

Another approach involves the use of media education to analyze the cultural ideologies presented in video games. Media education has long focused on students' literacy of media as "consciousness industries" (Buckingham 2003, 2). Media literacy is defined by The Center for Media Literacy (2003) as, "the ability to communicate competently in all media forms, print and electronic, as well as to access, understand, analyze, and evaluate the powerful images, words, and sounds that make up our contemporary mass media culture" (as cited in Taylor & Carpenter 2007, 87). To prevent students from becoming what Jenkins (2006) described as passive audiences that unconsciously inherit media's hegemony, media education provides a repertoire of useful concepts to decode the ideologies communicated by the cultural script in video game content. Resnick (2007) termed this process as "digital fluency" (as cited in Chien 2012, 22), which is the "ability to design, create, and invent with digital media" (Chien 2012, 22). In this way, this approach extends affinity groups' practice of creation through prosumerism by critiquing and emphasizing the structural and systematic construction of video games as cultural artifacts.

A third approach towards using video game content in schools involves the application of media education's critical stance by curating games addressing moral dilemmas. Some games are designed specifically to engender critical reflection of real world issues. These are usually considered to be "serious games" (Michael & Chen 2005, 2). These games are usually not produced by large video game corporations but rather by independent publishers. Games such as *Peacemaker* (ImpactGames 2007) or *Darfur is Dying* (Ruiz 2006) prompt players to examine current human crises and probe ways to solve these problems in hypothetical settings (Parks 2008). This approach is similar to media education in that it aims to critique the social structure. However, it extends beyond critique and prompts players to act on these problems through imagining alternative social structures.

In sum, there are various game-based pedagogies that have been developed and utilized by educators teaching in formal learning environments. By positioning students as players, building classrooms for affinity, and constructing lessons out of video games, these game-based pedagogies harness the elements of video games for targeted learning objectives. For game-based pedagogies that focus on positioning students as players, the targeted learning objective is the mastery of existing school subjects. For game-based pedagogies that focus on building classrooms for affinity, the targeted learning objectives are the identification and the mastery of skills that are applicable to students' out-of-school engagements. For game-based pedagogies that focus on constructing lessons out of video games, the targeted learning objectives varies from the literacy of media in general to the critique of specific social structures.

CONCLUSION

In the previous sections, I reviewed arguments, studies, and teaching practices about learning that occur through video game playing made by educational scholars that signals a shift in United State's shifting educational landscape. Video game playing is seen and argued as a form of literacy learning where players are learning to encode and decode meaning through this medium for active cultural participation in both societies at large and the specific video game cultures. This learning is enabled through both the technological structure and the socio-cultural practice of the medium, where semiotic domains are embodied through gameplay and practiced through affinity groups. In the context of formal learning, schools and teaching practitioners have appropriated different elements of video games to facilitate active

participation among students in related semiotic domains. These educational discourses on learning through video game play reflect the ways in which the introduction of video game as a medium is reshaping our understanding of what counts as learning as well as how we might facilitate learning.

However, it is worth pondering who is benefiting from these revised imaginations and facilitation of learning (Sefton-Green 2006). Yes, players and students are learning to become literate in this specific medium and active participants of this form of cultural practice. But when these cultural practices are situated within a stratified and hegemonic society operating under neoliberal logics, who are we serving with this interpretation of learning? Specifically, I conclude with two problems with these claims. The first problem lies in the ideal learning trajectory assumed by these interpretations of learning through video game play. This ideal learning trajectory depends upon an active and uninterrupted participation in various cultural practices within video game cultures. However, this argument about learning falls apart when issues of exclusion based on players' personal attributes outside of the game comes into effect (Nakamura 2009; Shaw 2015). The application in schools furthers existing exclusions by assuming a universal experience among students. The second problem lies in the ideologies innocently embedded within popular video games that are left unaddressed during this form of learning, including meritocracy norms and playbor (Wu, 2015). Without overt recognition and acknowledgment of these ideological and material apparatus at play during this form of learning, it is questionable whom this form of learning is actually serving. These unanswered problems point towards the need for educational scholars, critical media studies scholars, and game studies scholars to work in closer alignment with each other in order to collectively address the bigger question of how do these forms of learning introduced by video games translate into fueling the drive and demand for greater productivity in United States' late capitalism and identify what are our collective points of intervention.

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