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Abstract

The genre of massively multiplayer online role-playing games has become increasingly popular with adolescent males. While researchers have studied the social aspect of online role-playing games, there is little known about the metacognitive and self-scaffolding processes that players engage in as they navigate these digital immersive environments. This case study focuses on the experience of an adolescent male gamer as he develops his knowledge, selfawareness and virtual identity.

Keywords

Metacognition, Self-Scaffolding, Immersive Learning, MMORPG, Gaming, Virtual Identity, Observational Case Study

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Metacognition and Self-Scaffolding in MMORPGs: Case Study of an Adolescent Male Gamer

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The genre of massively multiplayer online role-playing games has become increasingly popular with adolescent males. While researchers have studied the social aspect of online role-playing games, there is little known about the metacognitive and self-scaffolding processes that players engage in as they navigate these digital immersive environments. This case study focuses on the experience of an adolescent male gamer as he develops his knowledge, self-awareness and virtual identity. Keywords: Metacognition, Self-Scaffolding, Immersive Learning, MMORPG, Gaming, Virtual Identity, Observational Case Study

"After all - we live in 3D. Why shouldn't we start thinking and teaching that way?"
(Google, 2011)

Traditional educational frameworks have evolved significantly in recent years. This is due in part to technological advances and demands to meet the needs of neomillenial learners (De Freitas, 2014; Dede, 2005; Prensky, 2001). Dede (2005) refers to learners born after 1982 as neomillenials, while Prensky (2001) refers to them as digital natives. The traditional roles of the student as a learner and the classroom as an instructional setting have evolved in order to satisfy the modern mind and compete with the dynamic nature of the internet (De Freitas, 2014; Small & Vorgan, 2009). This is especially true in the case of adolescent learners. The way adolescents receive information and acquire new skills has been transformed by digital technology. Adolescents and young adults spend hours engaged in online multi-user virtual social and gaming environments. The ever changing interface of virtual environments has allowed learners to use technology as disembodied extensions of their identities. The number of gamers participating in massively multiplayer online role-playing games (MMORPGs) has reached 23 million users, with as many as 8,000 users entering and exiting multi-user virtual environments during peak usage hours (Pittman & Gauthier-Dickey, 2007; www.mmodata.net, 2013). Adolescents and young adults account for 50% of gamers in MMORPG environments, and of those gamers, 66% are males (www.superdataresearch.com, 2014). Mendenhall, Saad, and Nepomuceno (2010) suggest that males may prefer MMORPGs over other types of games because they encourage competition and allow males to partake in male-dominated activities such as cooperative hunting and warfare.

This research topic was selected based on the researcher's teaching experience and observations working with adolescent males. The cultural and social conditions of digital natives are heavily embedded in their use of multimedia and web-based applications. Immersive virtual environments such as MMORPGs play a substantive role in the lives of many adolescent males (Hou, 2013). When compared to female students, male students appeared to be more actively engaged when they were participating in learning modules that delivered multi-sensory stimulation. Adolescent males appear to acquire superior cognitive and motor skills through their involvement MMOPRGs. Another notable observation is in regards to adolescent males' rapid reaction time and ability to make split second decisions according to their virtual conundrum. However, there is limited research on the learning process that male

gamers undergo as they engage in MMORPGs. As such, it is necessary for educators to acknowledge and understand their potential as effective pedagogical tools.

The purpose of this case study was to understand the role of MMORPGs in stimulating metacognitive functions and enhancing self-scaffolding skills in a 16 year-old male gamer. Specifically, this case study addressed the question: What self-scaffolding skills does a teenage male utilize as he engages in MMORPGs?

Massively Multiplayer Online Role-Playing Games

MMORPGs are a genre of video games and subset of role-playing games that are played online by large numbers of players who interact with one another in an immersive virtual environment (Safko & Brake, 2009). An immersive environment is a domain in which an individual fully assimilates himself or herself. The domain is characterized by interactive multimedia stimuli delivered in a continuous stream (Witmer & Singer, 1998). The user controls the viewpoint, level of interactivity and redundancy. Immersive environments enhance learning by allowing learners to freely express themselves and create and manipulate objects. Such three-dimensional (3D) virtual environments offer learners an opportunity to experiment without real world repercussions. Via immersive environments, education is accessible regardless of proximity or physical ability. Learners rely on their virtual selves to communicate, acquire knowledge and complete tasks (Dickey, 2003).

Immersive environments afford opportunities that would be otherwise inaccessible to certain learners. For example, paralyzed learners (if they choose) could experience walking, running, or flying. They could explore freely without the social stigma of being wheelchair bound (Ford, 2001). Learners with pervasive developmental disorders (PDD) such as Aspergers's Syndrome could experience social situations according to their individual level of comfort (Parsons, Mitchell, & Leonard, 2004). Immersive environments facilitate learning by allowing users to participate in virtual field trips and simulations of real world scenarios. Moreover, immersive environments empower learners by enabling them to possess access and modality to limitless geographical and social explorations (Ford, 2001; Parson, Mitchell, & Leonard, 2004).

Learning Theories

The development of MMORGPs is based on educational principles derived from cognitive and constructivist learning theories. Their design incorporates and facilitates many important attributes identified by educational theorists. The most effective MMORPGs create an environment where learners can engage and interact with content in a way consistent with Piaget's understanding of the learning process as assimilation and accommodation (Piaget, 1952). Likewise these environments invite exploration and play in a fashion consistent natural learning (Huizinga, 1998). MMORPGs also incorporate Mayer's Cognitive Theory of Multimedia Learning (CTML) which proposes that learners possess two information processing systems, verbal and visual (Mayer, 2001). The two systems work in tandem to construct meaning, the verbal system takes in auditory narration and the visual system takes in animations. MMORPGs, with their multisensory cues and levels of user control, far exceed the criteria for effective design that CTML stipulates.

Metacognition

Internalizing knowledge involves metacognition, or the awareness of one's thinking as he or she is thinking. Pintrich and DeGroot (1990) reported a positive correlation between high

levels of self-regulation and high levels of metacognitive strategies. Metacognition is triggered by interest, or affective states that stimulate strong feelings such as success and satisfaction, connected to past experiences (Flavell, 1979). Metacognition is comprised of a range of functions including metacognitive knowledge and metacognitive control.

Cognitivism

Cognitive learning theory is built on the premise that learners assign meaning to what is learned by using their senses, perception and self-awareness. Cognitive processes direct the internal process of learning and are comprised of thought procedures, motivation, existing knowledge base, and memory. The learner receives and processes information in his or her short term memory. The learner then assigns meaning to the information and transfers it to long term memory where it is either assimilated or accommodated. In assimilation, the learner connects a concept to an existing schema, or organized pattern of thought. Accommodation occurs when the learner is forced to alter his or her schema based on new information (Piaget, 1952).

In cognitive learning theory, knowledge can be epistemologically divided into two categories, explicit and tacit (Polanyi, 1966). Explicit knowledge is that which can be physically demonstrated or verbally communicated by the learner. Tacit knowledge is that which is stored within a learner's cognitive domain and is deeply rooted in process, function, and involvement in a specific task. Tacit knowledge is acquired through experiential learning and invokes intuitive action (Reber, 1989). Knowledge can be described as a set of skills that grow and decay over time due to infrequent practice, interference from other tasks, or environmental factors (Reber, 1989, 1993; Tunney & Shanks, 2003). Knowledge decay may occur as content specific information grows and changes, subsequently rendering old knowledge useless. In order to benefit from tacit knowledge, learners must be able to interpret, internalize, and understand different issues, circumstances, and situations (Allen & Reber, 1980).

Experiential learning. Kolb's experiential learning theory (ELT) is a cyclical model of the learning process that emphasizes the fundamental role that experience plays in the learning process. The learning cycle consists of four stages:

1. concrete observation,
2. reflective observation,
3. abstract conceptualization, and
4. active experimentation.

ELT is built upon Lewin's theory that knowledge created through concrete experiences, Dewey's theory that knowledge is gained by observation, and Piaget's theory that knowledge is shaped by experience and accommodation of schemas according to new experiences in the world (Kolb, 1984).

Constructivism

Constructivist theory posits that learning is an activity that is enhanced by shared inquiry. Individual learners create their own interpretation of knowledge-building experiences. Reliable information is developed by sharing communication and coming to a shared meaning of information. MMORPGs reinforce the nature of constructivist learning theory by providing learners with interactive environments in which they construct meaning based on their

experiences. Vygotsky (1978) notes the importance of the experience of completing challenging tasks that allow learners to gain confidence and motivation. The sense of learner-centered control may reinforce feelings of learner self-efficacy. Learning in MMORPGs transpires at the point in which the learners' lack of prior knowledge meets and overcomes the necessity to apply new knowledge to complete a given task. In essence, MMORPGs allow learners to self-pace instruction based on information they already know and use the interactive resources available to them to self-scaffold instruction until they have successfully completed the task (Bickhard, 1992; Hung & Chen, 2001; Vygotsky, 1978).

Bickhard (1992) proposes that self-scaffolding consists of six skills:

1. blocking
2. muting
3. suspending
4. compensating
5. bracketing, and
6. satisfying knowledge through an external source.

Self-scaffolding requires the learner to break a problem down into sub-problems. The learner solves each simpler sub-problem until he or she solves the entire problem (Bickhard, 1992).

Social constructivism stems directly from Vygotsky's theory of constructivism which posits that learners develop cognitive skills in social settings. Knowledge is constructed by the learner via active participation in a learning activity. The learner uses his or her or background knowledge to advance his or her knowledge. In Vygotsky's Zone of Proximal Development, a more advanced learner aids in the knowledge acquisition of the less skilled learner (Vygotsky, 1978). The interactive, immersive nature of MMORPGS are consistent with the foundations of social constructivism's premise of connecting learners with other learners thereby allowing learners to socially co-create new knowledge.

Situated Learning

Situated learning is an interconnected theory that links cognitivism and social constructivism to identity formation within communities of practice (Lave, 1991). According to Lave and Wenger (1991), a learner acquires knowledge by co-participating in everyday activities and constructing his or her own meaning based on the context of the situation. In essence, learning is an ancillary outcome stemming from involvement on the periphery of social situations. MMORPGs facilitate situated learning by providing learners with activities set in graphically rich, realistic, virtual environments. MMORPGs also provide considerable opportunities for social engagement and active discourse in a shared community. Situated learning is embedded in community and identity (Lave & Wenger, 1991). MMORPGs provide flexibility for learning and anonymity to learners. As such, MMORPGs may help dispel social status qualifiers and help develop a new set of criteria for status and acceptance. Learners can exchange ideas and information without discrimination. Learners are not held back or bound by the restrictions imposed by the real world.

Identity Formation

Identity formation is an essential component to learning. Identity is shaped by experience, emotions, intelligence, morals, and social aptitude (Mead, 1925; Vygotsky, 1978). Individuals construct their identities within the context and purpose of the learning environment (Lave & Wenger, 1991; Wenger, 1998). Individual identity is not one-

dimensional; an individual consists of many selves, each supporting a different a function of the complete self (Mead, 1925). The wholeness of these entities and the manner in which individuals apply the entities define an individual (Giddens, 1991). Personal identity is a dynamic concept this is transformed by a learner's commitment to learning goals and subsequent internalization of knowledge (Lave & Wenger, 1991).

Physical, Virtual, and Disembodied Virtual Identities

In the physical world, individuals create states to exist and then assume roles or identities, associated with those states (Mead, 1925). The identities are created according to the demands of an individual's life. For example, an adolescent male who wants to pursue a position as class president may create the roles of leader, friend, brother, son, and teenage student. Due to self-expectations and expectations of others, the roles may not always be harmonious, thus causing individuals to feel a disjointed sense of identity. This disaccord leads to an internal need to negotiate between identities. Failure to meet the demands of various roles may lead to feelings of isolation which impede an individual's ability to perform (Swann, 2005).

Identity, in the virtual sense, is best viewed from an interactionist perspective. Mead (1925) describes interactionism as a perspective in which individuals subjectively interpret and give meaning to the behaviors of others in society. Individuals create a fictional sense of behavior in order to justify it. This is achieved by individuals creating labels for the roles they play in the lives of others. Consequently, behavior is attached to an identity that is created and classified according to the labels that have been created, thus allowing individuals to behave according to the labels they interact with, such as group member, moderator, or expert (Hillis 1999; Mead, 1925).

Virtual identity can exist in the form of a static element, such as a picture or graphic, that makes an individual identifiable and accountable while maintaining his or her anonymity (Dickey, 2003). Virtual environments allow individuals to experiment with their identities without the limitations dictated by the real world. Individuals gain independence and assurance over themselves, their role in a given situation, and their communication abilities (Hillis, 1999). Formation of a virtual identity provides an individual with the opportunity to project self-selected attributes onto his or her virtual self (Turkle, 1996). This ability to explore different dimensions can positively influence the learner's ability to accept diverse perspectives.

Disembodied virtual identity refers to an identity that is independent of the actual self. A disembodied virtual identity is not tied to any particular time and place. It is a dynamic identity that can transform shape, fly, or possess supernatural traits (Hermans, Kempen, & Van Loon, 1992). In reference to virtual identity in MMORPGs, the word "avatar" is used to describe the disembodied representation of the user. The word avatar is a Sanskrit term, derived from the Hindu religion, meaning "incarnation" (Avatar, n.d.). Avatars can be two or three-dimensional objects or animations (Au, 2008; Stephenson, 2000).

The use of disembodied virtual identities allows learners to transcend boundaries of their physicality and physical world. The availability of copious graphics design programs and web-based tutorials provide individuals with infinite possibilities to create ideal avatars of themselves. Individuals can let go of the imperfections, either accidental or congenital, that delineate their real life presence (Au, 2008). Avatars help individuals feel a connection and sense of commitment to their virtual selves, spurring them to perform their roles according to the attributes they project onto their avatars (Blinka, 2008).

Research Methods

An observational case study approach was chosen for this study. According to Bogdan and Biklen (2007), a case study should be used by qualitative researchers in instances where they choose to focus on a particular aspect of a group. Observational case studies are characterized by participant observation supplemented by interviews and a review of documents (Bogdan & Biklen, 2007). An observational case study was also chosen because it focuses on exploration of the participant's experiences and his relevance to the overall topic (Merriam, 2002).

Participant and Setting

Purposive sampling was used to recruit an adolescent male participant who could provide insights in his own words and provide descriptive data (Bogdan & Biklen, 2007). The participant was chosen based on his relevant experiences in MMORPGs. The participant was recruited from personal references. Because the participant was a minor, the researcher secured Institutional Review Board (IRB) approval through her affiliated university prior to the start of the study. The researcher also secured parental consent and child assent prior to the start of data collection.

The participant, Randy (a pseudonym), was a 16 year old Hispanic male. Randy was an 11th grader who attended a large urban high school in South Florida. Randy started participating in MMORPGs at the age of 11. His interest started as a result of playing video games with his older male cousins.

Randy was observed and interviewed in his home. His home was located in a suburban neighborhood. His home was a moderately-sized and comfortable space where he lived with his parents and his brother. He participated in MMORPGs by playing video games on a large screen television connected to a gaming system located in the family's living room.

Data Collection and Analysis

Data were gathered via participant observations, face-to-face interviews, and document analysis of a cultural artifact. *The Making of Second Life,* written in 2008 by Wagner James Au, was chosen as a cultural artifact because it was written as a firsthand account of Au's experiences as an avatar in virtual immersive environments.

Randy was observed for 120 minutes, divided into four 30-sessions. He was also interviewed for 60 minutes, divided into two 30-minute sessions. The interviews took place following two of the observation sessions. As suggested by Bogdan and Biklen (2007), interview questions were generated based on elements related to the observed phenomenon. Some of the interview questions were adapted from the Metacognitive Awareness Inventory (MAI) (Schraw, 1994).

Data analysis of participant interviews, participant observations, and document analysis of *The Making of Second Life* were ongoing throughout the data collection process. As recommended by Bogdan and Biklen (2007) and Merriam (2002), data were broken down into manageable, organized pieces and coded throughout the analysis process. Field notes and interviews were coded according to observed behaviors and participant responses.

Role of the Researcher

According to Merriam (2002) and Peshkin (1988), the researcher's role is to record events and explore meaning through personal exploration. During this study, the researcher

served as the primary research instrument. The researcher was as an observer, interviewer and data recorder. The researcher made note of her personal feelings and subjectivities in a field journal. After spending time with the participant and reading about the experiences of other MMORPG users, the researcher appreciated their unique perspective and the insights they shared about their virtual world. This process allowed the researcher to learn about a different culture and be mindful of their customs and values.

Trustworthiness

Several measures were taken to enhance the trustworthiness of this study and support the credibility of the sources. Qualitative studies rely on the researcher as the primary instrument for recording data such as observations, interviews of subjects in their natural settings, and recording accurate information in their field notes and journals (Merriam, 2002). With this in mind, the researcher included the following measures of quality to enhance this case study: external audit, reflective journaling, triangulation of data sources, and member checking (Guba & Lincoln, 1981; Janesick, 1994).

Findings

Coded Field Notes

Analysis of coded field notes generated a focus on inner speech. According to Vygotsky (1984), adolescents' silent inner speech evolves from children's vocalized self-directed speech. Silent inner speech has also been referred to as self-talk (Bruffee, 1973). Using self-talk as a centralized focus, field notes were further coded according to the type of self-talk. Three types of self-talk were found to be most dominant:

1. Self-scaffolding of directions
2. Stating existing self-knowledge
3. Questioning self-knowledge

Self-scaffolding of directions. There were several instances where Randy used self-talk to guide himself through the game. "It's gotta be over there…I need to get there." Consistent with the characteristics of self-scaffolding and self-talk, Randy spoke to himself regarding his capacity to learn and thought back to a process that he had used successfully in the past (Bickhard; 1992; Bruffee, 1973; Vygotsky, 1984). In this instance, "Usually when I try it, it works. This time was different. I guess it changed." Randy referred back to a previous successful strategy and became aware that the once successful strategy was no longer working in his favor.

Stating existing self-knowledge. Stating interest in and knowledge of a subject an individual wishes to learn about is another characteristic of self-scaffolding and self-talk (Bickhard, 1992; Bruffee, 1973; Vygotsky, 1984). This characteristic was clear in Randy's comment, "I kept practicing and going back because I knew it was gonna work." Randy believed he knew enough about a particular aspect of the game to help himself achieve success.

Questioning self-knowledge. In metacognitive awareness, the brain organizes and coordinates information that an individual already knows with information that the individual needs to find out. The brain then provides the individual with an action plan to locate the information that he needs (Flavell, 1979; Ogle, 1994). In this aspect, metacognitive awareness

functions very much like an online search engine; an individual uses what he already consciously acknowledges he knows to find the information he does not know. In this example of questioning self-knowledge, "I'm not supposed be on this level...am I?" Randy was trying to figure out how his avatar moved to another level in the game. When Randy stated, "Whatever... It is what it is... I gotta move on," he was attempting to organize information and coordinate an action plan to overpower his opponent. There were also instances when Randy seemed surprised by his own subconscious knowledge, "Whoa, since when is that possible? I'm getting good."

Coded Transcripts

Coding of interview transcripts centered on two dominant metacognitive themes:

1. Self-awareness
2. Self-scaffolding

Self-awareness is extremely useful in helping learners recognize their own knowledge and keep track of their growth. Self-awareness helps facilitate learners' independence and autonomy. Learners can learn to rely on their own internal mental process to self-scaffold their knowledge acquisition. According to Ogle (1994), learners who engage in self-awareness experience positive changes in attitude and develop self-confidence. The boost in self-confidence empowers learners and helps them take charge of their learning.

Randy's responses were consistent with Reber's (1989) and Kolb's (1984) understanding of experiential learning. Randy's experiences in MMORPGs relied on his instinct.

> *You just get into the game. You can't panic. Everything is happening real quick. What you do is automatic. It's already burned in your brain because you played so many times and you messed up or you died millions of times. You don't forget how to play. Even if you don't play for a year, you always remember. Once my hands get on the controls, my brain takes over and I'm on autopilot. Do or die.*

The brain connects the new information to the old information. It is a simple, yet highly complex process, but it cannot take place unless the individual is self-aware of what he already knows (Flavell, 1979; Ogle, 1994). Randy provided a precise example of this when he stated, "You remember it from last time. Maybe the other time you played, your players told you that you messed up because you got killed even though they warned you the arch enemy was behind the corner. Whenever you see the corner, or they say corner, you're gonna remember and be on guard cause now you know all about the corner."

In another example of Randy's metacognitive self-scaffolding by connecting prior knowledge to new knowledge, Randy stated,

> *You build the map of the game in your brain. You see yourself on the map. You move around and you know where everything is. You do the play in your head a million times before you do the play in the real game. You take the best parts of the play where you did good. You imagine the good plays, and if you combine them with new plays...wow. You put it together and you get the best plays. If it don't work, then you learn your lesson 'cause you messed up. Next time, you try again 'cause you got new skills.*

The Making of Second Life

Au (2008) discussed the challenges and nuances of existing in a virtual environment. Throughout the book, Au talked about the dynamic status of virtual identity and how it afforded users of immersive environments, such as MMORPGs, the freedom to explore their interests. During one observation session, Randy commented, "Now, I'm the engineer of this game." Playing as an avatar allowed him to place himself in the shoes of his character. Randy created his own new habitat and learned how to survive and succeed in his new environment. For the moment, he was an engineer. This opportunity would not have been available to Randy without the existence of his disembodied identity and the immersive nature of MMORPGs.

The ability to develop a disembodied identity in a virtual world has the potential to promote learning by stimulating cognitive functions, increasing learner control and diminishing physical constraints (Au, 2008; Blinka, 2008; Hermans, Kempen, & Van Loon, 1992; Stephenson, 2000). In response to a question regarding navigating in his virtual environment, Randy responded,

> *I know where I'm going. I weave in and out. I tell myself to go left or right, up or down, wherever I need to go to win. I just know where I'm going. I just have this feeling inside. I'm good with directions. I know how to climb over the walls, knock down the stairs, throw stuff, squeeze my body in little corners, duck down, whatever. There's no limit.*

Randy's response was provided from the perspective of his avatar. His response indicated his avatar was in control of the situation and knew what to do. The interactive nature of MMORPGs allowed Randy to fully immerse himself in the environment and respond as if he were actually in the game.

Discussion

The purpose of this case study was to understand the role of MMORPGs in stimulating metacognitive functions and enhancing self-scaffolding skills in a 16 year-old male gamer. The interactive, multi-modal, multi-sensory, graphically rich features of MMORPGs stimulated the metacognitive functions of the participant. The dynamic stimulus of MMORPGs helped sustain his interest and motivated his desire to enhance his gaming skills.

The anonymity of MMORPGs allowed Randy to explore his identity without the fear of real world repercussions. MMORPGs diminished Randy's physical, social, and cognitive limitations and promoted his sense of self and willingness to learn. He continuously pushed himself to become a better player and challenged himself to learn new gaming skills to overcome virtual conundrums.

The researcher asked the question, "What self-scaffolding skills does a teenage male utilize as he engages in MMORPGs?" Metacognitive awareness and self-scaffolding were essential components in Randy's participation in MMORPGs. Randy had to always be alert and aware of his surrounds. Self-scaffolding took place spontaneously, sometimes in the most hectic, tense situations. Randy had to rely on spur of the moment strategies and techniques to outwit his opponents. The pressure to think and react instantaneously forced Randy to make quick mental connections between existing knowledge and information presented to him in the moment of play. The continuity of MMORPGs immersive environment forced Randy to rely on himself to fill in gaps in his knowledge the moment he realized he did not possess the information.

Learning is a process that unequivocally has the capacity to transcend curriculum and mediums. Adolescent males are spending an increasing amount of time in web-based interactions, particularly in MMORGPs. What happens in a MMORPG game does not just happen in a MMORPG. For players, it is more than just a game; MMORPGs envelope the player's identity, mind, and emotions. As such, contemporary educational frameworks should adjust themselves to balance neomillenials' needs with the intellectual skills necessary for their academic success.

This case study provided an account of the experiences of an adolescent male gamer. It resulted in increased self-awareness for the participant and the researcher. The study also showed the importance of self-scaffolding in contributing to the participant's knowledge, feelings of success, and motivation.

Limitations

This study focused on one adolescent male gamer and is therefore limited in providing information on the metacognitive experiences of other adolescent gamers. This study cannot be generalized to a wider population and it is difficult to determine whether the findings of this study are representative of other adolescents who participate in MMORPGs.

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