The Use of Video Games in Literacy Education and Development: What Have We Learned?

Masoud Mahmoodi-Shahrebabaki

Middle Tennessee State University, USA

Article Info	Abstract
	The growth of video gaming popularity has traversed the entertaining area and is finding its place in the educational arena as well. The educational potentials of video games have prompted literacy practitioners and researchers to embark on using video games for the purpose of increasing the quality and productivity of literacy education. The current theoretical article reviews the latest theories and research findings related to the general use of video games in education with an eye towards the literacy instruction in particular. The material selected for this systematic review consisted of both theoretical and empirical articles about the use of video games in learning and teaching of literacy in the educational contexts. Even though there is tangible evidence as to the positive effects of digital games on students` learning, there is still a dearth of converging evidence as to the practical benefits of inclusion of video games in literacy education. The available evidence are mostly the results of correlational studies, and we still need a connected research stream in pursuit of finding the predictive potentials of the video gaming in literacy instruction.

✉ Correspondence :
1301 E Main St, Murfreesboro, TN 37132, USA
E-mail: mm2ad@mtmail.mtsu.edu

INTRODUCTION

The use and popularity of digital visual media are consistently increasing, which has resulted in some changes in educational practices. Education is also refashioning in tandem with other facets of our lives under the heavy influence of digitalization. As new technologies have developed over the past few decades, the learning process has been transformed accordingly (Mahmoodi-Shahrebabaki, 2015). In the contemporary world, digital visual stimuli typically supersede written materials due to the propagation of digital devices (Ngiam et al., 2011) and this has spawned sweeping changes in our learning and teaching fashion (Conway & Christiansen, 2005). More and more, educators are adapting and incorporating technology use, including game-based learning, into educational practices (Mahmoodi-Shahrebbaki, 2015).

The traditional linear and rigid modes of instructions, which are abundant with prescriptive rules, has been found to be the primary reason for the lack of learners` interest in these instructional environments (Boud & Feletti, 2013; Mahmoodi-Shahrebabaki, 2015). Video gaming is one particular area of digital life that has become exceedingly trendy. Because of its popularity and widespread use, some educational theoreticians have proposed the inclusion of video game-based learning (e.g., Gibson, 2006; Wu et al., 2012; Arnab et al., 2015).

The concept of learning is still an elusive concept; however, we for sure know that the way we define learning would affect how we study it (Reinders, 2017). The notion of including video games in education has been primarily based on cognitive and sociocultural theories of teaching and learning (Juul, 2011; Mahmoodi-Shahrebabaki, 2014; Mayo, 2009). Huizinga (1955) has been one of the original voices who has stressed the effectiveness of including the elements of playfulness and games in educational settings. In his study of play, Huizinga states that. "anthropology and its sister sciences have so far laid too little stress on the concept of play and on the supreme importance to civilization of the play-factor." (n.p.). Huizinga (1955) in his seminal book *Homo Ludens*, explains that classes and playing games have a lot in common. He adds that classroom procedures are detached from routine life since classrooms possess their own demarcations in terms of time, rules and space.

The exponential growth of game-based learning since the 1980s has been precipitated by the advent and ubiquity of entertainment video-gaming (Höffler, Prechtl & Nerdel, 2010; Mahmoodi-Shahrebabaki, 2014). The video game industry took in approximately 25.1 billion dollars in 2010 (Malykhnia, 2014). Digital video games have been shown to be enormously appealing to children and adolescents (Annetta, Minogue, Holmes & Cheng 2009; Duke & Pearson, 2008). The Entertainment Software Association (2008) estimated that around 65 percent of the American population play video games on a regular basis. Because some video games have the potential to hold individuals attention who are engaged in learning situations, they are sometimes referred to as "edutainment" media (Griffiths, 2008).

Juul (2005) contends that being engaged in playing a video game can be considered a learning experience. Prensky (2005) asserts that the current young age groups, who have been born and raised in the environments wherein internet and digital devices abound, can be labeled "digital natives" who prefer learning using digital tools. This popularity has provided a fertile field for researchers to investigate the potential influences of the video games on general learning experiences of players. While most video games are played for amusement and the pleasure of discovery (Anderson, 2004), educational and learning aspects (e.g., learning how to pass a particular challenge) are indeed a significant component.

Van Eck (2006) argues that games are influential on account of what they manifest and what people do during the game. According to the discovery learning theory, students tend to become more active learners when they are engaged in activities in which there are problem-solving requirements (McNamara, 2012; Van Joolingen, 1998). The elements of interactivity and popularity of the video games have spawned interest among some researchers that the digital games may be utilized in educational settings (Annetta, Minogue, Holmes & Cheng 2009; Peterson, 2016). The digital natives have been mostly born after the 1980s and been working

with the digital devices since they were very young (Ng, 2012).

Many educational practitioners have recognized the potentials of the digital world being used as an educational tool for the digital natives. More specifically, they have been implementing immersive gaming technology to make the learning environment more appealing to their learners. This trend has been concomitant to the transformation of the way video gaming publishers develop and offer the games in terms of the ease and lower cost of the game development platforms. For instance, *Game Maker* is a freeware with a simple interface allowing educators to be able to develop diverse video games apposite to their students` needs (Papastergiou, 2009). Another example would be Sloodle Sloodle, which is a virtual environment wherein students and teachers can develop virtual classrooms (Alenezi & Shahi, 2015).

There is now reasonable evidence in the literature suggesting the fruitfulness of using video games in educational settings (Anneta, 2008; Granicm, Lobel & Engels, 2014; Heins, 2017; Squire, 2008). In a recent comprehensive metanalysis (Clark, Tanner-Smith, & Killingsworth, 2016) analyzed the research findings about video games and learning for K-12 students. Based on their metanalyses, the authors found that game-based instructional design significantly increased learning compared to non-game instructional design. Based on these findings, literacy researchers have taken further steps by evaluating the effectiveness of video game-based material in literacy instruction. These researchers have made their suggestions by referring to the already established strong links between literacy development and sociocultural factors (also called external) as well as cognitive (also known as internal) factors. It is noteworthy to mention that while investigating the interactions between literacy and video gaming, literacy should not be limited to the printed or written texts. As Lankshear and Knobel, (2007) note, "Literacy in current times is a matter of applying the knowledge of reading and writing in a particular kind of script" (p. 7).

In this paper, literacy is defined as the "ability to use language, numbers, images, computers, and other basic means to understand, communicate and gain useful knowledge" (UNESCO, 2006, p. 147). The purpose of the current review is to provide a synopsis of the theoretical framework and practical implications of implementing video games as a literacy instruction tool. First, the theoretical frameworks are discussed. Second, the results of related studies are provided with an eye towards the links between the suggested theories and rationale. Finally, the gaps in the present literature are discussed along with some recommendations for the further research. The studies chosen for this review have been selected on a comprehensive search on major online databases including Eric, EBSCO, Psych info, ProQuest, Game-research.com and so forth. The key words using for the searching were "literacy," "video game," "education," "instruction," "reading" "writing" "digital game" and "digital learning."

THEORETICAL BACKGROUND

According to the socio-cultural theory of cognitive development and constructivist perspectives, learning and acquisition processes include cases of symbol use and change (Alibali & Nathan, 2018). As von Glasersfeld states, "cognitive change and *learning* take place when a scheme, instead of producing the expected result, leads to perturbation, and perturbation, in turn, leads to accommodation that establishes a new equilibrium" (1989, p. 128). The functionality of the video games in education has been discussed with reference to the prominent learning models including such as Vygotsky's Zone of Proximal Development (ZPD) (1987). Vygotsky's Zone of Proximal Development (ZPD) reminds the importance of scaffolding the learners consistently during their education on the condition that as long as they progress toward their education, less assistance should be provided. The idea is to train learners to be self-regulated and capable of using learning strategies (mainly metacognitive strategies) with more ease. Use of video games in education can well fit into this model in a sense that typically the initial stages of games are simple and lenient; however, as the players are more attuned with the requirements of the game, the levels of difficulty increase. Players should learn new skills (also new information) in order to

proceed and succeed. The progression in the game, which is intermingled with a sense of self-achievement, can be a motivating factor to keep the players more engaged in the activity (Kusurkar, Artino, & Ten Cate, 2015).

Situated learning theory (Brown, Collins & Duguid, 1989) states that an individual`s consciousness and learning experience is formed through the activity, context, and culture wherein it was learned. Researchers have found that playing video games is a fundamental socialization and cognitive mechanism existing in many cultures (Granicm, Lobel & Engels, 2014; Greenfield, 2014; Höffler, Prechtl & Nerdel, 2010). Further, it has been suggested that video games can utilize this principle of playing as an educational strategy (See Dondlinger, 2007; Mayo, 2009). Gee (2003) has suggested a rationale for using video games to improve literacy development. He argues that main rules followed in video games can be implemented for students' literacy learning. The rules he suggests that may be used in literacy instruction and learning include focal attention and continuous linguistic engagement.

Video games are similar to language, as they can be utilized to convey meaning (Ferdig & Pytash, 2014). They provide a rationale that has roots in socio-cultural, environmental and metacognitive ideologies. For example, Gee (2016) argues that learning should not be deemed as an exclusive internal mental process; rather, it should be mainly viewed as a person`s response to environmental stimuli. He further mentions that human learning is reliant upon accumulated experiences instead of the storage and retrieval of mental knowledge. Video games help the player to enter into a virtual world and enjoy that experience as a part of the virtual world`s society. Research studies about video games have seen a transference from traditional software analysis to the analysis of elements of the games within a sociocultural framework (Ang et al., 2010; Krzywinska & Lowood, 2006; Mortensen, 2006). This change has mainly been owing to the progress made in the video game industry toward the interpersonal facets of play (Gee, 2016; Greitemeyer & Mügge, 2014), such as multiplayer online gaming.

Throughout the game making process, developers have sought to employ functions of social interactions and player companionship in the production of gaming consoles (Ang et al., 2010; Consalvo, 2006). For example, The Entertainment Conglomerate *Sony*, introduced Play Station 3 Home (Sony, 2007) as the 3D virtual world in which gamers may converse, discuss game experience, and co-play games. Therefore, playing digital games is not confined to the materials and content within the game software itself, but it also encompasses a digital culture that is instigated by the game-playing experience. (Ang et al., 2010; Gee, 2003; Squire, 2002).

Some researchers have discussed the effects of video-gaming within the framework of Activity Theory introduced and developed by Leont'ev (1978). The tenets of Activity Theory were built upon the Vygotskyan notions on educational psychology which challenged atomistic and reductionist views toward education resulting in separation of intellect and feeling (Roth & Lee, 2007). Activity Theory (see Figure 1) asserts that individuals are socio-culturally embedded actors and, their actions are influenced by cultural tools upon which subsequent sociocultural knowledge is built (Ang et al., 2010; Engeström, Leont'ev, 1978; Miettinen & Punamäki, 1999). The surge of interest in the Activity Theory in Computer Assisted Education has been concomitant with the current trends in educational research adopting a more inclusive and holistic view toward learning by considering the influences of contextual events, personal interactions, ecological factors and environmental agents on education and learning (Jackson et al., 2008; Lim, 2002; Pantić & Florian, 2015).
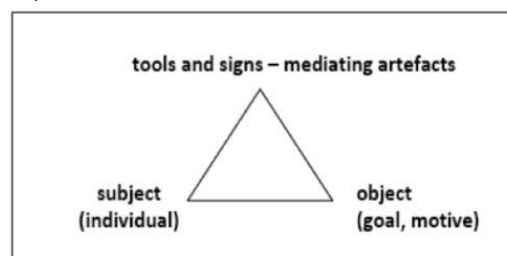

Figure 1. The basic structure of activity. Adapted from "Investigating language learning activity using a CALL task in the self-access center" by Montoro, C., and Hampel, R., 2011. *Studies in Self-Access Learning Journal,* 5, p.

The subject is the individual who is deemed a focal point of the analysis and, the object is the problem space which can lead to outcomes with the using the available tools. Tools refer to any concepts or resources that allow individuals to interact with various items (Asquire, 2002; Barr, Noble & Biddle, 2007; Buckingham & Willet, 2013; Vygotsky, 1978; Wong et al., 2007). And finally, the community are those with whom the individual has a similar objective (Ang et al., 2010; Wasko & Faraj, 2000)). According to the Activity Theorists, the goal of video-gamers is enjoyment and the player experience, which can be considered as an outcome in this framework, and is mediated by the video game as a tool (Barr, Noble & Biddle, 2007; Buckingham & Willet, 2013).

Another sociocultural oriented theory in video game studies has been the theory of "magic circle" (Salen & Zimmerman, 2003). The "magic circle" according to Sale and Zimmerman (2003) "in a very basic sense, the magic circle of a game is where the game takes place. To play a game means entering into a magic circle, or perhaps creating one as a game begins". (p. 95). Correspondingly, video games are not developed and played under the pressure of binding rules; instead, there are progressive debates and renegotiations according to the social situation available within the game (Montro & Hampel, 2011).

Researchers who have sought to identify the potential associations between literacy and video gaming put their arguments on the basis of a sociocultural view that while individuals play video games, they take part in a composite "constellation of literacy practices" (Steinkuehler, 2007, pp. 299–300). Apperley and Walsh (2012) offer a heuristic model within which digital gaming literacy may be fruitful in recognizing different facets of students` gaming literacy and opt games which support curricular and/or extracurricular activities. Basically, their model is aimed to introduce diverse aspects of video gaming cultures which may be utilized in literacy teaching and assessment. Accordingly, (Meta) knowledge and (Meta) language observed in the games can connect students` home-based literacy learning to school-based literacy instruction. The authors` conclusion is similar to what Abrams

(2014) has called "paratext" to be used in literacy education. Apperley and Walsh (2012) define *paratext* as:

"The term *paratext* is useful for helping teachers and practitioners familiarize themselves with the wide-ranging print and multimodal texts that circulate in digital gaming cultures. Digital game paratexts represent print and multimodal texts (walkthroughs, video tutorials, fan fiction, fan art, for example) that are easily accessible to teachers and practitioners when digital games themselves are not". (*p.*2).

This perspective is similar to the rationalization put forth by Buckingham and Burn (2007) asserting "game literacy also implies that there is something specific about this medium that distinguishes it from others– that we positively need game literacy as distinct from print literacy or television literacy, or even a broader notion like media literacy" (p. 325).

From a micro-social view, two analogous terms of Video Game-Supported Collaborative Learning (VGSC) (Sánchez, Zea, & Gutiérrez, 2009) and Collaborative Game-based Learning Approach (Romero et al., 2012) have been introduced. The main argument of these concepts is that learning by doing promotes learning and gives us better opportunity to take the full benefit of the collaboration existing among the video gamers in multiplayer online games. The benefits of using video games in educational settings have also been discussed within the framework of Connected Learning Theory (Ito et al., 2013). According to this theory, learning transpires anytime, anywhere and educational practitioners should take advantage of the video-games for making learning more appealing and contextualized for students by relating their interest to a circle of support and academic subjects (Ito et al., 2013).

VIDEO GAMES AND LITERACY DEVELOPMENT

Gee (2004) used his own experiences as a gamer to exemplify his emphasis on the pragmatic dimensions of literacy, on the idea that "writing" and "reading" do not exist as generalized, abstracted cognitive activities but only as specific social practices embedded in the purposes and

goals of particular discourse communities, or "semiotic domains," as he referred to them (p. 17). Simply put, Gee reminded us that there are "many different ways of reading and writing" and that each different way is embedded in "a lived and historically changing set of discursive practices" (pp. 14, 21). Trying to separate reading and writing as technical skills apart from these discursive practices means losing an understanding of the motivation and purpose that drives the development of literacy. Gee (2003) criticized what often happens in literacy classrooms as a result: "In school, many times children are expected to read texts with little or no knowledge about any social practice within which those practices are used" (p. 16).

Since the 1990s, some video games have become available with the sole purpose of helping players enhance their literacy skills (Ferdig & Pytash, 2014; Gee, 2003; Mahmoodi-Shahrebabaki, 2014; Squire, 2011; Steinkuehler, 2010). Several studies have probed the potential usefulness of video games for boosting cognitive engagement resulted from the gaming experience. For example, Barlett, Vowels, Shanteau, Crow and Miller (2009) examined the effect that playing two video games (one violent and one non-violent) exerted on cognitive capacity. The participants of their study were asked to sit for identical cognitive tests five times. The initial four tests were implemented for practicing, and the final used served as the post-treatment comparison. Random assignment was used for formation of three groups: the control group, including 54 participants, the non-violent video game experimental group, including 27 participants, and the violent video game experimental group including 32 players. The results revealed that the cognitive performance of the participants in the control group did not indicate any significant change in cognitive performance; however, those in video game groups did have substantial growth in their cognitive performance. The authors concluded that playing video games can potentially enhance cognitive performance.

Dye, Green, and Bavelier (2009) contend that playing video games demands instantaneous processing of sensory information and automatic responses, requiring players to analyze incoming data and produce a reaction expeditiously. They add that "during gameplay, delays in processing often have severe consequences, providing a large incentive for players to increase speed" (p. 321). Processing speed, in the literacy context, refers to the rate of accomplishment of reading comprehension with reasonable accuracy (McIntyre et al., 2017).

The notion of "rapid processing" has been actively followed by the researchers in the literacy-development related studies. For instance, Jacobson et al. (2011) sought to compare the reading fluency of children with attention deficit and hyperactivity disorder (ADHD) with control groups including children without symptoms of ADHD across the tasks of the Wechsler Intelligence Scale for Children (WISC-IV-I) Processing Speed Index, "dissociating the executive *processing* components necessary to response selection and preparation from the initial perceptual and terminal graphomotor output demand of Processing Speed (PS)" (p. 220). Their sample included 62 children diagnosed with ADHD. Based on their findings, the authors assert that the element "processing speed" (i.e., that involving response selection) had a statistically significant correlation with oral reading fluency performance of their participants. They further claimed that, because reading fluency requires both efficient and accurate responding in addition to the rapid reaction, the slow response can be due to the sizable executive demand in response selection and preparation.

There is also substantial evidence that selective attentional factors are actively involved in higher-level tasks in spatial cognition (see Cardoso-Leite & Bavelier, 2014; Mahmoodi-Shahrebabaki, 2015; Matthews & Meck, 2016; Unsworth et al., 2016). Selective attention refers to the capability to concentrate on relevant required information germane to the task while filtering out impertinent information (Chung-Fat-Yim, & Bialystok, 2017). Blumberg (1998) observed that video game players perform cognitive tasks more actively thanks to the ability to focus on specific game aspects. Similar evidence corroborates that individuals who play video games routinely have an expanded attentional capacity (Pashler, 2016). The ability to

keep attention has been indicated to predict academic success in school beyond cognitive and language skills (Duncan et al., 2007).

Franceschini et al. (2013) found that 12 hours of involvement with action video games- without explicit phonological or orthographic instructions - notably enhanced the reading speed and accuracy of children with dyslexia. They assessed three variables including reading, phonological, and attentional variables using two matched groups of children diagnosed with dyslexia before and after their involvement in playing action or non-action video games for nine sittings of 80-minutes each day. The results showed that playing action video games ameliorated reading speed of dyslexic children; however, accuracy was not significantly influenced. These findings support the notion that playing video games promotes attentional span of readers. The author concluded that "this attention improvement can directly translate into better reading abilities, providing a new, fast, fun remediation of dyslexia that has theoretical relevance in unveiling the causal role of attention in reading acquisition" (p. 462). The main shortcoming of their study was the lack of comparison between control and treatment group and their use of a pre-post design which leaves the effect of any potential third variable unaccounted for.

Beavis and O'Mara (2010) conducted case studies of two instructors who merged literacy lessons with video games. One of the teachers had students read images from video games to do critical analyses. Their analysis was based on players' interactions with games as players, creators and, readers. The primary goal of the researchers was to conduct a critical reflection on the practices happening during the play. The results indicated that students had the "capacity to anticipate what new players would need to know, while also assuming a shared degree of internet savviness and knowledge" (Beavis & O'Mara, 2010, p. 67).

The other instructor engaged students in utilizing *GameMaker*. Students had to consider genre and narrative awareness to create video games. Students conducted peer-review to be able to provide feedback to their peers about their games. The analysis of the results of the two case

studies demonstrated that being involved in producing video games prompted students to focus on metacognitive strategies more frequently to know how video games are conceptualized (Beavis & O'Mara, 2010). The overall conclusion of the authors was that video games have the potential to be used in literacy instruction as players have to read and write para-texts, such as websites, chats, instructions, and online forums. Their use of cases study, however, may not produce substantial evidence owing to the case study natural limitations including replicability and generalizability.

Andrews (2007) discussed the symbiotic associations between playing video games and literacy development. From this perspective, children can retain and recall the words in reality if they are exposed to those words during game-playing engagement. There exists a 'symbiotic' relationship between video gaming and literacy practices (Andrews, 2007). Moreover, game-playing children usually follow many instructions during their games and are more actively involved in game-related discussions. Hence, their exposure to the authentic language is augmented. Correspondingly, Mifsud, Vella, and Camilleri (2013) hold that children who play literacy-related video games possess. Substantially superior letter-naming and letter-sounding performance and show significant story abstractions as well as greater knowledge of letters in their own names. Their argument is aligned with the findings of Rosas et al. (2003) who reported statistically significant improvements in spelling and reading comprehension performance of their participants after they played literacy-related video games.

While there is a gap in the literature as to the direct influence of playing video games on fluency in reading-related skills including Rapid Automatized Naming (RAN) or Oral Reading Fluency (ORF), it has been shown that playing video games has significantly affected attention span of some ADHD children readers (Jacobsen et al., 2011). Because RAN has been indicated to be strongly influenced by the attention span of readers (Ryan et al., 2016), it is not impertinent to hypothesize that playing video games may produce a positive effect on RAN and other skills that have been linked and may be influenced by attention span. Future research evaluating the

direct links between video games and these skills (e.g., RAN) could add valuable insight into the role gaming may play in the reading process.

Kongmee et al. (2011) investigated the effects of massive multiplayer online role-playing games (MMORPGs) on language learning. The multiplayer games were solely for the purpose of entertainment and were chosen by the participants. Their rationale was based on the hypothesis that video games can be resorted to as a substitute social interface to promote language acquisition. Additionally, because each game included multiple tasks and objectives, playing would establish an engaging environment for consistent practice.

The researchers initially familiarized the participants with the MMORPGs and monitored their progress via recorded sessions. The participants were carefully observed for their use of the English language while playing the games and finishing the objectives together. The data gathering and analysis processes were action research and ethnography. The students took multiple tests before, during, and after playing the video games. Their findings demonstrated that students who played the MMORPGs had significant improvements in their reading comprehension and vocabulary knowledge. The results were attained by means of screen recorders providing virtual ethnography. The findings were also corroborated by pre and post-test on ELLIS Placement Test (EPT). As a part of ELLIS academic suite, the EPT measures each student's skills in each of three skill areas—listening comprehension, grammar, and vocabulary. The authors concluded that the learners showed more eagerness in using English and greater patience in reading. The researchers also observed more motivation for writing; however, they did not report any effect sizes. Although the findings introduced new insights into the nature of language usage in online game forums, their generalization is limited due to the nature of sampling and treatment.

Steinkuehler (2004, 2006, 2007 & 2008) conducted several studies on the educational opportunities produced by the proliferation of Internet-based role-playing games. Steinkuehler (2004) maintains that MMORPGs: "are ripe for a cultural/cognitive analysis of the social and

material practices attending them: Given their increasing domination of the entertainment industry, wide-spread and growing popularity with people of all age groups, ethnicities, and economic classes, and purported addictive quality of those who plug in . . . MMOGs are quickly becoming the form of entertainment and a major mechanism of socialization for young and old alike". (p. 78).

LIMITATIONS

The studies conducted thus far have several significant limitations worthy of notice. First and most importantly, most of the studies reported in this review were case studies, correlational, and pre-post designs. Unfortunately, these studies cannot provide the same scientific evidence for causal relations as random controlled trials, which is a methodological limitation.

Second, there wasn't a systematic distinction between the games used in these studies. Specific characteristics of games including the amount of action, the amount of concentration necessary to finish tasks, and how recreational level (for entertaining purpose only) should be controlled and explained if more valid and reliable evidence were not reported.

Third, the available literature has mainly focused on the effects of playing video games on the perceptual, visual and attentional factors excluding other essential elements such as auditory or kinetic aspects which have been shown to affect literacy development (Sencibaugh, 2007).

CONCLUSION

The representation of literacy is changing from what has been seen to be 'static print/book culture . . . where learning is geographically tied to a desk . . . and an old-style transmission and surveillance pedagogy' (Luke, 2003, p. 398). Due to this transfiguration, young learners are currently more inclined to rely upon the use of digital technologies to teach themselves (sang et al., 2010), self-regulate learning (Schraw, 2007), and discover the unknown (Laurillard, 2013). Consequently, educators ought to revisit the conventional view toward literacy that merely

views print-based texts as the cornerstone of literacy teaching and research.

Based on the review of the literature on the relationships between playing video games and literacy development, several conclusions can be drawn. First, research needs to investigate whether using educational games can be useful for the improvement of both reading and writing instruction (Adams, 2007). Second, research is required to examine not just how video games can be applied in education but how different *varieties* of games can be utilized and how game compositions give support to learning compositions(Black, 2005).

There should be noted here that over-reliance on playing video games may be detrimental to the educational progress of children. Numerous research studies have reported the adverse effects of video game addiction phenomena (e.g., Brunborg, Mentzoni, & Frøyland, 2014; King, Delfabbro, & Griffiths, 2013; Weinstein, 2010). Gentile (2009) reported that on average the time children spend playing video games is to a great extent more than the time they spend on their school assignments or readings. Therefore, it is advisable that parent make their children strike a balance between the time they spend on playing video games, including educational games, and the time they have to spend on their school assignments (Weis & Cerankosky, 2010)

Future research is needed for more in-depth analyses of the observations and findings to provide further explanations about how the use of video games might impact literacy development and peripheral socio-cultural developments. As Steinkuehler (2004) states, "without basic ethnographic work conducted here, it will remain difficult to tease out what practices, understandings, and identities MMOGaming recruit from those who play and whether or not they are portable, plausible, or productive" (p.7).

Moreover, it can be argued that there are different expectations for neophytes and adept gamers. That is, if adept gamers are employed owing to their playing experience and quality, they look forward to performing well due to their competence because their self-belief affects their fulfillment. Yet, this may not be the case with the beginner gamers.

Additionally, future research should include more proximal measures of literacy. More research with this regard would enable the direct effect of gaming on literacy to be examined to determine if stronger links between the two exist as opposed to the indirect connection some of the reviewed studies indicate. Finally, commercial, recreational games which include, unintentionally, fruitful elements for literacy education can be studied separately (Mackereth & Anderson, 2000).

The existing evidence of the positive effects of video games is also corroborated by students, instructors and, parents for the application of video games in literacy acquisition classrooms. Research evidence shows educational and non-educational digital video games may be implemented for literacy development and instruction (see Kickmeier-Rust & Albert, 2010). The preliminary research suggests that investigating video games as literate practices deserves more investigation, especially given the exponential growth of their presence. Although the initial study examining the link between gaming and literacy is relatively sparse, the evidence suggesting a link affords a potentially rich opportunity for further research to explore not only their relationship but also to develop interventions using gaming to improve literacy directly.

REFERENCES

Reader Rabbit is a game developed by The Learning Company for tutoring children from toddlers through second grade. The games have been specifically meant to teach kids the basic spelling and reading skills (The Learning Company, 1996).

Nessy Learning Program is a digital game developed for the purpose of teaching dyslexic children how to spell words (Al-Wabil et al., 2010; Nessy, 2017).

The interactive Strategy Training for Active Reading and Thinking (iSTART) (McNamara, Levinstein, & Boonthum, 2004) is a web-based application developed for teaching reading comprehension strategies to students of different ages.

References

Adams, E. (2007). *Game writing: Narrative skills for videogames.* C. M. Bateman (Ed.). Boston, MA: Charles River Media.

Alberti, J. (2008). The Game of Reading and Writing: How Video Games Reframe Our Understanding of Literacy. *Computers and Composition, 25(3),* 258-269. doi:10.1016/j.compcom.2008.04.004.

Alenezi, A. M., & Shahi, K. K. (2015). Interactive e-learning through second life with blackboard technology. *Procedia-Social and behavioral sciences*, *176*, 891-897.

Alibali, M. W., & Nathan, M. J. (2018). Embodied cognition in learning and teaching: action, observation, and imagination. In *International handbook of the learning sciences* (pp. 97-107). London: Routledge.

Al-Wabil, A., Meldah, E., Al-Suwaidan, A., & AlZahrani, A. (2010, September). Designing Educational Games for Children with Specific Learning Difficulties: Insights from Involving Children and Practitioners. In *Computing in the Global Information Technology (ICCGI), 2010 Fifth International Multi-Conference on* (pp. 195-198). IEEE

Anderson, C. A. (2004). An update on the effects of playing violent computer games. *Journal of Adolescence, 27*, 113–122.

Andrews, R. (2007). Research on teaching secondary English with ICT. *Teaching secondary English with ICT*, 126-136.

Annetta, L. A., Minogue, J., Holmes, S. Y. & Cheng, M. (2009). Investigating the Impact of Video Games on High School students' Engagement and Learning About Genetics, *Computers and Education, 53 (1),* 74–85.

Annetta, L. A. (2008). Video games in education: Why they should be used and how they are being used. *Theory into practice*, *47*(3), 229-239.

Barlett, C. P., Vowels, C. L., Shanteau, J., Crow, J., & Miller, T. (2009). The effect of violent and non-violent computer games on cognitive performance. *Computers in Human Behavior, 25,* 96–102.

Beavis, C., & O'Mara, J. (2010). Computer games-pushing at the boundaries of literacy. *Australian Journal of Language and Literacy*, *33*(1), 65.

Blumberg, F. C. (1998). Developmental differences at play: Children's selective attention and performance in computer games. *Journal of Applied Developmental Psychology, 19*, 615–624.

Boud, D., & Feletti, G. (2013). *The challenge of problem-based learning*. London: Routledge

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational researcher*, *18*(1), 32-42.

Brunborg, G. S., Mentzoni, R. A., & Frøyland, L. R. (2014). Is video gaming, or video game addiction, associated with depression, academic achievement, heavy episodic drinking, or conduct problems?. *Journal of behavioral addictions*, *3*(1), 27-32

Calfee, R., Pearson, P.D. & Callahan, M. (2012). *Smarty Ants*. Retrieved from, http://www.smartyants.com/ research/research-reports

Chung-Fat-Yim, A., Sorge, G. B., & Bialystok, E. (2017). The relationship between bilingualism and selective attention in young adults: Evidence from an ambiguous figures task. *The Quarterly Journal of Experimental Psychology*, *70*(3), 366-372.

Clark, D. B., Tanner-Smith, E. E., & Killingsworth, S. S. (2016). Digital games, design, and learning: A systematic review and meta-analysis. *Review of educational research*, *86*(1), 79-122.

Conway, C. M., & Christiansen, M. H. (2005). Modality-constrained statistical learning of tactile, visual, and auditory sequences. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *31*(1), 24.

Connor, C. M., & Zwolan, T. A. (2004). Examining multiple sources of influence on the reading comprehension skills of children who use cochlear implants. *Journal of Speech, Language, and Hearing Research*, *47*(3), 509-526.

De Aguilera, M., & Mendiz, A. (2003). Video games and education :(Education in the Face of a "Parallel School"). *Computers in Entertainment (CIE)*, *1*(1), 1.

Dondlinger, M. J. (2007). Educational video game design: A review of the literature. *Journal of applied educational technology*, *4*(1), 21-31.

Duke, N. K., & Pearson, P. D. (2008). Effective practices for developing reading comprehension. *The Journal of Education*, *189*(2), 107-122.

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P. & Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*, *43*, 1428.

Dye, M. W., Green, C. S., & Bavelier, D. (2009). Increasing speed of processing with action video games. *Current directions in psychological science*, *18*(6), 321-326

Entertainment Software Association. (2008). *Industry Facts*. Retrieved from http://www.theesa.com/ facts/index.asp

Facoetti, A., Trussardi, A.N., Ruffino, M., Lorusso, M.L., Cattaneo, C., Galli, R., Molteni, M., & Zorzi, M. (2010). Multisensory spatial attention deficits are predictive of phonological decoding skills in developmental dyslexia. *Journal of Cognitive Neuroscience, 22,* 1011–1025

Ferdig, R. E., & Pytash, K. E. (2014, January). Using video games for literacy acquisition and studying literate practices. In *Learning, Education and Games* (pp. 55-71). ETC Press.

Franceschini, S., Gori, S., Ruffino, M., Viola, S., Molteni, M., & Facoetti, A. (2013). Action video games make dyslexic children read better. *Current Biology*, *23*(6), 462-466

Gee, J. P. (2016). *Gaming lives in the twenty-first century: Literate connections*. G. Hawisher, & C. Selfe (Eds.). Berlin: Springer.

Gentile, D. (2009). Pathological video-game use among youth ages 8 to 18: a national study. *Psychological science*, *20*(5), 594-602.

Gee, J. P. (2003). What video games have to teach us about learning and literacy. *Computers in Entertainment (CIE)*, *1*(1), 20-20.

Greenfield, P. M. (2014). *Mind and media: The effects of television, video games, and computers*. London: Psychology Press.

Granic, I., Lobel, A., & Engels, R. C. (2014). The benefits of playing video games. *American psychologist*, *69*(1), 66.

Griffiths, M. D. (2008). Videogame addiction: Further thoughts and observations. *International Journal of Mental Health and Addiction*, *6*(2), 182-185.

Harushimana, I. (2008). Literacy through gaming: The influence of videogames on the writings of high school freshman males. *Journal of Literacy and Technology*, *9*(2), 35-56.

Heikkilä, R., Torppa, M., Aro, M., Närhi, V., & Ahonen, T. (2016). Double-deficit hypothesis in a clinical sample: Extension beyond reading. *Journal of learning disabilities*, *49*(5), 546-560.

Heins, M. C. (2017). *Video games in education* (Master's thesis). Education and Human Development, The College at Brockport, State University of New York, Paper 625. Retrieved from http://digitalcommons.brockport.edu/cgi/view content.cgi?article=1653&context=ehd_theses

Höffler, T. N., Prechtl, H., & Nerdel, C. (2010). The influence of visual cognitive style when learning from instructional animations and static pictures. *Learning and Individual Differences*, *20*(5), 479-483.

Hopper, P.F., & Miller, S. R. (2010). Supporting reading goals through the visual arts. *Reading Improvement, 47*(1), 3.

Huizinga, Johan. (1955). *Homo ludens: A study of the play element in culture*. Boston, MA: Beacon Press. (Original work published in 1950).

Jackson, L. B., Ryndak, D. L., & Wehmeyer, M. L. (2008). The dynamic relationship between context, curriculum, and student learning: A case for inclusive education as a research-based practice. *Research and Practice for Persons with Severe Disabilities*, *34*(1), 175-195.

Jacobson, L. A., Ryan, M., Martin, R. B., Ewen, J., Mostofsky, S. H., Denckla, M. B., & Mahone, E. M. (2011). Working memory influences processing speed and reading fluency in ADHD. *Child Neuropsychology*, *17*(3), 209-224.

Juul, J. (2011). *Half-real: Video games between real rules and fictional worlds*. Cambridge: MIT press.

King, D. L., Delfabbro, P. H., & Griffiths, M. D. (2013). Video game addiction. In *Principles of Addiction* (pp. 819-825).

Kongmee, I., Strachan, R., Pickard, A., & Montgomery, C. (2011, July). Moving between virtual and real worlds: second language learning through massively multiplayer online role playing games (MMORPGs). In *Computer Science and Electronic Engineering Conference (CEEC), 2011 3rd* (pp. 13-18). IEEE.

Kusurkar, R. A., Artino, A. R., & Ten Cate, T. J. (2015). Motivation and Learning. *The Art of Teaching Medical Students-E-Book*, 62.

Lankshear, C., & Knobel, M. (2007). Sampling "the new" in new literacies. *A new literacies sampler*, *29*, 1-24.

Laurillard, D. (2013). *Teaching as a design science: Building pedagogical patterns for learning and technology*. London: Routledge

The Learning Company. (1996). Reader Rabbit series. Reading Development Library 1. Cambridge, MA: Author.

Leont'ev, A. N. (1978). *Activity, consciousness, and personality*. Englewood Cliffs, NJ: Prentice Hall.

Lewis, C., Enciso, P., & Moje, E. B. (2007). *Reframing sociocultural research on literacy: Identity, agency, and power* (pp. 1-11). Mahwah, NJ: Lawrence Erlbaum Associates.

Lieury, A., Lorant, S., Trosseille, B., Champault, F., & Vourc'h, R. (2016). Video games vs. reading and school/cognitive performances: a study on 27000 middle school teenagers. *Educational Psychology*, *36*(9), 1560-1595.

Lim, C. P. (2002). A theoretical framework for the study of ICT in schools: a proposal. *British Journal of Educational Technology*, *33*(4), 411-421

Luke, C. (2003). Pedagogy, connectivity, multimodality, and interdisciplinarity. *Reading Research Quarterly, 38*(3), 397–413.

Mackereth, M., & Anderson, J. (2000). Computers, video games, and literacy: what do girls

think? *Australian Journal of Language and Literacy, 23*(3), 184.

Mahmoodi-Shahrebabaki, M. (2015). Educational syncretism: call for a hyper-modernist educational theory through Proactionary Approach. *Bulgarian Journal of Science and Education Policy, 9*(1), 5-22.

Mahmoodi-Shahrebabaki, M. (2015). Relationships between Language Teachers' Time-management Skills, Creativity, and Burnout: A Mediation Analysis. *Alberta Journal of Educational Research, 61*(1), 20-39.

Mahmoodi-Shahrebabaki, M. (2015). On the Understated and Avant-garde Language Teaching Methods and Theories. *Int. J. Appl. Ling. Stud, 4*(1), 17-23.

Mahmoodi-Shahrebabaki, M. (2014). An Investigation on the Effectiveness of Using Movie Clips in Teaching English Language Idioms. *Enjoy Teaching Journal, 2*(4), 26-35.

Malykhina, E. (2014). Fact or Fiction?: Video Games Are the Future of Education. Retrieved August 19, 2017, from https://www.scientificamerican.com/article/fact-or-fiction-video-games-are-the-future-of-education/

Mayo, M. J. (2009). Video games: A route to large-scale STEM education?. *Science, 323*(5910), 79-82.

McIntyre, N. S., Solari, E. J., Grimm, R. P., Lerro, L. E., Gonzales, J. E., & Mundy, P. C. (2017). A comprehensive examination of reading heterogeneity in students with high functioning Autism: Distinct reading profiles and their relation to Autism Symptom Severity. *Journal of Autism and Developmental Disorders*, 1-16.

McNamara, D. S., Levinstein, I. B., & Boonthum, C. (2004). iSTART: Interactive strategy training for active reading and thinking. *Behavior Research Methods, Instruments, & Computers, 36*(2), 222-233.

McNamara, D. S. (Ed.). (2012). *Reading comprehension strategies: Theories, interventions, and technologies*. London: Psychology Press.

Mifsud, C., Vella, R., & Camilleri, L. (2013). Attitudes towards and effects of the use of video games in classroom learning with specific reference to literacy attainment. *Research in Education, 90*(1), 32-52.

Nessy Reading & Spelling Help For Children With Dyslexia. (2017). Retrieved from https://www.nessy.com/uk/product/nessy-reading-spelling/

Ng, W. (2012). Can we teach digital natives digital literacy?. *Computers & Education, 59*(3), 1065-1078

Ngiam, J., Khosla, A., Kim, M., Nam, J., Lee, H., & Ng, A. Y. (2011). Multimodal deep learning. In *Proceedings of the 28th international conference on machine learning (ICML-11)* (pp. 689-696).

Pantić, N., & Florian, L. (2015). Developing teachers as agents of inclusion and social justice. *Education Inquiry, 6*(3), 27311

Papastergiou, M. (2009). Digital game-based learning in high school computer science education: Impact on educational effectiveness and student motivation. *Computers & Education, 52*(1), 1-12

Pashler, H. (Ed.). (2016). *Attention*. London: Psychology Press

Peterson, M. (2016). *Computer games and language learning*. Berlin: Springer.

Piaget, J. (1976). Piaget's theory. In *Piaget and his school* (pp. 11-23). Springer Berlin Heidelberg.

Prensky, M. (2007). *Digital game-based learning* (2nd Ed.). St. Paul, MN: Paragon House.

Prensky, M. (2005). Listen to the natives. *Educational leadership, 63*(4).

Reinders, H. (2017). Digital Games and Second Language Learning. *Language, Education and Technology*, 1-15

Rosas, R., Nussbaum, M., Cumsille, P., Marianov, V., Correa, M., Flores, P. & Rodriguez, P. (2003). Beyond Nintendo: design and assessment of educational video games for first and second grade students. *Computers & Education, 40*(1), 71-94.

Roth, W. M., & Lee, Y. J. (2007). Vygotsky's neglected legacy: Cultural-historical activity theory. *Review of educational research, 77*(2), 186-232.

Ryan, M., Jacobson, L. A., Hague, C., Bellows, A., Denckla, M. B., & Mahone, E. M. (2016). Rapid automatized naming (RAN) in children with ADHD: An ex-Gaussian analysis. *Child Neuropsychology*, 1-17.

Sang, G., Valcke, M., Van Braak, J., & Tondeur, J. (2010). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with educational technology. *Computers & Education, 54*(1), 103-112.

Schraw, G. (2007). The use of computer-based environments for understanding and improving self-regulation. *Metacognition and Learning, 2*(2-3), 169-176

Sencibaugh, J. M. (2007). Meta-analysis of reading comprehension interventions for students with learning disabilities: Strategies and implications. *Reading improvement, 44*(1), 6.

Shaffer, D. W., Squire, K. R., Halverson, R., & Gee, J. P. (2005). Video games and the future of learning. *Phi delta kappan, 87*(2), 105-111.

Squire, K. D. (2005). Changing the game: What happens when video games enter the classroom. *Innovate: Journal of online education*, *1*(6).

Squire, K. D. (2008). Video games and education: Designing learning systems for an interactive age. *Educational Technology*, 17-26.

Steinkuehler, C. A. (2004, June). Learning in massively multiplayer online games. In *Proceedings of the 6th international conference on learning sciences* (pp. 521-528). International Society of the Learning Sciences.

Steinkuehler, C. A. (2006). Massively multiplayer online video gaming as participation in a discourse. *Mind, culture, and activity*, *13*(1), 38-52.

Steinkuehler, C. (2007). Massively multiplayer online gaming as a constellation of literacy practices. *E-learning and Digital Media*, *4*(3), 297-318

Steinkuehler, C. A. (2008). Cognition and literacy in massively multiplayer online games. *Handbook of research on new literacies*, 611-634.

UNESCO. (2006). *Education for All: A Global Monitoring Report*. Retrieved from http://www.unesco.org/education/GMR 2006/full/chapt6_eng.pdf

Van Eck, R. (2006). Digital game-based learning: It's not just the digital natives who are restless. *EDUCAUSE review*, *41*(2), 16.

Von Glasersfeld, Ernst. 1989. Cognition, Construction of Knowledge, and Teaching. *Synthese* 80(1):121–140.

Vidyasagar, T.R., & Pammer, K. (2010). Dyslexia: a deficit in visuo-spatial attention, not in phonological processing. *Trends Cognitive Sciences, 14,* 57–63.

Vygotsky, L. (1987). Zone of proximal development. *Mind in society: The development of higher psychological processes*, *5291*, 157.

Weinstein, A. M. (2010). Computer and video game addiction: a comparison between game users and non-game users. *The American journal of drug and alcohol abuse*, *36*(5), 268-276.

Weis, R., & Cerankosky, B. C. (2010). Effects of video-game ownership on young boys' academic and behavioral functioning: A randomized, controlled study. *Psychological science*, *21*(4), 463-470.

116