Digital Games, CMC, and Women: How Enactivism Helps Reform e-Learning?

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Abstract

The world is changing - rapid technological development is profoundly changing our economy, culture, and society. The diversity of learners and increasingly distributed nature of learning environments pose various challenges that deserve our serious attention. This paper explores current educational technology research and diverse perspectives on bridging the digital divide of gender, paying particular attention to educational gaming and computer-mediated communication (CMC). It first outlines the theoretical grounding for this paper. Then it explores the gap between digital natives and digital immigrants, seeking to paint a bigger picture. This is followed by a discussion of gender in relation to digital games and CMC. Last, a possible educational model is proposed for bridging the gender gap by harnessing the power of games and Web 2.0.

Key words

e-Learning, women, digital games, computer-mediated communication, Web. 2.0, enactivism.

The world is changing - rapid technological development is profoundly changing our economy, culture, and society. The diversity of learners and increasingly distributed nature of learning environments pose various challenges that deserve our serious attention. Educators confront individual differences defined by racial, gender, cultural and economic factors as well as access and connectivity "disparities in the distribution of educational resources" (Cochran-Smith, 2004). Particularly, the digital divide on a global scale is astonishing. For example, with regard to networking, although approximately 430 million people have internet access around the world, 41% are in North America. Further, the US has more

computers than the rest of the world combined. In US and Canada, the divide increases substantially with educational background and income. For example, 65% of college graduates have home Internet access while only 11.7% of people with less than a high school education have such access. Only 12.7% households with income less than $15,000 had access to the Internet, compared with 81% of households with an annual income of $75,000. Region is another factor which contributes to the digital divide: 55% of urban dwellers used the Internet, compared with 45% in rural areas (Digital Divide Network, 2001; O'Brien, 2001). Only 9% of Native households had computers and of those only 8% had Internet access (Welfare Information Network, 2002). In short, "Internet users differ from non-users in average age, education, and income. Non-users of the Internet are more likely to be older individuals, and are more likely to have less education and lower household income than Internet users. Non-users are more likely to be women than men at every age group…, those living in rural [areas] are less likely to use the Internet than urban dwellers" (Dryburgh, 2001).

The documented disparity in internet access offers a primary example of a digital divide. Given the increased technology integration in all levels of education, some groups are left behind. Certain individuals and groups continue to enjoy increased educational advantages and opportunities while others are increasingly disadvantaged in a digital global educational community.

The multifaceted nature of digital divides across diverse learning environments calls for educational research to better understand the disparities associated with social, cultural, regional and economic factors in order to promote equity. This paper explores current educational technology research and diverse perspectives on bridging the digital divide of gender, paying particular attention to educational gaming and computer-mediated communication (CMC). It first outlines the theoretical grounding for this paper. Then it explores the gap between digital natives and digital immigrants, seeking to paint a bigger picture. This is followed by a discussion of gender in relation to digital games and

CMC. Last, a possible educational model is proposed for bridging the gender gap by harnessing the power of games and Web 2.0.

Theoretical Grounding

This paper is grounded on enactivism applied in educational technology. Rooted in biology (Varela *et al.*, 1991) and phenomenology (Merleau-Ponty, 1964), enactivism is an emerging philosophical world view. At a fundamental level, enactivism rejects dualism and focuses on the importance of embodiment and action to cognition. In stressing embodied action, it finds a middle way between two extreme views about reality: The objective view assumes that reality exists independent of our experience versus the subjective perspective in which reality is independent of the surrounding world.

Enactivism, compatible with elements of Piaget's and Vygotsky's psychology as well as experientialism of Lakoff (Reid, 1995), is based on two important premises: Cognition and environment are inseparable, and "systems" enact with each other from which they "learn". Consistent with the ontological embodiment view, enactivism argues that "the world is inseparable from the subject, but from a subject which is nothing but a project of the world, and the subject is inseparable from the world, but from a world which the subject itself projects" (Varela *et al.*, 1991, p.7). Enactivism regards the body not only as a lived structure to experience, but also the setting for cognition. It claims that our mind, body, and the world are inseparable. Cognition is therefore, a human, social, and biological phenomenon. Learning is through the learners' acts and is acted upon by the learning world and understanding is embedded in doing.

Compared to objectivism or constructivism, enactivism provides a more encompassing framework to meet the current epistemological challenges for education caused by rapid development of technology (Dede, 2008). This paper pays particular attention to two significant aspects of enactivism, namely 1) an emphasis on doing, and 2) knowledge coauthoring. A well

known slogan of enactivism is "all doing is knowing and all knowing is doing" (Varela *et al.*, 1991). Another central idea of enactivism is that learners are coauthors rather than simply consumers of knowledge (Davis *et al.*, 2000; Li, 2008).

Putting It in Context: Digital Natives vs. Digital Immigrants

Amongst various digital divides, the gap between digital natives and digital immigrants is a rather different one. As early as the beginning of the new century, researchers (Gee, 2005; Prensky, 2001a) started to argue that students have changed fundamentally in response to the technologies in their lives. "It is now clear that as a result of this ubiquitous information environment and the sheer volume of their interaction with it, today's students think and process information fundamentally differently from their predecessors" (Prensky, 2001b, p.1). According to Prensky (2001a), digital natives speak fluent digital language of computers, the Internet and games. Watching MTV, playing games (e.g., game consoles, video arcades, GameBoy), having the Internet and cell phones are norms for digital natives while digital immigrants are raised in environments full of books, linear movies and TV, wired telephones, and board and card games. Digital natives therefore, are very proficient with these new technologies although they have never studied them in school.

Prensky (2001) further argues that the significant difference of the environments results to a very different digital native generation from the digital immigrant generation. Digital natives are used to faster speeds - information moves at the light speed and they are not patient. They are used to multitasking or parallel processing – they can do many things at the same time. They are used to random things rather than those in a step-by-step, hierarchical fashion – they are good at taking information gathered in a random fashion and combining it into useful knowledge. They are used to graphics first and most – they first experience graphical presentation while text provides backup information to explain the

graphics. Digital natives are used to being connected rather than isolated with inexpensive or free access to email, Internet such as Facebook, MSN, and cell phones. Even playing games like Massive Multiplayer Online Role Playing Game (MMORPG) allows them to stay connected with many people without geographic limit. Digital natives have played digital games all their lives and computers are considered toys for fun not tools for work. They prefer learning in an environment that feels more like play than work. To the digital natives, learning is not about consuming knowledge that is generated by few experts. Rather learning is centered around the interests of the learners and is owned by the learners and they are the authors of knowledge (e.g., Web 2.0). These, undoubtedly, create a gap between the life digital natives and their learning: They learn best when it is exciting, fun, playful experience in a noisy environment, like in gaming environment; yet our form schools provide learning that is boring, dull, very serious, linear/hierarchical, in a quiet place.

Gender Gaps

Gaming

Immersive interactive digital entertainment, or digital game (hereafter *game*) playing, has become an important medium that strongly influences our economy, culture, and society. The appeal of gaming has become wide spread, particularly as a defining feature of the younger generation of learners. A recent PEW survey of 1,102 teens indicates that virtually all kids play digital games and "at least half playing games on a given day" (Lenhart *et al.*, 2008, p.2). Youth spend over 10,000 hours playing games, possibly spending more time in virtual worlds than watching TV or reading, by college graduation (Prensky, 2001b) where they apply knowledge in "hypothetical worlds that are increasingly a part of how we work and play" (Squire, 2006, p.19). Gaming, according to some survey studies, is reshaping a whole generation's view about working and education (Beck & Wade, 2004). An elementary student's statement best

captures the significant value of gaming for education: "Why read about ancient Rome when I can build it?" (Moulder, 2004).

Although games are often painted in news media as a threat to society, research studies (Bryce & Rutter, 2003; Dede, 2005; Dickey, 2006, 2007) tell a different story. The value of gaming and its compelling educational potentials include that games allow authentic and engaging learning in a safe environment (Becker, 2007; Dede, 2005; van Eck, 2006) games can enhance learning by increasing students' interest in the subject matter and by more effectively meeting students' needs and habits (Kiili, 2007; Prensky, 2001a) as well, games are "immersive, require the player to make frequent, important decisions, have clear goals, adapt to each player individually, and involve a social network" (Oblinger, 2006, p.2).

Although only a slim body of educational literature has considered videogames seriously, recently there is a renewal of interest in educational gaming and an increasing number of researchers argue that educators ought to pay close attention to videogames (Gee, 2003; Squire, 2006). Jenson and de Castell (2002) identify seven categories into which research in this field generally falls: *Play and pleasure studies of gaming genres game development, systems and content narrative and gaming psychological, behavioral and cognitive effects of gaming, especially violence; gaming and gender constructionist theory and research.*

Three dominant theoretical standpoints are important in the research on gaming (de Castell & Jenson, 2005). The *first* view, taken by Jim Gee (2003), considers how game playing, including commercial game playing, can inform learning and pedagogy. The *second* view considers the educational value and significance that may exist in games that children are already playing focusing mostly on commercial entertainment games. The *third* standpoint, as exemplified by Squire and Jenkins's work (Squire, 2002), focuses on designing and developing educational games that are as engaging as commercial games. This approach follows conventional disciplinary structures in schools and inquires into "understanding and unpacking how learning occurs through game play, examining how game

play can be used to support learning in formal learning environments, and designing games explicitly to support learning" (Squire, 2002, p.1).

One approach to learning with games is the adoption of "learning-by-building/doing" which allows people to learn in rich and authentic ways by placing learners at the centre of learning processes. Earlier works (Kafai, 1995; Papert, 1993; Perkins, 1986) have shown that the creative investment one makes in the game-building process leads directly to intellectual ownership of the game's content. The game-building process enables contextualized learning that is considered meaningful and useful through effortful and meta-cognitively guided processes. When learning through doing, but within powerful constraints instantiated through cyber and social systems, students develop situated understandings (Gee, 2003; Squire, 2006).

Games have been traditionally considered predominately as a male activity, as claimed by many researchers (Jenkins, 2001; Kafai, 1998; Kafai, 1996). In recent years, progresses in promoting gender equity have been made, evidenced by the proliferation of large- scale statistical data showing the diminishing of the gender gap in playing and buying digital games (ESA, 2004; Jones, 2003; Lenhart *et al.*, 2001). For example, the statistics from Entertainment Software Association (ESA, 2004) indicate that increasing numbers of females play games and in US over 40% of digital game players are female. A recent study of American kids (age 12-17) by PEW (Lenhart *et al.*, 2008) show that 99% of boys and 94% of girls play games. These, findings however, should not be considered that we have achieved gender equity in this field. As argued by Jenson and de Castell (2005), we have "no reason to believe, and in fact, many reasons to disbelieve the ways in which these large studies are reporting on game play and good reasons for concern about what of significance is being actively obscured by them" (p.3). Jenson and de Castell further scrutinized these large-scale data and claim that the gender gap is not disappearing but rather disguised:

- Males and females prefer different types of games: Females prefer

board games like quiz, trivia, and contest games while males like action games.

- Males play longer, sometimes nearly twice as long as, females.
- Although there's an increase of female characters and their development in computer games, only 16% of available game characters are female, almost all of them are highly sexualized (Jenson & de Castell, 2005).

All these, as Jenson and de Castell (2005) argued, precisely demonstrate how digital game playing is still the realm of males. The gender polarization of technology use with children, including those reflected in game playing, has serious consequences for it means young women are missing critical workforce skills for the 21st Century (Dickey, 2006; Gailey, 1993; Jenson *et al.*, 2007; Prensky, 2006). Rapid advancement of technology, coupled with a more technological job market and more complex scientific society, highlight that an adequate representation from both men and women is imperative.

CMC

Computer-mediated communication, including Web 2.0, "is redefining what and how and with whom we learn" (Dede, 2008, p.80). What is Web 2.0? Tim O'Reilly (2005) defines it as "a perceived ongoing transition of the World Wide Web from a collection of static websites to a full-fledged computing platform serving web applications to end users". Although no universally-agreed-upon definition exists, it is widely accepted that Web 2.0 represents a shift in focus from information warehousing where users are passive consumers to sites promoting and facilitating user participation. In Web 1.0, users gain information through surfing, browsing, and consuming. In Web 2.0, the focus is on connecting, collaborating, sharing, and developing. In this sort of environment, consumers become producers and producers become consumers. Current examples of this include social media (e.g., MySpace,

Facebook, YouTube), web apps (e.g., Google, Xero), and learning tools (e.g., Wikipedia).

The changes introduced by Web 2.0 require few if any hardware modifications to the existing Internet. Instead, Web 2.0 is changing the ways that information is published, searched, reused, and modified. The use of markup languages (e.g., XML) to encode the meaning and/or functionality of web page content will lead to more powerful and efficient data search and information management tools. In the case of mathematics, the MathML (W3C, 2007) markup language will make equations, data, and graphics portable from one tool to another. For instance, a student will be able to copy a mathematical function from a course webpage, paste it into a mathematical analysis program (e.g., Maple), use that program to explore the properties of the function, and share his/her results with fellow students and/or an instructor. In this scenario, the exchange of mathematical information occurs in a dynamic, rather than a static manner and both teachers and students are empowered. Such change causes fundamental shifts of our epistemological beliefs and consequently educational practices (Dede, 2008).

With respect to gender, when CMC was introduced, it created excitement among researchers and practitioners. Many educators and researchers had high hopes for CMC, believing that it provided more equal access to information and communication, and would ultimately lead to greater equity (Charney, 1994; Grabe & Grabe, 2001; Warren, 1998). Is it true that CMC is a gender equalizer? "There have been many claims made by disparate groups and institutions…which have claimed that CMC-based interactions lack the overt structures of inequality found in other communicative situations" (Yates, 1997, p.281). In contrast, others (Kiesler *et al.*, 1984) believe that CMC brings out the worst aspects of male behaviors and gender relations due to the lack of face-to-face cues. Some research findings (Herring, 1993; Li, 2002; Yates, 1997, 2001) suggest that gender differences and their social consequences persist on computer-mediated networks. That is, CMC reflects the same gendered identities and practices, as opposed to the claims that CMC

provides environments "free of the power structures of face-to-face interactions," (Yates, 1997, p.287).

Researchers have explored a full spectrum of aspects concerning gender differences in CMC, ranging from participation patterns to affective variables. For example, some researchers report that males have more computer interest and ability and spend more time with computers than females (Martinez, 1994). Males use the Internet, entertainment and search machines more often and more extensively, and download more information than females (McCoy *et al.*, 2001; Nachmias *et al.*, 2000). Males rate their computer expertise higher than females (McCoy *et al.*, 2001), are more motivated to acquire CMC skills, and developed less anxiety toward technology (Nachmias *et al.*, 2000). In contradiction, others have found that females, compared with males, view CMC more favorably (Hiltz & Johnson, 1990) and believe computers to be more useful, but are less comfortable using them (Katz *et al.*, 1999). Similarly, earlier studies exploring male/female participation come with mixed conclusions (Herring, 1993; Light *et al.*, 1997; McAllister & Ting, 2001; Sussman & Tyson, 2000).

Attempting to clear the confusions created by such inconsistent results, Li (2006) conducted a meta-analysis, systematically synthesize 51 primary studies. This work shows that males and females exhibited different communication and interaction patterns in CMC environments. Females tend to use more engagement approaches, challenge more, are more personal oriented, and like to remedy or to make suggestions more than males. In contrast, males are more likely to use authoritative language, to present facts, to persevere, and have better access to CMC. In another word, females use powerless language while males use powerful language.

With respect to affective outcomes, males are more confident in using CMC and believe CMC to be more useful or important than females. When other process measures are examined, significant gender differences are identified for the feedback, mask, and skill variables. On average, females enjoyed the immediate feedback in CMC and mask their gender more than males. Males, on the other hand, have more experience or are

more skillful in using CMC than females. Contrary to some expectations that CMC is a gender equalizer, the results from Li's study show that gender still plays an important role in people's attitudes and behavior when using CMC.

Who holds more positive attitudes toward CMC, males or females? Results from Li's (2006) study echo the patterns of preference in using technology: Males tend to hold positive attitudes toward CMC. They enjoy CMC more, have more experience and skill, are more confident, and believe it is more important and useful, than their female counterparts do. It is important to note that the examination of the moderators shows that all the significant results favor males over females in enjoyment findings. That is, regardless of the situation and condition, males often enjoy CMC more than females. One speculation is that, since males have more experience, are more skillful and confident, they enjoy their CMC experience more than their female counterparts.

Li's (2006) systematic analysis confirms that just as in face-to-face environments, gender-related stereotypical patterns do exist in virtual environments. Females are more collaborative, emotional, use engagement approaches (e.g., using graphic accents like emoticons), more expressive, personal oriented (using first person and self-closure), and like to remedy conflicts. Females generally showed more communication apprehension than males in CMC environments. It is worth noting that females like to mask their own gender identities. When possible, females use either gender-neutral or male pseudonyms to disguise their gender. Males, in contrast, tend to preserve their gender identities. Male communication, on the other hand, tends to be more demanding, authoritative, and task-oriented. Males participate in CMC longer and more often, and have better access to CMC. In other words, they tend to dominate conversations. This, again, reflects the power structure identified in face-to-face communication and interaction.

The gendered communication and other behavior patterns demonstrated in this meta-analysis and others contrast to the belief (McAllister & Ting, 2001) that in CMC, people could "transcend the socialized constraints on

their communicative expressiveness and adopt a more androgynous style of interaction" (Siegel *et al.*, 1986). Even when gender identity is disguised, users still hold socially constructed gendered-beliefs and behaviors into CMC settings (Sussman & Tyson, 2000). These gendered-beliefs and behaviors include affective, communicative, and interaction variables. Rather, it supports the idea that communication and interaction mirror the power structure of the society. As explained by Socialization Theory, regardless of the medium used for discourse, the gender "power-behaviors in communication…have become intransiently [sic] socialized into behavioral dynamics …. Power differentials in communication still persist and it appears that cyberspace is a male-dominated atmosphere" (Sussman & Tyson, 2000).

What Do We Do Then?

The gaps discussed above, whether the one between digital native and our schools or the gender identified in digital games and CMC, call for changes of our educational practice to meet the needs of our learners. I argue that the creation of learning worlds grounded on enactivism can directly respond to this call. In particular, this learning world should focus on two significant aspects of enactivism, namely 1) an emphasis on doing, and 2) knowledge coauthoring. A well known slogan of enactivism is "all *doing* is knowing and all knowing is *doing*" (Lea & Spears, 1995). Another central idea of enactivism is that learners are coauthors rather than simply consumers of knowledge (Varela *et al.*, 1991).

The core focus of gaming on *doing* provides a condition that is essential to craft an enactivist learning world (Davis *et al.*, 2000; Li, 2008). Many existing games are designed as complex environments of interrelated parts, mirroring our real world, that players engross and are controlled to act in certain ways (Li, 2008). Players interact, enact in and with this environment and coevolving with not only the cyber world but also our real world. Game environments can be designed as a multimodal space that reflects not only the complexity of the creation of cyber worlds but

also the ramification of the design of social relationships/identities in our modern world. This space, with situated meanings, allows players to solve problems through embodied experiences (Gee, 2003, p.42). In gaming environments,

> knowing is at its essence a kind of performance, as learners learn by doing, but within powerful constraints instantiated through software and social systems. The focus is on experience that enables students to develop situated understandings, to learn through failure, and to develop identities as expert problem solvers (Gee, 2003).

Another essential condition for an enactivist learning world is the emphasis on learner coauthoring rather than simply consuming knowledge. W2, a shift in leading-edge applications on WWW, not only is redefining education (Dede, 2008), but also provides a perfect platform for building an enactivist learning world. It is widely accepted that W2 is more about a new philosophy than a new technology. It represents a change from control to connection, from a focus on information warehousing to the promotion of user participation. Sample technologies include social media (e.g., Facebook), Web Apps (e.g., GoogleDocs), and learning tool (e.g., Wikipedia). This change in WWW is causing a seismic epistemological shift: learners are no longer consumers but coauthors of knowledge (Dede, 2008). Contemporary games, with different assumptions and containing a whole new set of features, enable the creation of learning worlds entirely different from traditional games (Squire, 2006). Researchers (Aldrich, 2005; Blumberg, 2000; Squire, 2006) suggest that this change in assumptions fundamentally alters this medium, making it intriguing as a suite for learning for both boys and girls. Further, the focus of W2 on connecting, collaborating, sharing, and developing makes it particularly appealing to girls (Ching *et al.*, 2002; Culp & Honey, 2002). Additionally, newer technologies allow for a greater range of body movement, which support cognition through

embodied action.

We, therefore, should focus our education on the creation of comprehensive learning worlds which mirror the complex system of our world, integrating electronic medium. Such learning worlds should have enough constraints so that students' attentions are guided towards these possible coevolving patterns. Within this learning world, learners create their own learning environments with the support of technologies, and through their co-emergence, learning occurs. Unlike typical constructivist approaches, an enactivist learning world would allow learners to immerse in rich and stimulating learning experiences while the intentionally built-in constraints foster learners' development towards the set of intended co-evolving patterns. This also reframes issues of authority and knowledge. Learners, therefore, are co-authors of the learning environments, their learning, and knowledge.

One possible example is the integration of digital games and Web 2.0 for creating such a learning world. This learning world should attend to specific feminist strategies (such as peer collaboration, focusing on creativity and building) supported by the appropriate use of technology (e.g., gaming). Particular attention should be paid to the identified female preferred game characteristics: "1) rich narrative, 2) roles involving positive action, 3) appropriate levels of challenges, 4) opportunities to design or create, 5) engaging characters, 6) communication and collaboration, 7) use of strategies and skills beyond shooting guns" (Dede, 2008). For instance, we can develop a learning world with emerging technologies such as augmented reality simulation game where students can create games to teach others specific content. In this world, students are co-authors and designers of the learning environments toward the possible coevolving patterns. This world provides a foundation and resource that the students act and solve problems. In this world, virtual and real worlds are integrated, and students' emotional connections are leveraged to physical locations (Dickey, 2006, p.790). As players, students immerse in a world of action through which they learn from experiences guided by the very design of the learning world. Various

constrains are built-in and students accept a powerful set of values connected to their identity (virtual or real). Through the use of Web 2.0, students co-emerge with the world through their actions of building mental models, playing the game, evaluating the outcomes, and revising their actions.

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