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ARTICLE

Second language learning in the context of massively multiplayer online games: A scoping review

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Abstract

This review examines the second language acquisition (SLA) literature with regard to the role of "massively multiplayer online games" (MMOGs) in second language (L2) learning. It focuses on commercially developed off-the-shelf (COTS) MMOGs only (some of them modified for educational purposes such as Reinders' & Wattana's work). It surveys the current empirical research to find out which aspects of L2 learning have been investigated, how they were studied, and what the findings suggest in relation to L2 learning opportunities and outcomes within and beyond MMOG contexts. We synthesized the findings of 31 studies reporting empirical evidence about the role of MMOGs in L2 learning. We observed that the empirical research in this area is mainly qualitative and that L2-related motivational and affective factors, L2 vocabulary, and learners' communicative competence (or discourse management strategies) are the most widely investigated topics. Based on the findings, our paper presents a model that depicts hypothetical interrelationships among (a) MMOG designed settings, (b) the social and affective affordances provided in these settings, (c) L2 learning opportunities, and (d) the L2 learning outcomes achieved. We conclude that MMOGs provide socially supportive and emotionally safe (i.e. low-language-anxiety) environments that afford multiple opportunities for L2 learning and socialization, which, in turn, help L2 learners to enrich their L2 vocabulary repertoire and enhance their communicative competence in the target language.

Keywords: L2 learning; massively multiplayer online games; affordances

1. Introduction

Being involved in "virtual world games" (Kaplan & Haenlein, 2010), as a form of social media, has become a part of people's daily lives around the globe (Yee, 2006). Kaplan and Haenlein (2010: 61) defined "social media" broadly as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content." They also distinguished six types of social media: "collaborative projects," "blogs," "content communities," "social networking sites," "virtual game worlds," and "virtual social worlds." They positioned virtual game worlds (e.g. World of Warcraft [WoW]) and virtual social worlds (e.g. Second Life), among other types of social media, at the highest level concerning "social presence" and "media richness." They defined social presence as "the acoustic, visual, and physical contact that can be achieved … between two communication partners" and media richness as "the amount of information they allow to be transmitted in a

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given time interval" (Kaplan & Haenlein, 2010: 61), asserting that virtual game and social worlds "try to replicate all dimensions of face-to-face interactions in a virtual environment" (Kaplan & Haenlein, 2010: 62). Virtual game worlds, known as massively multiplayer online games (MMOGs), provide highly interactive two- or three-dimensional persistent virtual worlds within which thousands of players can interact, collaborate, and compete simultaneously. They provide gamers with "access to theme-based virtual worlds, real time communication through text chat, opportunities for role-play, guild membership, status advancement, problem solving, and content creation" (Peterson, 2011: 57). MMOGs provide second language (L2) learners with access to a vast number of native or more competent interlocutors of the target language (TL), who will have real-life interactions with the learner for a genuine purpose. Due to their design, massively multiplayer adventure/role-playing games afford more player–player and player–computer interactions and their contents include more narratives and language use compared to other game genres (Reinhardt & Sykes, 2012).

Due to their characteristics, commercially developed off-the-shelf (COTS) or "vernacular" (Reinhardt & Sykes, 2012) MMOGs have increasingly been considered as promising venues for L2 learning and socialization (Peterson, 2010a; Thorne, Black & Sykes, 2009). The notion of L2 learning in the context of MMOGs is well grounded in the definition of computer-assisted language learning (CALL) as "any process in which a learner uses a computer and, as a result, improves his or her language" (Beatty, 2010: 7). Aligned with Beatty's definition of CALL is the concept of "naturalistic CALL," which refers to "students' pursuit of some leisure interest through a second or foreign language in digital environments in informal learning contexts, rather than for the explicit purpose of learning the language" (Chik, 2013: 835–836). It opposes the concept of "tutorial CALL" that "refers to the implementation of computer programs (disk, CD-ROM, web-based, etc.) that include an identifiable teaching presence specifically for improving some aspect of language proficiency" (Hubbard & Bradin Siskin, 2004: 457). Naturalistic CALL underlines the opportunities social media in general and COTS MMOGs in particular can afford for "informal education," defined by Coombs and Ahmed (1974: 8) as "the lifelong process by which every person acquires and accumulates knowledge, skills, attitudes and insights from daily experiences and exposure to the environment—at home, at work, at play." In the same vein, the rationale for incorporating recreational MMOGs in L2 learning and pedagogy can be provided by Lave and Wenger's (1991) situated learning theory (or legitimate peripheral participation model), which suggests that learning takes place in its non-educational form as one is involved in performing meaningful tasks situated in an authentic sociocultural context. According to this argument, "learning is situated; learning is social; and knowledge is located in communities of practice" (Brouwer & Wagner, 2004: 33).

According to Statista (https://www.statista.com), as of July 2014, there were an estimated 23.4 million active monthly MMOG subscribers worldwide. Only one game – WoW – had around 10 million global subscribers in the fourth quarter of 2014. Studies (e.g. Steinkuehler, 2004; Yee, 2006) found that massively multiplayer online role-playing games (MMORPGs) are popular across different genders, age groups, and ethnicities. A survey of 30,000 MMORPG players between 2000 and 2003 revealed that "Not only do MMORPGs appeal to a broad age range ($M_{age} = 26.57$, range = 11–68), but the appeal is strong (on average 22 hours of usage per week) across users of all ages" (Yee, 2006: 309). These figures indicate the emergence of a new form of online social setting that holds promise for second language acquisition (SLA). Getting immersed in such multilingual and multicultural social settings – like in any other real-life situations – can involve the development of behavioral, social, cultural, and linguistic skills. According to Thorne (2008: 308), "What students do online and outside of school involves extended periods of language socialization, adaptation, and collective transformation that result in highly complex, modality and interlocutor specific language practices." Finding out if, how, and to what extent playing COTS MMOGs contributes to the developmental process of L2 learning and socialization can enhance our understanding of SLA as a naturally occurring phenomenon in non-educational, real-life situations. This valuable insight can,

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in turn, transform our L2 teaching practice by expanding its borders beyond the boundaries of educational settings. As Thorne (2008: 322) speculated, "For the growing number of individuals participating in MMOG environments, the international, multilingual, and task-based qualities of these social spaces, where language use is literally social action, may one day make them *de rigueur* sites for language learning."

As "unorthodox language-learning tools" (Rankin, Gold & Gooch, 2006), MMOGs have attracted the attention of SLA scholars (e.g. Cornillie, Thorne & Desmet, 2012; Peterson, 2010a, 2010b, 2011, 2012a, 2012b; Sundqvist & Sylvén, 2014; Sykes & Reinhardt, 2013), who have investigated MMOGs' potential for L2 improvement. Although so much more of L2 development has yet to be explored in the context of MMOGs, findings have been promising so far. However, notwithstanding various findings concerning COTS MMOGs' L2 learning affordances, the literature lacks an integrated conception that can describe (a) which aspects of L2 learning have been researched in MMOG contexts, (b) which approaches and methodologies have been adopted to investigate these aspects, and (c) what the findings suggest concerning the interrelationships among salient features underlying L2 learning processes within and beyond the MMOG context. Accordingly, the current study was conducted as a scoping review (Arksey & O'Malley, 2005) of prior empirical studies to discover how this broad topic has been approached in the literature and what the findings suggest in relation to the wider framework of L2 learning processes. This type of review aims to "map *rapidly* the key concepts underpinning a research area and the main sources and types of evidence available" (Mays, Roberts & Popay, 2001: 194).

2. Previous reviews of computer games

Several scholars (e.g. Chiu, Kao & Reynolds, 2012; Connolly, Boyle, MacArthur, Hainey & Boyle, 2012; Cornillie *et al*., 2012; Ke, 2009; Peterson, 2010b) have reviewed computer games and their contribution to the development of different sets of skills and knowledge. For example, Peterson (2010b) examined the key findings from seven studies (published between 2001 and 2008) that focused on digital games and simulations in language education. He categorized the studies according to whether they analyzed "web-based simulated virtual worlds," "3D web-based simulated virtual worlds," "stand-alone commercial simulation games," "massively multiplayer online role-playing games" (MMORPGs), and/or "game- and simulation-based training systems." For the MMORPG category, Peterson reviewed Thorne's (2008) study, which investigated language-learning opportunities in WoW, and found that participation in MMORPGs affords L2 learners with extensive exposure to the TL in a motivating and learner-centered environment – a setting that encourages negotiation of meaning, collaborative dialog, and interpersonal relationships.

Connolly *et al*. (2012) undertook a systematic literature review encompassing 129 papers (published between 2004 and 2009) with empirical evidence regarding the effects of playing computer games on learning and engagement. The results indicated that "playing computer games is linked to a range of perceptual, cognitive, behavioural, affective, and motivational impacts and outcomes" (Connolly *et al*., 2012: 661). The review also showed that knowledge acquisition (or content understanding), as well as affective and motivational outcomes, was the most significant result of gameplay.

Cornillie *et al*. (2012) carried out a database search to identify general trends in digital game-based language learning research over three decades and found that, between 2001 and 2010, most of the research on digital gaming was design based – that is, studies mainly focused on the conceptual design or development of a particular type of game-based language-learning environment. They also reported a growing number of empirical studies investigating the use of digital games in the domain of language learning.

Chiu *et al*. (2012) completed a meta-analysis (i.e. a statistical method for summarizing and synthesizing the results of previous quantitative research to obtain a single index of the outcome with greater statistical power) of 14 studies that investigated the overall effects of digital

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game-based learning in an English as a foreign language (EFL) setting. They examined the effects of "drill and practice" games versus "meaningful and engaging" ones. In the former, players modify actions through trial and error to improve their scores, whereas the latter type of game involves higher order thinking activities such as exploration, hypothesis testing, and constructing objects. Chiu *et al.* (2012) found a medium positive effect size in favor of digital game-based learning in the EFL setting. Their analysis also yielded a large effect size for meaningful and engaging games, but a small effect size for drill and practice games.

To date, no single review was located as focusing specifically on COTS MMOGs in the field of second or foreign language learning. The reviews conducted so far were more inclusive concerning the type of games, learning domains, or both. Connolly *et al.* (2012), for example, included empirical studies that had examined the positive impacts and outcomes of both digital and non-digital games with various purposes (entertainment, game for learning, serious games), genres (e.g. role-playing, strategy, and adventure), platforms for delivery (e.g. video console, PC, and online), and subject disciplines or curricular areas (e.g. health, language, and math). Moreover, the reviews that focused on the role of digital games in the field of second or foreign language learning adopted either a broader (e.g. Cornillie *et al.*, 2012) or more limited (e.g. Chiu *et al.*, 2012) scope concerning types of games. Cornillie *et al.* (2012) reviewed the studies that addressed – theoretically or empirically – the role of digital games (including MMOGs) for language learning, whereas Chiu *et al.* (2012) examined the research over the effects of playing only digital educational games on language learning in an EFL setting. The literature suggests that previous syntheses did not thoroughly address MMOGs – in particular, COTS MMOGs as the focus of the current review – from an SLA perspective. Therefore, a more focused review is required to map L2 learning research in the context of recreational MMOGs regarding the topics investigated, the theoretical perspectives adopted, the approaches implemented, and the results obtained. More importantly, a review is warranted to provide some insights into the underlying processes of L2 development in the context of MMOGs by drawing on the findings of the current literature.

3. Method

The current study is a scoping review. This type of review aims to "map *rapidly* the key concepts underpinning a research area and the main sources and types of evidence available, and can be undertaken as stand-alone projects in their own right, especially where an area is complex or has not been reviewed comprehensively before" (Mays, Roberts & Popay, 2001: 194). Unlike a systematic literature review, which "might typically focus on a well-defined question where appropriate study designs can be identified in advance," a scoping review "tends to address broader topics where many different study designs might be applicable" (Arksey & O'Malley, 2005: 20). Moreover, while a systematic literature review seeks to answer questions from "a relatively narrow range of quality assessed studies," a scoping review "is less likely to seek to address very specific research questions nor, consequently, to assess the quality of included studies" (Arksey & O'Malley, 2005: 20). Moreover, unlike a meta-analysis, a scoping review does not seek to summarize and synthesize the results of quantitative research studies using statistical techniques. As a scoping review, our study proposes to discover the extent, range, and nature of L2 research in the context of MMOGs.

3.1 Search procedure

First, five electronic databases – the U.S. Department of Education's Education Resources Information Center, EBSCO's Academic Search Complete and its Communication Source, ProQuest's Linguistics and Language Behavior Abstracts, and the American Psychological Association's PsycINFO – were searched using the combinations of keywords listed below. Some key journals were also hand searched, to ensure the effectiveness of the search procedure, including *CALICO Journal*, *Computer Assisted Language Learning*, *International Journal of*

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Game-Based Learning, *Journal of Computer Assisted Learning*, *Language Learning & Technology*, and *ReCALL*. Next, a manual search was undertaken of the reference lists of the papers identified in the first step. Then, Google Scholar and Thomson Reuters' Web of Science were used to locate articles that have cited the studies found in the first step. Finally, the abstracts and, in some cases, the main body of all papers were scanned to shortlist them for the review.

3.2 Search terms

The following composition of search terms was used by an expert to search the five electronic databases listed previously:

> (DE "Video Games") OR (DE "Computer Games") OR AB ((game* or gaming) n2 (digital or online or video or simulation or computer* or mobile or multiplayer* or immersive or massive* or multiuser)) or mmorpg* or muds or moos or mmog or muve)
> AND
> (DE "Second Language Learning") OR (DE "Bilingual Education" OR DE "College Second Language Programs" OR DE "English (Second Language)" OR DE "English for Special Purposes" OR DE "English Language Learners") OR ((AB (language W1 (learn* OR acquisition OR second))) OR TI (language W1 (learn* OR acquisition OR second))) OR AB (esl OR efl OR ell) OR TI (esl OR efl OR ell) OR DE "Second language acquisition"))

The keywords were used independently and combined in order to locate as many publications as possible. The search was completed on December 4, 2015, and resulted in an initial selection of 348 papers.

3.3 Inclusion criteria

The papers had to (a) be published in the English language; (b) include empirical evidence (quantitative, qualitative, or mixed method) about L2 learning within or beyond the contexts of COTS MMOGs; and (c) be published after 2000. We excluded the studies conducted in the context of (a) synthetic immersive environments, or "visually rendered spaces which combine aspects of open social virtualities with goal-directed gaming models to address specific learning objectives" (Sykes, Oskoz & Thorne, 2008: 528); (b) online virtual worlds (e.g. Second Life and ActiveWorlds), which are "more open-ended and/or predominantly socially-oriented virtual worlds" (Cornillie *et al.*, 2012: 247); and (c) simulation video games (e.g. The Sims and SimCopter), which lack two defining characteristics of a "game" as being rule-governed and involving competition (see Prensky, 2001). The Sims, for example, is a life simulation game series that focuses primarily on socialization (through simulating real-life situations and scenarios) rather than competitive, rule-governed, and objective-based gameplay. The games in this series are largely sandbox games (i.e. they lack any defined goals and rules or structures); therefore, players are free (from the structures and directions typically present in mainstream video games) to decide what to do, when, and how in the game setting.

Thirty-one studies (24 journal articles, three conference proceedings, two dissertations, one master's thesis, and one book chapter) met the inclusion criteria. An overview of the studies is provided in the Appendix.

3.4 Coding of papers

The papers were coded by the first author according to their (a) purpose, (b) research paradigm (e.g. quantitative, qualitative, or mixed method), (c) theoretical (or conceptual) framework, (d) data collection procedure, (e) data analysis techniques, and (f) findings. To evaluate the quality of coding, a sample of five papers (16% of 31 articles) was coded independently by a second coder. A simple percentage agreement calculation found the inter-rater agreement to be 96%.

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Table 1. Research goals of the papers[a]

Research foci	Frequency	%
L2-related motivational and affective factors	16	30
L2 skills	11	21
Communicative competence/strategies	7	13
Affordances for second language and culture learning	5	9
L2 production (the quantity and quality of L2 interactions)	4	7

[a]$N = 31$.

4. Findings

4.1 Research goals

Most of the studies had multiple research foci. As Table 1 shows, L2-related motivational and affective outcomes, L2 skills (predominantly vocabulary) acquisition, communicative competence (or discourse management strategies), and L2 production were the most frequently addressed topics in the papers. Other topics (including L2 literacy practices, skilled linguistic action and values realizing, practicing autonomy, L2 learning strategies, opportunities for negotiation of meaning, and the linguistic complexity of game-presented texts and game-external websites) were dealt with by one or two studies and accounted for 20% of the total frequency (i.e. 53).

4.2 Research paradigms, theories, and methodologies

Most (19 or 61%) of the studies were qualitative; there were only four quantitative and eight mixed-method studies. The qualitative works were mainly case studies that utilized a virtual ethnography approach, whereas the quantitative ones chiefly comprised quasi-experimental research.

Ten studies did not refer to any theoretical assumption underlying their hypotheses or choice of research methods. Some (e.g. Dixon, 2014; Palmer, 2010; Zheng, Young, Wagner & Brewer, 2009) adopted more than one theoretical perspective to frame their research. In 21 studies, we identified 13 theoretical frameworks, of which Vygotsky's (1978) sociocultural theory was the most frequently cited.

We also examined two significant features of research methodology – data collection and data analysis – within the papers. Thirteen data collection tools (see Table 2) were applied, with interviews (21%), observation (18%), chat logs (16%), and questionnaires (12.6%) the most widely utilized. We also pinpointed 16 different data analysis techniques, among which discourse analysis (19%), descriptive statistics (16%), paired/independent samples *t* tests (16%), and constant comparative analysis (12%) were the most frequently used.

The studies also varied with respect to the number of participants, ranging from one (in Lee & Gerber, 2013) to 86 (in Sylvén & Sundqvist, 2012) ($M = 18.03$, $Mdn = 7$). The participants were of different age groups (10–37 years old, $M = 20.6$, $SD = 5.1$) and L2 proficiency levels, ranging from beginner to advanced levels. In 87% (27) of the studies, the participants were English as a second language (ESL) or EFL learners from diverse first language (L1) backgrounds. In about 10% (three) of the studies, the participants were learning other languages than English (i.e. Italian and Spanish); and one study (Thorne, 2008) describes the intercultural communication between a Russian and an American learning each other's native languages.

4.3 Findings of the papers

To synthesize the findings of the 31 studies (summarized in Table A1), we borrowed the data analysis strategy from the grounded theory approach (Corbin & Strauss, 2008). We combined the papers' main findings – as reported in the original papers – and created a textual database of

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Table 2. Data collection tools used in the papers

Data collection tools	Frequency	%
Interviews	20	21
Observation/field notes	17	18
Chat logs	15	16
Questionnaire	12	12.6
Recorded live gaming sessions	8	8.5
Language tests	5	5.2
Email texts/telegrams/Skype instant messages	4	4.2
Diaries/journal entries	4	4.2
Text samples from quests and game-related websites	4	4.2
Surveys	3	3.1
Focus group discussion	1	1.0
Simulated recall sessions	1	1.0
Recorded interactions during face-to-face activities	1	1.0
	95	100

approximately 20 pages. We implemented open coding as "breaking data apart and delineating concepts to stand for blocks of raw data" and axial coding as "the act of relating concepts/categories to each other" (Corbin & Strauss, 2008: 198) to code the findings. Then we allocated codes with a similar focus to a single category. Due to their multiple research foci and naturally different results, some papers were assigned to more than one category. The coding led to the identification of five main categories: design features of MMOGs, MMOGs' social and affective affordances, opportunities afforded for second language and culture learning, and L2 learning outcomes.

4.3.1 Design features of MMOGs

Some studies highlighted and characterized a range of MMOGs' design features (see Figure 1), which help create an engaging multimodal communication setting. By drawing on these elements, some scholars elaborated on the social and affective affordances that MMOGs provide for L2 game players. They considered, for example, a range of MMOGs' design features that allow gamers to remain anonymous (through adopting and customizing digitally embodied characters known as avatars) (e.g. Peterson, 2011, 2012a; Reinders & Wattana, 2014, 2015b), to use multiple routes for and modes of communication (e.g. Rama *et al.*, 2012), to practice autonomy in governing their gameplay (Chik, 2014) and language learning (Bytheway, 2014), and to connect "verbal utterances and avatar-embodied actions" (Newgarden, Zheng & Liu, 2015: 38) in their interactions.

The linguistic environment of MMOGs, as one of these design features, was investigated by Thorne, Fischer and Lu (2012). Their examination of the texts used in WoW's quests and three of the most frequently visited WoW-related websites attested to the richness of the language in terms of readability, lexical sophistication, lexical diversity, and syntactic complexity. They argued that these linguistically complex texts "are attended to because they are highly relevant to the actions, decisions, and problem-solving at hand" (Thorne, Fischer & Lu, 2012: 298), reasoning that such texts are functionally tied to the game's activities and serve the players'

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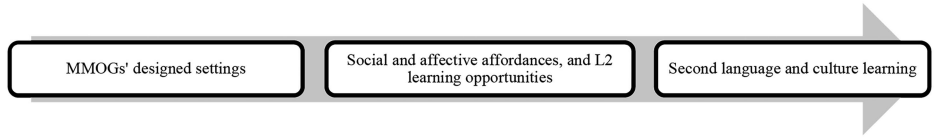

MMOGs' designed settings	MMOGs' social affordances	L2 learning outcomes
• Fun and play • Immersion (or passionate involvement) • Discovery • Competition/challenge • Rewards/feedback • Remaining anonymous • Game character (or avatar) customization • Role-playing • Problem-solving/goal-oriented tasks • Story-based • Rule-based gameplay • Multimodal communication • Interactions (PC-NPC, PC-PC, PC-Game) • Connecting verbal utterances and avatar-embodied actions • Linguistically complex settings • Distribution of knowledge, skills and expertise	• Peer-mentoring (apprenticeship) • Interdependence and collaboration • Affiliative social bond • Shared goals • Teamwork • Socialization • Cross-cultural communication **MMOGs' L2-learning affective drives** • Less anxiety in L2 interactions • Positive attitude towards in-game interaction • L2 learning motivation • WTC in the TL • Self-confidence in learning and using L2 • Self-efficacy toward e-communication • Risk-taking in using the TL **L2 learning opportunities** • Traditional and modern literacy practices • Negotiation of meaning • Socialization in the TL • Discourse management practices • Practicing conversational skills • Producing L2 • Improving cultural knowledge in the TL	Developing: • communicative competence • vocabulary knowledge • reading and listening skills • L2 awareness • L2 pragmatics • cultural knowledge • cross-cultural communication skills

Figure 1. Hypothetical relationships among the themes identified in the papers' findings

immediate and situated game-playing needs. Their argument corroborates the "multimodal," "text," and "situated meaning" principles advanced by Gee (2003) in relation to video games.

The multimodal principle posits that "in video games, meaning, thinking, and learning are linked to multiple modalities (words, images, actions, sounds, etc.) and not just to words" (Gee, 2003: 108). Drawing on the similar construct, Hattie and Yates (2013: 115) asserted that "we all learn well when the inputs we experience are **multi-modal** or conveyed through different media." According to text principle, "Texts are not understood purely verbally (i.e. only in terms of the definitions of the words in the text and their text-internal relationships to each other) but are understood in terms of embodied experiences" (Gee, 2003: 107). Moreover, according to the situated meaning principle, "The meanings of signs (words, actions, objects, artifacts, symbols, texts, etc.) are situated in embodied experience. Meanings are not general or decontextualized. Whatever generality meanings come to have is discovered bottom up via embodied experiences" (Gee, 2003: 107).

4.3.2 MMOGs' social and affective affordances

Several studies have underscored the significant roles that design features of MMOGs play in promoting some positive social norms in the game environment such as peer mentoring, interdependence, collaboration, and teamwork. Embracing these social norms within the game environment seems to have created an L2 learning environment that affords positive social and affective drives theorized as being crucial for L2 development.

The studies revealed that MMOGs' social context encourages communal L2 learning practices (Chik, 2014), inspires expert–novice interactions (Rama, Black, van Es & Warschauer, 2012; Thorne, 2008), affords multiple routes for and modes of communication in the game world (Rama *et al.*, 2012), and creates an "affiliative social bond" among participants in that sphere (Thorne, 2008). These affordances help to create socially dependable, low-anxiety environments in which L2 learners can partake in collaborative game activities and socialize confidently in the

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TL. Chik (2014), for example, observed that experienced gamers provided novice players with advice on both gaming strategies and using L2 gaming for language-learning purposes. As she noted, more experienced players regularly shared helpful resources such as walkthroughs, video tutorials, fan fiction, and fan art on interest-driven websites. Thorne's (2008) research on intercultural communication within WoW also highlighted the establishment of an affiliative social bond between the gamers that sustained the participants' in-game collaboration and expanded their social interactions to out-of-the-game contexts.

Bytheway (2014: 9) observed that WoW provides highly semiotic interactive contexts characterized by particular in-game cultures that "encourage creativity, decrease anxiety, force interaction, demand cooperative and autonomous learning, increase motivation, and reward curiosity." Her findings are supported by Peterson (2011, 2012a), who studied linguistic and social interactions in the context of two MMOGs. Participants in Peterson's studies affirmed that interactions through personalized avatars increased the level of immersion in and engagement with the games' social environments. Peterson found that interacting through personalized avatars, which offer gamers the opportunity to remain anonymous throughout gameplay, reduces identifying social cues, facilitates gamers' self-expression, enhances risk-taking in TL use, and motivates the gamers to socialize actively with other players. In the same vein, Reinders and Wattana (2014, 2015b) contended that anonymity due to the absence of an open public sphere in the game helped to lower language learners' communication anxiety and increased their self-perceived communicative competence. They concluded that the affective affordances of the game environment were the main reasons that participants felt more willing to use English in the game setting. Zheng, Young, Brewer and Wagner (2010) also recognized that MMOG players, compared with non-players, developed higher levels of self-efficacy toward using English with native English speakers (NESs) and exhibited a more positive attitude with respect to learning the TL.

4.3.3 L2 learning opportunities

Sixteen papers highlighted different opportunities afforded within and beyond MMOG contexts for practicing and developing L2 skills. Sorted according to the number of times these opportunities have been acknowledged, these include opportunities for (a) negotiation of meaning, (b) discourse management practices, (c) increased production of L2, (d) traditional and modern literacy practices, (e) socialization in the TL, (f) intercultural communications, and (g) practicing conversational skills.

Researchers have found that verbal interactions in the world of MMOGs promote opportunities for negotiations of meaning, which is shown in the SLA literature (e.g. Smith, 2004, 2005) as being facilitative of L2 learning processes. Dixon (2014) identified "requesting" and "checking" as the most commonly implemented communication strategies in the negotiations of meaning, which were triggered mostly by player-produced and game-environmental inputs. Peterson (2012a), too, found that L2 learners overcame in-game communication challenges through involvement in the co-construction of meaning, observing that learners employed "continuers" (e.g. confirmation check, requests for assistance, and requests for clarification) as negotiation-of-meaning tools in order to maintain interactions. In addition, Thorne's (2008: 321) analysis of naturally occurring dialogs in the context of WoW showed that "both participants provided expert knowledge, language-specific explicit corrections, made requests for help, and collaboratively assembled successful repair sequences." These findings appear promising in view of the interaction hypothesis (Long, 1981) or approach (Gass & Mackey, 2007), suggesting that conversational modifications between an L2 learner and other interlocutor(s) with a view to resolving a communication breakdown are beneficial for L2 development.

Additionally, some scholars (e.g. Peterson, 2011, 2012b; Rama *et al.*, 2012; Reinders & Wattana, 2011) underlined the opportunities for utilizing adaptive discourse management strategies to communicate effectively during gameplay. Peterson (2011, 2012b) identified various approaches – such as the use of acronyms and contractions, combinations of keyboard symbols,

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strings of dots to signal a pause or show uncertainty, quotation marks to attract attention and display emphasis – and inferred that the application of these strategies "facilitated the consistent production of coherent TL output" (Peterson, 2012b: 89). Through an analysis of learners' in-game utterances, Rama *et al.* (2012) also observed the occurrence of frequent pauses and use of abbreviated and orthographically and stylistically non-standard language. They believed that, "For language learners, this affords valuable leeway for pauses to formulate utterances and inculcates an acceptance of errors, qualities that may facilitate the performance of communicative competence within this context" (Rama *et al.*, 2012: 332). Such studies suggest that learners adopt innovative discourse management strategies to meet the demands of in-game communication, such as focusing on meaning, catching up with the rapid pace of communication, and compensating for the absence of paralinguistic features.

The amount of L2 produced within game interactions can indicate how far the learners are comfortable and confident in their social interactions with other playing characters (PCs) (Rankin *et al.*, 2006). It also indicates the degree of opportunities a game context provides for L2 learners to produce language output that is, according to Swain's (1985) output hypothesis, crucial in the process of L2 development. Reinders and Wattana (2011, 2015a) showed that gameplay had positive effects on the quantity of L2 interaction (as measured by the number of words and length of turns) via text- and voice-based chat. These results may differ for students possessing different levels of L2 proficiency. For example, in Rankin *et al.*'s (2006) study, advanced ESL students generated 6 and 2.5 times more chat messages than the high-level beginners and the intermediate students, respectively. Rankin, Morrison, McNeal, Gooch and Shute (2009) also revealed a non-significant difference between advanced ESL students and NESs as regards the number of chat messages produced. This suggests that, unlike low proficiency L2 learners, advanced students are highly encouraged in the game to initiate and sustain social interactions with other gamers.

Studies (e.g. Li, 2011; Ryu, 2011) also acknowledged the opportunities that MMOGs offer for developing traditional and modern literacies. Li (2011: 147) conceptualized literacy from a sociocultural perspective, defining it as "effective functioning in situated social practices through meaning making across various modalities (texts, images, symbols, numerals, sound, movement and so forth) in a multimodal environment." He observed that reading and decision-making were respectively the first- and second-most frequently occurring literacy activities, and information seeking was the only literacy practice that took place both within and around WoW gameplay. Ryu (2011) also sought to discover how non-native English speakers (NNESs) develop multi-literacies as they communicate asynchronously in the context of CivFanatics, a beyond-game affinity space for players of Civilization. Ryu observed that participants had a chance to improve their traditional literacy through using different types of text (e.g. descriptive, argumentative, narrative) to describe their experiences, argue for their gaming strategies, and create stories based on gameplay. Ryu's study also highlighted the opportunities for practicing other types of literacy, including "multimodal literacy," "gaming literacy," "multilingual literacy," and "multicultural literacy."

Some scholars (Palmer, 2010; Rama *et al.*, 2012; Rankin *et al.*, 2009) also acknowledged that participation in MMOG virtual communities provided opportunities for L2 socialization as a developmental process that involves "learning to use language in socially and pragmatically appropriate, locally meaningful ways, and as a means of engaging with others in the course of – indeed, in the constitution of – everyday interactions and activities" (Garrett, 2008: 190). For example, in an ethnographic case study, Palmer (2010) investigated the process of L2 socialization in the virtual community of WoW through monitoring the participants' pragmatic development in the Spanish language. She observed that the participants improved their abilities to socialize with Spanish gamers by performing a range of appropriate pragmatic moves. Rama *et al.* (2012: 337) also concluded, "As sociocultural contexts characterized by shared proclivities rather than language ability, MMOGs provide unique contexts for language learning and

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socialization that are a marked contrast to the insulated communicative environments of many language classrooms." Opportunities for transcultural and intercultural communication within MMOGs' social settings are also highlighted by some scholars such as Thorne (2008) and Zheng *et al.* (2009). They argued that bi- and sometimes multilingual communication settings of MMOGs provide opportunities for intercultural (and transcultural) communications among gamers located in diverse geographic locations. Zheng *et al.* (2009: 504) discovered that "Fundamental to the acquisition of pragmatics, syntax, semantics, and discourse practices during the collaboration was the dyad's socialization in framing and structuring their development of both linguistic and cultural knowledge and the codetermination of context and language." Finally, Rankin *et al.* (2006) emphasized that MMOG play enhanced the opportunities for intermediate and advanced ESL students to practice and improve their conversational skills as they were using the TL in their interactions with other PCs.

4.3.4 L2 learning outcomes

Communicative competence and vocabulary knowledge were the most frequently acknowledged L2 learning outcomes achieved through involvement in collaborative interactions within and beyond MMOGs. Conversely, very few studies reported L2 learners' improvement in other language-related skills, such as reading, writing, listening, and speaking (e.g. Kongmee, Strachan, Montgomery & Pickard, 2011; Reinders & Wattana, 2011; Sylvén & Sundqvist, 2012), and L2 awareness (Lee & Gerber, 2013).

The review also suggests that meaning-oriented verbal interactions during MMOG play help L2 learners to develop communicative competence through practicing different discourse management strategies. Peterson (2012a), for example, discovered that L2 learners managed their in-game communications through the appropriate use of positive politeness strategies, informal language, small talk, humor, and lengthy leave-takings. Rama *et al.* (2012) found that playing WoW prioritizes sociolinguistic competence (i.e. socially appropriate language use) and strategic competence (i.e. proper use of communication strategies) as the two salient components of communicative competence (Canale & Swain, 1980). As they asserted, "Play in MMOGs favors these forms of communicative competence, which places emphasis on contextualized meaning rather than grammatical and lexical correctness of standard language forms" (Rama *et al.*, 2012: 330). The L2 learners in Palmer's (2010) study also developed abilities to socialize with and integrate into the Spanish virtual communities in WoW by enriching their repertoire of pragmatic knowledge and performing a range of appropriate pragmatic moves including "a host of new greetings, goodbyes, and requests for help" (Palmer, 2010: 307). As with Palmer (2010), Peterson (2012a), and Rama *et al.*'s (2012) studies, Rankin *et al.* (2009) also found that social interactions in the game environment helped ESL students improve their "communicative performance," defined as "the student's ability to know what to say and when to say it based on the context" (Rankin *et al.*, 2009: 166). Similarly, Reinders and Wattana (2011) found that, although L2 interaction during the gameplay did not improve the accuracy and complexity of the students' discourse, it encouraged them to use various discourse functions (e.g. greetings and questions) and practice different discourse management strategies (e.g. clarification requests, confirmation checks, and self-corrections) to communicate effectively within the game.

On the topic of improvement in L2 vocabulary as a key learning outcome, Rankin *et al.*'s (2006) study revealed that the students achieved a higher level of accuracy in defining L2 vocabulary words when the words were introduced more frequently in the conversations with non-playing characters (NPCs). Rankin *et al.* (2009) undertook an investigation with 18 advanced ESL students randomly assigned to three conditions (i.e. attending class instruction, playing EverQuest II on their own, and with NESs). As they evaluated the participants' recognition of the correct meaning of L2 vocabulary in the context of game tasks, the authors found a significant difference in post-test scores for the three groups. The students who collaborated with NES players performed better than the other two groups, who performed pretty much the same.

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However, the post-test scores for sentence usage revealed a significant difference for the students who received traditional classroom instruction. Sylvén and Sundqvist's (2012) research confirmed Rankin *et al.*'s (2009) findings concerning the positive impact of gaming on the learners' receptive L2 vocabulary knowledge, but their results depart from what Rankin *et al.* (2009) discovered about the impact of gaming on L2 learners' vocabulary usage (or production) skills. Specifically, Sylvén and Sundqvist (2012) found significant differences between non-gamers, moderate gamers, and frequent gamers in terms of L2 vocabulary recognition and production skills.

5. Discussion

Our review sought to ascertain how SLA is researched in the context of MMOGs, and what prior research findings suggest with regard to the affordances of these unconventional settings as venues for L2 learning and pedagogy. Figure 1 provides a conceptual framework that depicts projected relationships among the themes identified through our analysis. It is worth noting that there are many overlaps among the elements illustrated in Figure 1, and that the relationships between them should not be conceived of as merely linear and directional.

MMOGs' design features were found to help to provide low-anxiety L2 learning environments (e.g. Reinders & Wattana, 2014, 2015b) that are collaborative (Voulgari & Komis, 2011), socially interactive (Cole & Griffiths, 2007), semiotically rich (Thorne & Fischer, 2012), and linguistically complex (Thorne *et al.*, 2012). Performing a broad range of activities using the TL, learners get involved in different types of interactions (with other PCs, NPCs, and the game context), which seem to hold opportunities for L2 learners to develop L2 literacies and increase their cross-cultural communication skills. Furthermore, small and large "communities of practice" (Wenger, 1998) emerge to accomplish increasingly challenging targets that warrant a high level of collaboration among PCs. Socializing and interacting with native or more competent speakers of the TL in an "affinity group" that is "bonded primarily through shared endeavors, goals, and practices" (Gee, 2003: 197) appears less or non-intimidating for learners.

As Reinders and Wattana (2015b: 50) speculated, gameplay in such an environment appears to initiate "a virtuous cycle of lowered anxiety, resulting in more L2 production, leading to greater self-satisfaction, and resulting in more motivation, which in turn led to a further lowering of affective barriers." We further infer that a similar relationship can be found between the affective factors and the L2 learning opportunities identified in the context of MMOGs. L2 learners will likely take greater advantage of the possibilities as they grow increasingly self-confident in using the TL. Moreover, the more opportunities they seize to enhance their L2 skills, the more competent they can become in their L2 communications. In a logical sequence, this process can result in developing higher levels of self-efficacy beliefs, willingness to socialize, and positive attitudes towards L2 learning and gameplay. This chain of theorized impacts can be justified in light of willingness to communicate (WTC) theory (MacIntyre, Dörnyei, Clément & Noels, 1998), suggesting that "interaction in a non-threatening environment conducive to authentic language use, will lead to increased self-confidence, decreased anxiety, and increased willingness to practise and use the L2" (Reinders & Wattana, 2015b: 43–44).

In addition to developing positive affective and motivational drives toward L2 learning and socialization, we found that L2 learners can enrich their repertoire of vocabulary knowledge and enhance their communicative competence. Conversely, in spite of a large quantity of L2 interactions and production during gameplay (Rankin *et al.*, 2006; Rankin *et al.*, 2009; Reinders & Wattana, 2011, 2015a), no significant improvement was observed in the learners' discourse in terms of accuracy and complexity (e.g. Palmer, 2010; Reinders & Wattana, 2011; Zheng *et al.*, 2010). This finding appears to partly contradict assumptions underlying interactionist approach theorizing that "[n]egotiation for meaning, and especially negotiation that triggers interactional adjustments by the native speaker or more competent interlocutor, facilitates acquisition because

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it connects input, internal learner capacities, particularly selective attention, and output in productive ways" (Long, 1996: 451). The first hypothesis is that very few if any communication breakdowns occur during interactions, and, when they do occur, they are not negotiated, as in Peterson's (2012b) study. The second hypothesis is that even when negotiations of meaning do take place, they do not entail interactional adjustments; or, in some cases of interactional adjustments, the learners may fail to notice the gap in their interlanguage. The role of "noticing" or "selective attention" in the process of L2 learning is emphasized in Schmidt's (1990, 1992) noticing hypothesis, and also reflected in a learning principle established by Hattie and Yates (2013: 115), which states that "When the mind *actively* does something with the stimulus, it becomes memorable." Finally, the third hypothesis concerns the lack of opportunity or motivation for reviewing, practicing, and eventually internalizing new forms of language having been provided (through interactional adjustments) and noticed by the learners.

MMOGs afford multiple routes and modes of communication that can inspire the liberal and innovative use of language. During gameplay, language is utilized parsimoniously – through using the least morphological characters – for communicating in the most efficient manner. This likely explains, at least partially, why vocabulary and communicative competence were identified as the most frequently developed L2 skills in the context of MMOGs, yet L2 development falls way behind in terms of accuracy and complexity. Highly time-sensitive and goal-oriented verbal interactions – or in Reinders and Wattana's (2011: 16) terms, "the demands for simultaneous communication flow" – during gameplay encourage a form of communication that is unorthodox in language form, succinct in nature, and innovative in style. Example features of this communication style comprise the replacement of letters with numbers and symbols, the innovative spelling of words, the omission of articles, and the use of contractions and abbreviations. Thus, L2 research in immersive multiplayer games cannot be addressed comprehensively (Palmer, 2010; Rankin *et al.*, 2009) when *language* is perceived strictly as "the only linguistic mode instead of part of a multimodal ensemble of modes" (Newgarden *et al.*, 2015: 23) of communication. Adopting a more liberal perspective toward the concept of language is warranted. For example, "from an ecological perspective, 'movement, process, and action', things that people do … are inextricably integrated with language, i.e., they are part of languag*ing*" (Newgarden *et al.*, 2015: 23). This view aligns with complexity and dynamic systems theory (Larsen-Freeman & Cameron, 2008), which rejects the SLA research approaches that conceive of L2 development as merely "the taking in of linguistic forms by learners" (Larsen-Freeman & Cameron, 2008: 135).

6. Future research

Considering that most of the reviewed studies were qualitative, adopting an optimum combination of different research paradigms appears warranted. We contend that qualitative work has set the stage well for more quantitative investigations, which could present quantifiable indicators of L2 learning in MMOG settings. That is, future research needs to invest more in quantitative (e.g. controlled experimental or quasi-experimental) studies in order to substantiate what has been explored in earlier qualitative work and verify SLA scholarly theory concerning the affordances of MMOGs for second language and culture learning.

The second issue that needs to be addressed concerns the quality of research in the current literature. Our review revealed that about 57% of qualitative studies failed to report (or implement) measures ensuring the "credibility," "neutrality or confirmability," "consistency or dependability," and "applicability or transferability" (Lincoln & Guba, 1985) of their data analysis and findings. In some cases (Alp & Patat, 2015; Kongmee *et al.*, 2011; Rankin *et al.*, 2006; Thorne, 2008), the researchers did not even mention the approach(es) they adopted to analyze the qualitative part of their data. Similarly, quantitative studies were found to suffer from methodological deficiencies such as inappropriate sampling procedures and failure to implement

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measures required to ensure the validity and reliability of their data collection and data analysis tools and methods.

Related to concerns about the quality of the studies is the absence of a theoretical or conceptual framework. About 32% of the studies did not refer to any theoretical framework (or assumptions) underlying their hypotheses and choice of research methods. Correspondingly, a general limitation that applies to the whole body of research in this area is that a very limited range of theories has been drawn upon to examine L2 learning behavior in MMOG settings. Vygotsky's (1978) sociocultural theory was cited in nine (circa 29%) of the studies, with some researchers simply citing the theory without actually incorporating its principles, constructs, or methodology. Due to the interdisciplinary nature of L2 research in the MMOG environment, adoption of an eclectic range of theoretical perspectives is warranted to encompass multiple aspects of the phenomenon, which are in constant and dynamic interaction with one another in a complex system.

Finally, it is noteworthy that along with distinctive MMOG-related variables (e.g. type and genre), there also exists a range of different factors associated with L2 learners (e.g. age, gender, personality, L2 learning and gameplay motivation, learning styles, and L2 proficiency). To capture the dynamics of L2 learning in MMOG ecologies, a reasonable approach might be to incorporate all variables into a learning model particularly formulated to explain how, to what extent, and under what circumstances playing an MMOG can contribute to one's L2 development. Such an approach echoes complexity and dynamic systems theory (Larsen-Freeman & Cameron, 2008), which "aims to account for how the interacting parts of a complex system give rise to the system's collective behavior and how such a system simultaneously interacts with its environment" (Larsen-Freeman & Cameron, 2008: 1). One of the most daunting challenges facing researchers in the future would be the multiplicity and potential conflation of different variables (e.g. game- and learner-related) that explain the phenomena under investigation.

7. Limitations

A scoping review "can provide a rigorous and transparent method for mapping areas of research" (Arksey & O'Malley, 2005: 30). Adopting this methodology allowed us to present an overview of the current research on "vernacular" MMOGs in the field of SLA, and determine the volume, variety, nature, and characteristics of the primary research conducted so far. Equally, though, the current study also features some limitations due to the nature of scoping reviews. Arguably, the most serious issue is that the quality of evidence in the primary research included in our study is not critically assessed. Results from different types of sources (e.g. peer-reviewed academic papers, conference proceedings, postgraduate theses and dissertations) were grouped and reported without allocating more weight to one particular source over another. Therefore, the current study, as a typical scoping review, "cannot determine whether particular studies provide robust or generalizable findings" (Arksey & O'Malley, 2005: 27).

Moreover, because of the small number of quantitative studies in this area of research, meta-analysis was impossible to conduct. Presumably, this should be regarded as a limitation of the current state of research that warrants more quantitative investigations. The four quantitative studies and the quantitative sections of the eight mixed-method studies differed in terms of, for example, their design, focus, and participants. They covered a wide range of topics too. There were only a few studies that investigated similar topics such as vocabulary acquisition, quantity of L2 production, self-efficacy toward L2 use, and communication strategies.

Finally, some researchers (Rankin *et al.*, 2009; Reinders & Wattana, 2011, 2014, 2015a, 2015b) had modified the games by, for example, including some instructions and quests to ensure the appropriateness of the MMOGs to the learning contexts under study. Although these five studies do not fall 100% under the scope of *naturalistic CALL*, we had to synthesize and report their results with those obtained from the research papers in which L2 development was investigated in original (or unaltered) versions of the games.

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8. Conclusion

MMOGs have ignited some degree of optimism – among SLA scholars – that such socially and semiotically rich contexts can afford learners with authentic opportunities to socialize in the TL. This perspective has inspired researchers to investigate how the affordances of MMOGs might be harnessed for the improvement of L2-related skills. This review revealed that MMOGs encourage learners to get actively involved in L2 socialization and collaborative interactions with other PCs to perform a variety of goal-oriented tasks within and beyond game contexts. The findings do appear to suggest that playing MMOGs in the TL helps improve receptive L2 vocabulary knowledge and transform L2 learners into more resourceful communicators who venture to utilize various discourse management strategies to communicate effectively in their interactions. The current review also showed that most of the studies are qualitative, very limited aspects of L2 learning have been researched, the quality of studies needs to be improved, and that more innovative research models need to be designed to explore the cognitive processes underlying SLA in such dynamic and complex environments. Second language and culture learning within and beyond MMOGs' settings need to be studied more thoroughly by conducting a balanced combination of research paradigms and adopting more diverse theoretical perspectives within a dynamic system that encompasses both game- and learner-related variables.

Ethical statement. There are no ethical issues to declare for this review paper.

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Appendix

Table A1. An overview of 31 studies

Author(s)/Year	Focus	Participants	Major findings
Alp and Patat (2015)	Teaching Italian in WoW	14 Turkish undergraduates (aged 18–23)	WoW play accelerated L2 vocabulary acquisition and enhanced self-confidence in TL use.
Bytheway (2014)	Vocabulary learning strategies	6 ESL students from different L1 backgrounds (aged 20–30)	Participants used various vocabulary learning strategies affected by the MMORPG culture.
Chik (2014)	Practicing autonomy	10 Chinese-speaking undergraduates	Getting involved in L2 gaming as a long-term leisure and learning activity; gamers managed their gaming activities autonomously by drawing on personal experiences and the communal pedagogical resources.
Dixon (2014)	Learning and communication strategies in the gameplay; attitudes toward L2 learning	3 Chinese ESL students (early 20s)	The most commonly used learning strategy was "pooling information" that outnumbered "giving commands," "making statements," "giving suggestions," and "modeling"; MMORPGs provide opportunities for negotiations of meaning; "requesting" and "checking" were the most commonly used communication strategies; learners perceived in-game interactions as beneficial to L2 learning.
Kongmee *et al.* (2011)	Supportive role of MMORPGs in L2 teaching	8 Thai undergraduates	MMORPGs have positive effects on the participants' attitude towards, motivation for, and confidence in using ESL.
Lee and Gerber (2013)	L2 development in forms and functions	A 21-year-old Korean male	The participant learned game-relevant language forms, utilized various language functions, improved self-confidence, and showed less anxiety in TL interactions.
Li (2011)	L2 literacy practices in WoW	4 Chinese ESL learners (aged 13–18)	"Reading" and "decision making" were the most frequently observed literacy activities (within and around WoW gameplay); literacy activities within WoW gameplay were inducted into four literacy practices including "information seeking," "strategizing," "problem solving," and "socializing."

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Table A1. *Continued*

Author(s)/Year	Focus	Participants	Major findings
Newgarden *et al.* (2015)	Contribution of WoW players' coordination to values realizing in the L2	3 college-age ESL learners	"[P]rospective coordination was a strong predictor of values realizing while common ground alignment and coaction were not …; multimodal languaging in gameplay increased the odds of players' dual values realizing, suggesting that avatar embodiment afforded an enriching experience for these L2 learners" (Newgarden *et al.*, 2015: 39).
Palmer (2010)	L2 socialization and pragmatic development	2 NESs learning Spanish (a 37-year-old male and a 28-year-old female)	The learners improved abilities to socialize in Spanish virtual communities and the naturalness of their Spanish language.
Peterson (2011)	L2 learners' interactions in and attitudes toward MMORPG play	7 Japanese EFL students (aged 24–27)	The intermediate and advanced learners utilized "adaptive" and "transfer" discourse management strategies effectively, and engaged in collaborative social interaction in the TL; real-time computer-based interactions provided access to an engaging social context, enjoyment, exposure to new vocabulary, opportunities to practice L2, and reduced anxiety.
Peterson (2012a)	L2 learners' linguistic and social interactions in and attitudes toward a MMORPG	4 EFL students in Japan (aged 23–25)	The learners managed in-game communications, expressed positive attitude toward gameplay as a means to develop reading and vocabulary skills, and experienced low anxiety in using the TL.
Peterson (2012b)	L2 learners' interaction management strategies during and their attitudes toward MMORPG play	5 Japanese and 1 French EFL learners (aged 19–37)	The learners utilized a combination of "transfer" and "adaptive" discourse management strategies to manage their in-game interactions, were motivated by the learner-centered nature of in-game interactions, and claimed that these interactions provided opportunities for fluency and discourse management practices in the TL.
Rama *et al.* (2012)	L2 learners' response to WoW's affordances	2 college-age Spanish learners	WoW's affordances for socialization and L2 learning include "a low-anxiety setting, multiple routes for and modes of communication, expert-novice interaction, immersion in the TL, and access to native speakers" (Rama *et al.*, 2012: 328).
Rankin *et al.* (2006)	Impacts of gameplay on L2 proficiency	4 ESL students	A 40% improvement in the intermediate and advanced learners' L2 vocabulary; a 100% increase in the amount of their chat messages.

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Table A1. *Continued*

Author(s)/Year	Focus	Participants	Major findings
Rankin *et al.* (2009)	L2 vocabulary acquisition, in-game social interactions, and communication patterns	8 NESs and 18 Chinese ESL students	82% of the students who played the game improved their L2 vocabulary; the students in traditional classroom instruction performed significantly better ($p < .05$) in sentence usage post-test scores; those who played the game with NESs performed significantly better ($p < .05$) in vocabulary post-test scores than those who attended classroom instruction and those who played the game on their own; social in-game interactions helped ESL students improve their communicative performance.
Reinders and Wattana (2011)	L2 interaction patterns and attitudes toward TL use	10 male and 6 female Thai undergraduates (aged 21–26)	An increase in the quantity of L2 interactions via text-based ($t = 3.837$, $p < .05$, $d = 0.49$) and voice-based chat ($t = 8.1$, $p < .05$, $d = 0.75$) channels, an improvement in the learners' positive feelings about communicating in English during gameplay ($t = 6.301$, $p < .05$, $d = 1.15$), and a change in the students' WTC ($t = 5.921$, $p < .05$).
Reinders and Wattana (2014)	L2 learners' WTC	30 Thai EFL learners	More WTC, $t(29) = 21.54$, $p < .001$, $d = 2.79$, less anxiety to communicate, $t(29) = 21.20$, $p < .001$, $d = 3.33$, and higher communicative self-confidence, $t(29) = 25.89$, $p < .001$, $d = 3.54$, in English during gameplay than during class time.
Reinders and Wattana (2015a)	L2 learners' interactions in English	30 Thai EFL learners	An increase in the quantity of in-game interactions in both text chat, $t(29) = 11.27$, $p < .001$, $d = 0.87$, and voice chat, $t(29) = 18.51$, $p < .001$, $d = 1.96$; and producing more L2 during gameplay than face-to-face communicative activities (CAs), $t(29) = 5.49$, $p < .001$, $d = 0.97$.
Reinders and Wattana (2015b)	L2 learners' WTC	30 Thai EFL learners	Lower communication anxiety, increased perceived communicative competence, and increased motivation to communicate in English were the main reasons to feel more willing to use English during gameplay.
Ryu (2011)	Traditional and new literacy practices in beyond-game affinity space (i.e. CivFanatics)	20 NNESs from different L1 backgrounds	Beyond-game culture provided opportunities for practicing traditional and new (e.g. multimodal, gaming, multilingual, and multicultural) literacies.
Ryu (2013)	L2 learning activities through gameplay and beyond-game culture	6 male gamers (average age 27.8) from different L1 backgrounds	The participants learned a limited number of words and phrases repeatedly used in the game, acquired sophisticated TL forms through collaborative interactions with NESs or more fluent peers in CivFanatics, and developed English language skills through copying, reading, and writing extensively.

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Table A1. *Continued*

Author(s)/Year	Focus	Participants	Major findings
Sundqvist and Sylvén (2014)	Students' language-related activities outside school and their engagement in playing digital games	76 Swedish ESL learners (aged 10–11)	Young learners are extensively involved in extramural English activities out of school; digital gaming is popular, and more time is spent on gaming in English than in Swedish; compared to non- and moderate gamers, frequent gamers mostly rated themselves as "good" or "very good" in self-assessed English ability.
Sylvén and Sundqvist (2012)	The relationship between L2 proficiency and amount of time playing digital games	86 Swedish ESL learners (aged 11–12)	A positive correlation between ESL proficiency and amount of time playing games; compared with non- and moderate gamers, a larger ratio of frequent gamers claimed to have learned English mainly outside of school ($p < .01$); they performed significantly better in vocabulary recognition ($p = .012$), productive vocabulary knowledge ($p = .006$), reading ($p = .021$), and listening ($p = .022$) comprehension tests.
Thorne (2008)	L2 use and learning opportunities in WoW	An American and a Russian	In-game conversations showed instances of beneficial TL activities (e.g. providing expert knowledge, language-specific explicit corrections, making requests for help, and collaboratively assembled successful repair sequences); the participants established an affiliative social bond.
Thorne *et al.* (2012)	The linguistic complexity of WoW-presented texts and WoW-related websites	32 Dutch and 32 American gamers	The texts used in WoW quests and three most visited WoW-related websites are linguistically complex.
Turgut and Irgin (2009)	L2 vocabulary learning and pronunciation skills	10 primary and secondary school students (aged 10–14) from Turkey	The participants developed some vocabulary learning strategies and grew more motivated to learn unknown words; "Online games' repetition allows a language learner to 'bootstrap'; to use known language's vocabulary or grammar to decode unknown elements through constant exposure" (Turgut & Irgin, 2009: 763).
Wu, Richards and Saw (2014)	ESL learners' perceptions about and motivations for playing an MMORPG to improve English proficiency	19 ESL students (18 and older)	The top three motivation subcomponents for both male and female participants were *socializing*, *relationship*, and *teamwork*; males are driven by the motivation components of *customization*, *discovery*, and *role-playing*; the top three motivational components for females were *teamwork* ($M = 3.56$), *discovery* ($M = 3.51$), and *role-playing* ($M = 3.51$).
Zheng *et al.* (2009)	The affordances of Quest Atlantis (QA) chat for language and culture learning	4 females (2 Chinese, 2 Americans)	QA provided opportunities for improving L2 by using it in an authentic, meaningful, and goal-driven collaboration to perform educational tasks.

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Table A1. *Continued*

Author(s)/Year	Focus	Participants	Major findings
Zheng *et al.* (2010)	Impacts of gameplay on L2 learners' attitude and self-efficacy toward English language learning, achievement test scores, and responses to writing prompts	61 (42 male, 19 female) 7th grade students from China	QA group showed higher self-efficacy toward English language learning, $F(3, 53) = 3.11$, $p = .034$, and expressed high confidence in daily use of English; the non-QA group performed better in the post-English achievement test, $t(58) = 2.087$, $p = .041$; the t test was non-significant, $t(56) = -.808$, $p = .422$, on the score for readability of English essays.
Zheng, Newgarden and Young (2012)	The distribution of CAs and coordination of learners in WoW, and fluctuation of values realizing in a communicative project	3 college-age ESL learners from different L1 backgrounds	*Coordinating*, *gameplay knowledge distributing*, and *reporting on actions* were the most predominant CAs; game players integrated both language and action to achieve personal and collective goals.
Zheng, Bischoff and Gilliland (2015)	Vocabulary learning	A Japanese undergraduate and a NES	"[C]oaction in languaging with an expert and the game narrative affordances" (Zheng, Bischoff & Gilliland, 2015: 782) facilitated vocabulary learning; "the virtual world can link resources of in-game linguistic resources, actions within the game, and text chat with other learners or teachers to help situate words in a wider social context" (Zheng *et al.*, 2015: 784).

About the authors

Nasser Jabbari received his PhD in TESOL at Texas A&M University, USA. His primary research interests include both naturalistic and tutorial CALL. His current research focuses on the psycholinguistic and sociocultural processes underlying L2 learning and socialization in the multilingual and multicultural contexts of massively multiplayer online (role-playing) games (MMORPGs).

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