Towards a Research Agenda for the Use of Three-Dimensional Virtual Worlds in Language Learning

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ABSTRACT
This article investigates research on the use of network-based three-dimensional virtual worlds in computer-assisted language learning (CALL). The significant features of the major types of virtual world currently utilized are examined, as are the hypothesized advantages and issues associated with their use. This is followed by a critical review of the literature which reveals that contemporary research remains largely exploratory in nature and is subject to significant limitations. The literature review also identifies encouraging preliminary findings. These suggest that Active Worlds and Second Life present viable arenas for learner-based CALL projects. Positive findings identified in studies include evidence for beneficial forms of collaborative target language interaction, enhanced engagement, motivation, presence, and participation. The analysis draws attention to the need for learner training and consideration of educator roles. Further significant issues include the influence of task, technical affordances, and sociocultural factors on learner behavior. The article concludes by identifying areas of potential interest in future research.

KEYWORDS
Virtual Reality, Three Dimensional (3-D) Virtual Worlds, Second Life, Active Worlds, Avatars

INTRODUCTION
Network-based desktop environments that facilitate real-time communication between users within the framework of a simulated virtual world have long been of interest to CALL researchers. Early work focused on the use of text-based virtual worlds such as multiuser object-oriented domains (MOOs), and these environments have been the focus of extensive research (Schwienhorst, 2002; Shield, 2003; Von Der Emde, Schneider, & Kötter, 2001; Weininger & Shield, 2003). More recently, the emergence of robust browser-based environments such as Active Worlds and Second Life, which provide enhanced communication features such as audio and immersion in user-created 3-D virtual realities, has led to renewed interest in virtual worlds from the CALL research community (Cooke-Plagwitz, 2008; Sadler, 2008; Stevens, 2006). The following discussion examines the key features of these worlds and then explores claims made regarding their value as platforms for CALL projects.

3-D VIRTUAL WORLDS: KEY FEATURES
Virtual worlds have been defined as “persistent virtual environments in which people experience others as being there with them and where they interact with them” (Schroeder, 2008, p. 2). The 3-D worlds currently attracting attention from CALL researchers share a number of features with earlier virtual worlds. For example, they are network-based and provide access
to user-created simulated worlds that adopt a central design theme. Moreover, they enable real-time communication through the medium of text, provide for anonymity, and facilitate the collection of a permanent written record of users’ linguistic output through data recording. However, although there are differences between platforms, the 3-D virtual worlds currently in use provide access to a unique combination of design elements that distinguish them from the other types of virtual environment used in CALL. These differences can be conceptualized around three key features: realistic immersion, multichannel input, and personalized avatars.

A novel feature of these worlds is the utilization of high quality 3-D graphical interfaces that immerse users in a rich, visually appealing simulated environment. As can be seen in Figure 1, this provides for an impressive degree of realism.

Figure 1
A World in Second Life

The most popular 3-D worlds currently in use, Active Worlds and Second Life, incorporate large numbers of individual environments known as worlds. These are frequently user created and usually reflect a theme, specific location, or country. Unlike many of the temporary virtual environments used in CALL such as chat rooms, these worlds provide users with access to permanent venues for communication.

The second distinguishing feature of 3-D virtual worlds lies in their multimodal nature that provides for multiple communication channels. In Second Life for example, users can utilize text chat and instant messaging in real time. Text chat is displayed in an onscreen text box and in dialogue boxes. In addition, users of the latest versions of the these worlds have access to audio chat, which—coupled with the visual stimulus provided by the presence of on-screen text—offer a variety of communication channels and sources of feedback.
Finally, users can create and customize personal avatars in 3-D virtual worlds. The avatars in Second Life in particular are noted for their striking realism and diversity. Individual avatars can traverse virtual space within a world by walking or flying. They can also move between different worlds, an activity known as teleporting. A group of learner-created avatars are shown in Figure 2.

Figure 2
Avatars in Second Life

The features described above have led to claims that 3-D virtual worlds offer a number of benefits when utilized in CALL. These draw in part from research findings regarding the benefits of the communication tools that are utilized in these worlds such as text chat. Moreover, it is claimed that the combination of novel features provided by 3-D virtual worlds, creates additional opportunities for language learning. The discussion below examines these claims and the issues associated with the use of virtual worlds in CALL.

THE USE OF IMMERSIVE 3-D VIRTUAL WORLDS IN CALL: HYPOTHESESIZED ADVANTAGES AND ISSUES

The literature on the use of virtual worlds in language education has underscored a number of design features that are hypothesized as supporting language development. Network-based virtual worlds have the potential to overcome the limitations of other types of virtual environment that rely solely on typed text because they offer access to higher quality graphical user interfaces that create more realistic and immersive contexts for learning (Koenraad, 2008). The accessible nature of these environments, which are frequently open access, provides op-
opportunities for learner-centered interactions involving native speakers and a wider range of interlocutors than are frequently available in many traditional language classrooms. Interaction with native speakers and peers further provides exposure to the target language and may create opportunities for learners to engage in the production of modified target language input through the negotiation of meaning, a process that is perceived as facilitating second language acquisition (Long, 1996).

Moreover, these worlds are user created and incorporate content creation tools that enable registered users to undertake building, that is, the creation of new virtual locations within the world. These tools also facilitate other forms of content creation, such as adding video and animation (Dickey, 2005). Researchers have noted that the creation of personally meaningful artifacts in virtual worlds frequently engenders a high degree of engagement, motivation, and emotional investment in the system (Cooke-Plagwitz, 2008; Peterson, 2001). In this context, the ability to manipulate the environment has the potential to support the development of learner autonomy (Schwienhorst, 1998).

Most virtual worlds utilized in CALL offer communication through only one medium, usually typed text, which can restrict the development of cooperative interpersonal relationships necessary for effective communication because feedback to a learner’s utterance is limited (Walther & Parks, 2002). However, users of 3-D worlds have access not only to text chat and dialogue boxes that hold learner attention, but also real-time audio. The presence of multiple communication channels provides additional sources of feedback that are beneficial for language learners. Furthermore, 3-D worlds retain the advantages of text- and audio-based communication such as reduced social context cues which have been shown to reduce barriers to learning such as anxiety and inhibition (Hudson & Bruckman, 2002; Roed, 2003). In addition, the data-recording features of virtual worlds enable educators to provide the focus on form that is widely accepted as playing an important role in language acquisition (Ellis, 2005). This can be achieved, for example, through the use of transcript data in awareness-raising tasks (Hislope, 2008).

The use of personal avatars not only provides a sense of embodiment, but also strengthens presence; the sense of “being there” within a virtual environment (Lombard & Ditton, 1997). Avatars further heighten copresence, the sense of “being there together” (Schroeder, 2002, p. 4) experienced by users of a shared virtual environment. These factors are perceived as essential for effective communication when individual users are not physically present (Bays, 1998; Orenberg, 2003). The personal attachment engendered by the creation of avatars has been noted in the literature (Cooke-Plagwitz, 2008) and has led to speculation that a sense of ownership frequently develops, enhancing feelings of attachment and belonging. These factors foster emotional investment in the system leading to enhanced participation, motivation, and increased linguistic output (Cooke-Plagwitz, 2008). Moreover, the opportunity to create a new online identity opens up new forms of interaction involving identity exploration (Svensson, 2003).

The anonymity provided by avatars represents a further potential advantage of 3-D virtual worlds. The reduction of social context cues such as age or status frequently creates a low-stress atmosphere in which learners can take risks and engage in language play. Research suggests these behaviors may facilitate language learning (De Jong, Van Der Meijden, & Von Berg, 2005; Warner, 2004). In addition, the supportive atmosphere frequently engendered by interaction in virtual worlds can support the development of collaborative interpersonal relationships based on the exchange of personal information. This factor contributes to the social cohesion and sense of community that has been indentified in studies on the use of virtual worlds in CALL (Peterson, 2009; Von Der Emde et al., 2001).
The literature also highlights a number of potential issues raised by the use of virtual worlds. In the view of some researchers, the interfaces utilized in many of these worlds are complex and difficult to use (Berge, 2008; Cooke-Plagwitz, 2008). For novice users, these aspects require learner training and the time consuming nature of this activity may act as a barrier to use. The need for faculty training remains another potential restriction. The technological requirements of virtual worlds present further challenges. In order to run effectively, virtual worlds such as Second Life require modern computers and high-speed network access. These conditions are far from prevalent in many institutions. Moreover, since these worlds require access through network firewalls, security concerns can be a substantial issue. In order to avoid the risk of learners being exposed to flaming from unwelcome interlopers known as “griefers,” faculty frequently purchase their own virtual land in which they can construct worlds with limited access. However, the creation and maintenance of worlds may be challenging for educators who lack the necessary computer skills. Furthermore, the long-term financial costs of such arrangements can be prohibitive.

This discussion has drawn attention to the combination of design features that are unique to 3-D virtual worlds. Researchers have claimed that these features may offer a beneficial environment for language learning (Hislope, 2008). The above discussion has further drawn attention to potential issues associated with the use of these environments. In an attempt to investigate the credibility of claims that virtual worlds provide opportunities for language development and to establish the viability of these environments, the following discussion focuses on a critical evaluation of contemporary research. Although this research is at an early stage, a search of contributions to five international CALL journals revealed that three learner-based studies have been undertaken. Analysis of the key findings of these studies can shed new light on possible advantages and drawbacks of utilizing 3-D virtual worlds in CALL and provide guidance for future research.

**RESEARCH ON THE USE OF 3-D WORLDS IN CALL**

Table 1 summarizes the results of three learner-based studies: Toyoda and Harrison (2002), and Peterson (2006), and Deutschmann, Panichi, and Molka-Danielsson (2009).

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<tbody>
<tr>
<td>Number, L1 background, and location of subjects</td>
<td>5 undergraduate advanced learners of Japanese located at a university in Australia and native speakers of Japanese in America and Japan</td>
<td>24 intermediate-level EFL learners based at a university in Japan</td>
<td>13 advanced- and intermediate-level EFL doctoral students; location of subjects not specified</td>
</tr>
<tr>
<td>Session length and project duration</td>
<td>10 1-hour sessions held over a semester</td>
<td>3 1-hour sessions</td>
<td>12 90-min. sessions held over two terms</td>
</tr>
<tr>
<td>Methodology</td>
<td>Qualitative analysis of text chat transcripts</td>
<td>Qualitative and quantitative analysis of text chat transcripts</td>
<td>Quantitative analysis of voice chat recordings</td>
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<td>Researcher observation</td>
<td>Researcher observation and interviews</td>
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<td>Poststudy questionnaire</td>
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Key findings

Subjects changed the appearance of their avatars but made limited use of their communication features.

On occasion, the subjects had difficulties following the interaction.

Intercultural communication gaps occurred.

Communication problems occurred and led to instances of negotiation.

9 triggers for negotiation of meaning were identified.

Subjects used both transactional and interactional discourse management strategies.

Negotiation was infrequent; highest frequency of negotiation occurred in the decision-making task.

Subjects claimed that the presence of avatars enhanced presence and facilitated communication.

Learner behavior appeared influenced by a mixture of variables including sociolinguistic factors, context of use, and technical affordances.

Role play tasks administered in the first course failed to elicit active participation because the teachers dominated the interaction.

Authentic open-ended tasks (in-world presentations) administered in the second course were successful in eliciting higher levels of learner engagement and participation.

Role of the teachers changed to that of facilitators.

Participants expressed both negative and positive views.

Early research on the use of 3-D virtual worlds in CALL was reported in Toyoda and Harrison (2002). This longitudinal study involved the use of an experimental world known as JEWELS. This virtual world was located within an early version of Active Worlds and was specifically for research purposes. As Figure 3 shows, this world incorporated a simulation of a university campus located in Japan and contained a number of areas where the subjects could engage in communication.

Figure 3
JEWELS Virtual World

The researchers focused on analyzing the text chat produced by the participants who were learners of Japanese based in Japan and native speakers of Japanese located in the United States in order to establish if negotiation of meaning took place during communication problems. A second goal was to identify the triggers for this type of interaction. The researchers reported that the interaction elicited communication problems that produced instances of
negotiation of meaning broadly following the model proposed for face-to-face interaction (Varonis & Gass, 1985). As listed in Table 1, analysis of the chat transcripts indicated that nine types of trigger caused communication difficulties. These were: recognition of new word, misuse of word, pronunciation error, grammatical error, inappropriate segmentation, abbreviated sentence, sudden topic change, slow response, and intercultural communication gap. The most frequent cause of negotiations was unknown vocabulary, followed by abbreviated sentences and the misuse or misunderstanding of a word. Instances involving grammatical errors were infrequent.

The researchers noted that managing the interface and utilizing the communication tools provided by Active Worlds appeared to be challenging for the learners, who also had occasional difficulties following the different threads of conversation. This led to situations in which not all communication problems were successfully resolved and several instances of technostress. Observation revealed that the participants changed the appearance of their avatars but made little use of their communication features. This finding suggests that the participants, who were novice users, were fully preoccupied following the interaction and as a result failed to fully utilize the communication features of their avatars. However, the presence of negotiation of meaning represents a positive finding and suggests that Active Worlds provides a useful venue to elicit this beneficial form of collaboration. Finally, the research project was subject to limitations. The small sample size made generalization of the results problematic. Furthermore, no specific language tasks were implemented, leaving the potential of task-based learning unexplored. Nevertheless, this early work demonstrated the potential of virtual worlds for language learning and stimulated further research.

A study undertaken by Peterson (2006) reported on learner interaction in an area of AlphaWorld (see Figure 4).

Figure 4
AlphaWorld

AlphaWorld forms the largest virtual world within Active Worlds and incorporates a large number of virtual buildings and user-created spaces. Peterson’s longitudinal project investigated the use of language tasks during text chat involving 24 EFL learners based at a University in Japan. Three tasks were administered: decision-making, jigsaw, and opinion-exchange. The research produced a number of positive findings. The subjects reported few difficulties in using the system, but researcher observation and learner feedback highlighted the value of instigating a prestudy orientation session.
Analysis of transcript data confirmed that the participants consistently produced coherent target language output through collaborative interaction that was focused on the tasks. Two types of strategies were used to successfully manage the text-based interactions. These involved transfers from other communication contexts and adaptive behaviors appropriate to the online medium. The first type, transactional strategies (Brown & Yule, 1983), included naming the intended recipient of a message, using time-saving devices, and splitting long turns. These were effective in facilitating the efficient transfer of information during the real-time interactions. The second type, interactional strategies (Brown & Yule, 1983), were used to establish and maintain collaborative interpersonal relationships. The most frequent of these strategies were the appropriate use of both positive and negative politeness. The strategies supported the creation of collaborative social relationships, group cohesion, and a relaxed atmosphere. Analysis further revealed that transactional strategies were more frequent. Although interaction involving co-construction of the target language occurred, instances of negotiation were limited. The researcher speculated that this result was due, in part, to the subjects avoiding the discussion of problematic vocabulary and discourse features because of an occasional lack of time. Furthermore, the findings draw attention to the influence of sociocultural concerns on interactions. The subjects appeared anxious not to be misunderstood, and this factor, coupled with a desire to maintain status with peers, may have led, in certain instances, to avoidance. There was evidence of a high degree of task focus and task-induced effects. Data analysis indicated that the decision-making task elicited the most frequent negotiation.

In contrast to the findings reported by Toyoda and Harrison (2002), Peterson (2006) observed that the majority of the subjects made frequent use of their avatars. The use of the avatars facilitated interactions; the subjects reported they could move to quieter areas and use the communication features available such as waving and showing emotional responses. The students’ responses on the poststudy questionnaire indicated that the use of personalized avatars enhanced the feeling of presence experienced and contributed to a high degree of engagement and participation. The learners also made extensive use of text-based strategies to display feedback. This finding demonstrated the limitations of the avatars in Active Worlds, which, at that time, were unable to display many of the communication cues that influence communication in face-to-face contexts. This study was subject to a number of limitations. As a result of institutional constraints, only three sessions were completed. Although a larger learner group was investigated than in the study by Toyoda and Harrison (2002), the research in this project focused on learners at only one level of language proficiency and from a limited number of L1 backgrounds. Moreover, little use was made of the specific affordances provided by the environment. The findings nonetheless showed the potential of virtual worlds as venues for collaborative task-based learning. The broadly positive findings stimulated additional research that attempted to explore learner behavior in other types of 3-D virtual world.

Research conducted by Deutschmann et al. (2009) investigated the interactions of EFL students in the virtual world Kamimo Island that forms part of Second Life. This world provides access to a somewhat higher quality graphical environment than that provided by Active Worlds. As can be seen in Figure 5, Kamimo Island presents a simulation of a real world island incorporating virtual buildings and areas for interaction.
The researchers explored the participation patterns of the subjects, focusing on floor space, turn length, and turn taking in two courses that utilized audio chat. The courses, held in the autumn of 2007 and the spring of 2008, involved 13 learners working in two groups. The role-play task administered in the first course failed to elicit active participation on the part of the learners. Analysis indicated that the three instructors dominated all aspects of the interactions during this course. Moreover, technical difficulties related to network issues appeared to hamper participation. However, the exact nature of these problems was not discussed in detail. In the second course, in an effort to expand participation, the researchers introduced precourse training sessions, reduced the number of instructors present from three to two, and adopted open-ended tasks designed to give the subjects practice in presentation skills. These tasks, which were based on learner needs and made use of a lecture theatre within the environment, appeared to enhance engagement and learner participation. Data collected in the second course indicated that the change in course configuration and task type produced beneficial effects. Learner participation in terms of floor space, turn length, and turn taking increased significantly compared to the previous course. Moreover, the impact of the instructors was greatly reduced, and their role changed to that of facilitator. In a significant finding, towards the end of the second course, the subjects began to actively engage in more extended target language discourse.

Analysis of learner feedback produced differing views on the value of the courses. The students in the first course had difficulties coming to terms with managing their interactions in the environment provided by Second Life. This situation resulted in instances of technostress and feelings of frustration. Other learners claimed that the game-like nature of Second Life was inappropriate for a graduate-level course. The students also reported more positive views. They claimed that the use of avatars made the interactions enjoyable and reduced feelings of shyness and inhibition. Moreover, they commented favorably on the sense of presence and engagement engendered in the environment.
This study was subject to limitations. For reasons that were not stated, the subject groups were changed completely between courses. In addition, the specific role of the avatars in the interaction was not investigated. Nonetheless, this study highlights the important finding that features of task design intended for other more established types of audio-synchronous environment may be applied with some success to CALL projects involving Second Life.

CONCLUSIONS
The research analyzed in the previous discussion draws attention to a number of significant findings. As Table 2 shows, these relate to the specific design features provided by 3-D virtual worlds and emphasize a number of apparent advantages and issues associated with the use of these environments in learner-based CALL projects.

Table 2
Significant Research Findings on the Use of 3-D Virtual Worlds in CALL

<table>
<thead>
<tr>
<th>Positive findings</th>
<th>Negative findings</th>
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<tbody>
<tr>
<td>The combination of high quality interfaces and avatars reduces though does not remove constraints on learning (e.g., inhibition).</td>
<td>The effective use of virtual worlds requires learner training.</td>
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<tr>
<td>Use of personal avatars appears to enhance the sense of presence and copresence experienced by users.</td>
<td>Instances of technostress occurred caused by the difficulties in managing the interface and the communication tools.</td>
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<tr>
<td>Limited evidence that engagement, motivation, and enjoyment are enhanced for the majority of subjects.</td>
<td>A minority of subjects reported negative views.</td>
</tr>
<tr>
<td>Access to diverse groups of interlocutors not found in many conventional language classrooms</td>
<td>On occasion technical issues relating to network access hampered participation.</td>
</tr>
<tr>
<td>Tasks designed to facilitate interaction and to take advantage of the specific affordances provided in the environment can enhance participation and provide opportunities for target language use involving strategies associated with language development (e.g., co-construction and negotiation of meaning).</td>
<td>Sociocultural concerns can influence learner behavior leading to avoidance.</td>
</tr>
<tr>
<td>Development of collaborative social relationships based on the exchange of interpersonal information strengthens group cohesion.</td>
<td>Most effective role of the teacher has yet to be clarified.</td>
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The findings reported by Peterson (2006) and Deutschmann et al. (2009) suggest that the combination of realistic 3-D graphical interfaces and personalized avatars enhances learners’ sense of presence and copresence. In turn, these factors appeared to foster a sense of engagement and immersion for the majority of the students. The subjects in all three studies expressed largely positive views on their degree of enjoyment and motivation. The studies
demonstrate how interaction in virtual worlds provides valuable opportunities for learner-centered target language practice.

However, analysis suggests that these benefits are not automatic. As the literature reviewed shows, there is a high degree of risk in assuming that learners will automatically be familiar with the affordances provided by a particular online environment (Hauck & Youngs, 2008). The difficulties encountered by learners in Toyoda and Harrison’s (2002) study (e.g., technostress) demonstrate that the need for learner training in the use of virtual worlds remains essential. The findings of Peterson (2006) and Deutschmann et al. (2009) show the beneficial influence of training effects with regard to learner participation patterns. The unique nature of the communicative context in 3-D worlds clearly requires learner training in order to maximize the potential of these environments. The findings relating to technical issues remain an area of concern. Researchers considering using these worlds in learner-based projects would be well advised to thoroughly appraise themselves of the capabilities of the computers at their disposal and the prevailing network conditions at their institution.

The findings with regard to the area of task-based learning, though not conclusive, are encouraging. The work of Peterson (2006), and Deutschmann et al. (2009) to a degree, confirms that 3-D virtual worlds provide beneficial environments for the implementation of task-based learning. Their findings indicate that implementing task-based pedagogies in virtual worlds provides a useful means to elicit the strategy use associated with the type of collaborative interactions (e.g., co-construction and negotiation of meaning) that are held to play a central role in second language learning (Foster & Ohta, 2005; Pica, 1994). Moreover, the subjects in all three studies were able to form cooperative relationships based on the exchange of interpersonal information which facilitated the creation of a low-stress atmosphere. Although the barriers to learning in non-computer classrooms such as age and status appear less pronounced in virtual worlds, evidence from Peterson’s study suggests that learner sociocultural concerns relating to status are not entirely removed by the online nature of the interaction. The presence of avoidance behaviors in this study emphasizes that the L1 background of learners and the context of language use remain factors that must be carefully considered in CALL projects involving the use of these worlds.

Another noteworthy factor was the positive benefits engendered by the use of the specific affordances provided by the technology. For example in Deutschmann et al. (2009), the learners made use of a virtual lecture theatre, and their interactions shaped by the affordances of this environment enhanced their participation and target language use. This finding lends support to the contention made by Hampel (2006) that tasks designed for network-based interaction should be appropriate to the specific affordances of the type of online communicative environment in use. In this context, the above studies suggest that the role of the instructor remains crucial to the success of projects undertaken in virtual worlds. The findings examined here emphasize the diversity of approaches adopted by researchers. The work of Toyoda and Harrison (2002) and Peterson (2009) indicates that useful results can be obtained when instructors adopt a less prominent role during interactions. The approach of administering tasks based on learner needs and avoiding direct participation supported the kind of learner-centered interactions that have long been claimed to be beneficial for language learning. In contrast, the more active role played by the instructors in Deutschmann et al. (2009) shows that by adopting the role of facilitator, individual teachers can actively contribute to the creation of an environment conducive to participation and collaborative target language interactions. The findings examined in this discussion show that although an established pedagogy for CALL in virtual worlds has yet to emerge, the judgment of individual researchers regarding the precise nature of the role of the teacher in a project can have a substantial effect on outcomes.
FUTURE DIRECTIONS
The studies analyzed in this discussion, though exploratory in nature, have produced broadly encouraging findings. Taken as a whole, the findings suggest that although the use of 3-D virtual worlds does not come without its challenges, they can provide viable arenas for CALL. The findings draw attention to a number of promising areas for future research. The new forms of interaction made possible by virtual worlds remain, to a significant degree, unexplored. Future studies involving larger and more diverse learner groups may shed light on the role played by the new types of identity exploration made possible by virtual worlds and the relationship of this factor to learning. The investigation of sociocultural factors and their effect on learner behavior may offer valuable insights. The most effective role of the teacher in supporting learning during learner interactions in these environments remains an area in need of more research. In addition, the relationship between specific task types and beneficial types of interaction (e.g., negotiation of meaning and focus on form) that are considered essential for sustained language development remains an issue yet to be fully investigated. Moreover, the design of tasks that effectively utilize the unique combination of affordances made possible by 3-D virtual worlds including avatars and user-created content offers a promising area for study. Research that explores these issues offers the prospect of identifying the key features of the communicative context made possible by virtual worlds that can facilitate language learning in the online domain.

NOTE
1 The author is grateful to an anonymous reviewer for this insight.

REFERENCES


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Mark Peterson received his PhD in linguistics from the University of Edinburgh and is an Associate Professor at the Graduate School of Human and Environmental Studies Kyoto University, where he teaches courses on computer-assisted language learning. His current research explores the use of network-based virtual worlds and massively multiplayer online role playing games (MMORPGs) in language education.

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