the jaltcalljournal

ISSN 1832-4215
Vol. 14, No.3 Pages 225–238

3D digital games, virtual worlds, and language learning in higher education: continuing challenges in Japan

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Past research on digital games and virtual worlds suggests that these platforms provide multiple benefits for language learning, including positive effects on motivation and opportunities for authentic learner interaction. Despite this, adoption of these platforms in classrooms appears largely nonexistent. We provide a review of research on the use of games and virtual worlds in language learning and report on the results of a recent survey and series of interviews with university language teachers in Japan. Analysis provides insight into the challenges of adopting technology in language teaching and on the types of platforms that may ultimately see wide adoption.

Keywords: Digital games, virtual worlds, technology adoption, Japanese higher education.

Introduction

In the field of second language education, one area of research that has received considerable attention in recent years, especially regarding new teaching methodology, is computer-assisted language learning (henceforth, CALL), due largely to the rapid advances in digital technologies over the past several decades. Language educators were among the early adopters of computer technology, and their pioneering work lead to the development of CALL as a distinct field of research and practice. This interest has continued to the present and the expansion in research has been noted in the literature (Chun, 2016). CALL encompasses the study of a variety of different methods for using computer technology to enhance language learning, and one of the most

influential developments in contemporary CALL research concerns the use of multiuser 3D virtual worlds and digital games (Lai, Ni, & Zhao, 2013; Peterson, 2013; Sadler, 2012). Both types of platforms are usually run on standard internet-connected desktop or laptop computers and provide learners with the ability to operate a character (sometimes referred to as an "avatar") in a richly detailed and expansive three-dimensional virtual space. In these environments, learners typically have wide latitude to explore, observe, act, pursue goals, engage in creative expression, and collaborate with other participants. In addition to providing a virtual space, 3D digital games are distinguished from virtual worlds by their incorporation of game elements, such as explicit goals and a reward system. A genre of games that has attracted interest by researchers in second language acquisition (henceforth SLA) is that of massively multiplayer online role-playing games, more commonly known as MMORPGs, in which thousands of players may simultaneously interact in a shared environment as they complete game tasks known "quests" for enjoyment and to advance the ranking of their characters. Examples of platforms that have been used in empirical research studies include *World of Warcraft*, an MMORPG that places users in a high fantasy world reminiscent of the works of J. R. R. Tolkien, and *Second Life*, a virtual world that places users in a modern environment of buildings, city streets, parks, and other areas that somewhat resemble the real world. In between these two platforms is *Minecraft*, which provides a whimsical environment in which all material appears as large blocks. In its standard variation, *Minecraft* does provide features enabling the platform to be construed as a game, however in educational contexts it is more commonly used simply as a highly manipulatable virtual world (Swier, 2014).

Research in this area has been elicited by the emergence of a substantial and growing body of work indicating that these environments provide access to conditions where language learning may occur (Peterson, 2017), and many positive results and rationales have been described in the literature to support the use of games and virtual worlds for language learning. And yet despite these results, even a casual familiarity with university-level language education courses is sufficient to conclude that the prevalence of digital games and virtual worlds remains extremely limited. The use of digital games and virtual worlds in formal language learning contexts, like any other innovation that is implemented in software, requires the effective integration of computer technology. In the Japanese context, one of the foremost looks at the adoption of computer technology in higher education comes from Jane Bachnik's edited volume *Roadblocks on the Information Highway: The IT Revolution in Japanese Education* (Bachnik, 2003), which documented a widespread belief in the value of information technology among stakeholders in education and uncovered many of the institutional, cultural, and practical obstacles facing its increased adoption. However, in the years since *Roadblocks* was published, there have been developments that may have affected the integration of information technology in Japanese higher education. We might therefore wonder what, if anything, has changed over the years, whether the barriers identified by Bachnik are still in place, and whether these have been a factor in limiting the adoption of digital games and virtual worlds in learning classrooms.

We will first provide a review of previous academic work and motivations for the use of 3D digital games and virtual worlds in language education before examining the context of higher education in Japan and the conditions that may discourage use of these types of innovations. To explore the issue further, we then report on a recent survey and series of interviews regarding the attitudes and experiences of university language teachers working in Japan. Our findings will suggest that many significant hurdles remain to the adoption

of large innovations in classroom practice, particularly those that relate to the use of computer technology and non-traditional methodologies such as the use of games. We will conclude by considering whether games and virtual worlds will ever see common usage in language learning classrooms and provide some insight on the types of innovations that are most likely to be put into practice.

Rationales for the use of 3D games and virtual worlds

The promise of 3D digital games and virtual worlds lies in their potential for inspiring learner motivation and willingness to communicate while also providing an effective environment for engaging in that communication. The versatile 3D virtual environments of these platforms are believed by many researchers to provide opportunities to take actions and engage tasks that would otherwise be difficult or impossible to accomplish while seated in a standard university classroom. Researchers have drawn on developments in contemporary SLA theory to assert that features of these environments may support language learning (Thorne, Black, & Sykes, 2009). The most influential rationales proposed to justify the use of these environments draw on accounts of SLA that privilege the role of interaction in language learning (Peterson, 2011; Reinhardt & Sykes, 2012). It is claimed that from the perspective of cognitive accounts of SLA, these environments provide exposure to the target language in a context conducive to learning (Zhao & Lai, 2009). Researchers emphasize the importance of findings reported in learner-based research, suggesting that because many virtual worlds and digital games are designed to compel learners to undertake purposeful, real-time interaction in the target language, they provide opportunities to encounter communication issues relating to meaning (Lan, Kan, Sung, & Chang, 2016; Milton, Jonsen, Hirst, & Lindenburn, 2012; Wigham & Chanier, 2013). This aspect is perceived as supporting vocabulary acquisition (Rankin & Shute, 2010), as it enables individual learners to engage in forms of interaction involving feedback and the production of modified target language output that are identified as playing a central role in language learning (Long, 1996). Proponents of the cognitive rational also draw attention to research involving use of digital games that has produced findings indicating that vocabulary learning may be enhanced when digital games and virtual worlds are integrated into regular classroom activities (Hitosugi, Schmidt, & Hayashi, 2014; Liou, 2012) or are used in combination with supplementary materials (Miller & Hegelheimer, 2006; Ranalli, 2008).

Another major element of the cognitive rationale focuses on affective factors. Researchers who advocate the use of these environments assert that the presence of individual avatars and persistent virtual worlds that incorporate high quality graphics serve to promote engagement, emotional investment, and immersion (Cooke-Plagwitz, 2008; Liou, 2012). Researchers also claim that the anonymity provided by the use of pseudonyms supports the risk-taking that plays an important role in language acquisition (Bytheway, 2014; Jauregi, Canto, de Graaff, Koenraad, & Moonen, 2011). It is further noted that this feature may act to reduce barriers to learning, such as anxiety (Melchor-Couto, 2017; Wang, Deutschmann, & Steinvall, 2013). Moreover, supporters of this rationale draw attention to research indicating that the learner-centered nature of these environments facilitates the development of autonomy (Collentine, 2011; Suh, Kim, & Kim, 2010). Findings reported in the literature suggest that the above aspects of these environments combine to facilitate participation (Deutschmann, Panichi, & Molka-Danielsen, 2009), willingness to communicate (Reinders

& Wattana, 2011, 2014, 2015), and motivation (Lan et al., 2016; Wehner, Gump, & Downey, 2011).

Accounts of SLA that emphasize the social nature of language learning represent a further source of support for the use of these environments in CALL. Researchers assert that from this perspective, many virtual worlds and digital games are particularly promising venues for CALL as they are frequently designed to elicit social interaction, providing access to contexts where language learning may occur (Peterson, 2016; Sykes, Oskoz, & Thorne, 2008). Proponents of this view draw attention to research indicating that digital games and virtual worlds that are designed to facilitate teamwork and other forms of collaboration can offer learners opportunities to engage in authentic and potentially valuable forms of target language dialogue (Liang, 2012; Peterson, 2012; Zheng, Bischoff, & Gilliland, 2015; Zheng, Young, Wagner, & Brewer, 2009). In this context, studies suggest that the online communities associated with many digital games and virtual worlds provide low-risk venues where learners can experience language socialization and participate in authentic peer-based collaboration in the target language (Lee & Gerber, 2013; Peterson, 2010, 2012; Rama, Black, Van Es, & Warschauer, 2012). Researchers claim that these environments provide language learners with opportunities to access zones of proximal development where language skills may be developed through target language interaction involving assistance from more capable peers (Sykes, Reinhardt, & Thorne, 2010; Thorne, 2008).

Table 1. Rationales for the use of 3D digital games and virtual worlds in CALL

Cognitive rationale	— Opportunities to engage in purposeful target language interaction facilitate negotiation of meaning and individualized learning — Anonymity reduces barriers to learning and fosters participation, motivation, and risk-taking
Social rationale	— Fosters social interaction in the target language — Facilitates membership in online communities supporting collaboration, teamwork, and language socialization — Low-risk environments offer opportunities to engage in peer-based dialogue providing exposure to zones of proximal development

These rationales and positive findings, summarized in Table 1, suggest that digital games and virtual worlds may provide advantages over conventional forms of learning. Although the bulk of studies thus far have been experimental in nature, some research has been conducted on the use of these environments in formal institutional settings (Blasing, 2010; Collentine, 2011; Deutschmann et al., 2009; Hitosugi et al., 2014; Liou, 2012; Reinders & Wattana, 2014, 2015; Suh et al., 2010; Wang et al., 2013; Wigham & Chanier, 2013). However, outside of military and corporate training programs, implementation in formal educational contexts remains extremely limited (Chik, 2012).

Information technology in the context of Japanese universities

The use of 3D digital games and virtual worlds in educational contexts requires both significant availability of computing resources and freedom for instructors to leverage those resources for innovative pedagogical methods. To what degree is the limited use of these

environments simply a consequence of longstanding obstacles to the use of technology in general? Here we review the three principle obstacles to the adoption of technology in Japanese higher education as identified by Bachnik (2003). A summary is shown in Table 2.

Table 2: Summary of major obstacles to the adoption of technology identified by Bachnik (2003)

Obstacle	Cause	Effect
Lack of technical support	Tendency to hire generalists rather than specialists for staff positions; reliance on informal "volunteer" faculty/staff for support	Faculty who wish to use computer technology receive little technical support; must often manage technical issues themselves
Institutional barriers to effective use of technology, including the internet	Bureaucratic approval process that requires ample precedent for new initiatives; prioritization of regulation and control over supporting innovative methods of teaching and learning	Computer equipment and access to the internet, even when available, become far less usable
Focus on technology itself, rather than on how to adapt pedagogical methods to incorporate technology effectively	Pedagogical methods that most effectively integrate technology are ignored because their student-centered nature is a direct challenge to the traditional top-down, teacher-centered organization of university education	Computer technology may be promoted and installed at universities, but effective integration of that technology into learning programs is rarely achieved or even contemplated

In Bachnik's view, the obstacles arise mainly from an impasse that has developed in Japan between administrators (in both government and at educational institutions) who enthusiastically promote the use of information technology as a matter of policy, and an entrenched bureaucratic structure that is highly resistant to any reforms that might affect the status quo. For Bachnik, the effective use of technology requires an educational system that is highly flexible, interactive, and centered around the students rather than the teachers. She writes that the pedagogies that have emerged to make effective use of technology nearly always involve approaches "which promote creativity, individuality, innovation, and leadership qualities" (2003, p. 9). But despite efforts by administrators to promote the use of technology, the implementations seen in Japan at the time of her writing are described as suffering from both a prior resistance to reform from the bureaucracy itself and a lack of consideration of just how extensive the reforms would need to be in order to realize the expected benefits.

Although Bachnik's observations are now over 15 years old, the type of technology considered is similar to what is currently required for most 3D games and virtual worlds. It is therefore not unreasonable to suggest that obstacles to the implementation of technology itself have been a contributing factor to the low adoption rate of these platforms. In order to explore the degree to which these obstacles may continue to be factors, as well as other possible reasons for the low adoption rate, in the next section we will discuss findings from

a recent survey and series of interviews with language teachers on their related attitudes, interests, motivations, and working conditions.

Findings and discussion

We adopted a primarily qualitative approach to data collection, with the largest data source consisting of semi-structured interviews with current language teachers. These interviews will form the primary basis for our findings. As a way of identifying suitable candidates and of gaining insight to guide interview sessions, we conducted a survey of university language teachers in Japan to explore on the following four key issues: teachers' views on the availability of computer equipment at the institutions where they teach, views on whether universities were generally supportive of innovative teaching methods, views on the state of academic research regarding 3D digital games and virtual worlds, and views on the benefits of using these platforms given the effort required to bring them into the classroom.

Several methods for distribution of the survey were considered. One option included distributing an online survey by email to faculty members listed as language instructors on university websites, a methodology that was recently used by Franciosi (2016). However, this method has the unfortunate property of excluding adjunct faculty members, who teach a large portion of language classes at many universities, but who are employed on part-time contracts and typically not profiled on university websites. In order to reach this population of teachers, a method of snowball sampling was adopted in which an initial group of twenty participants from the researchers' professional networks were asked to complete an optionally anonymous online version of the survey and forward the survey to friends and colleagues who were likely to fit the survey criteria. The initial participants consisted of both full-time and part-time teachers from twelve universities in the Kansai, Kanto, Chugoku, and Shikoku regions of Japan. The survey was also shared to several social media communities that were deemed likely to have a large percentage of members fitting the survey criteria. Although non-probabilistic sampling methods limit the applicability of the data to making quantitative conclusions about a population, this method was sufficient for the current analysis.

Each respondent was asked to complete 12 multiple choice background questions, 24 items based on a five-point Likert scale, and two open-ended questions. Based on whether the respondents indicated having experience using 3D games or virtual worlds with their students, respondents were directed to slightly different sets of questions to ensure that only those who had actually used the techniques before would be asked about their past experiences with the technology. The open-ended questions asked respondents to write about the reasons why they had chosen or not chosen to use digital games and virtual worlds in the classroom, and about the challenges they had faced or would expect to face in order to use these technologies. In a possible indication of how marginalized 3D games, virtual worlds, and other CALL approaches continue to be, a relatively low number of 42 respondents completed the survey, with eight of these respondents having previous experience using 3D digital games or virtual worlds in language learning settings. From these 42 respondents, 12 were selected for in-depth one-on-one interviews ranging from 30 to 60 minutes, conducted in-person or via video conference. The selection of interviewees was based primarily on whether the respondents indicated a willingness to be interviewed and on the depth and informativeness of their responses to the open-ended questions. Five of

the interviewees had significant experience with implementing CALL methodologies and/or non-digital games in the classroom. Of these five, three had used 3D games or virtual worlds, including *Second Life*, *Minecraft*, and the digital adventure games *Life is Strange* and *The Walking Dead*. The remaining seven interviewees had no experience with these methodologies.

In the remainder of this section, we will discuss our findings as they relate to the four key issues identified above, highlighting survey results to motivate discussion and reporting on interviews with current language teachers.

Are the necessary technology resources available?

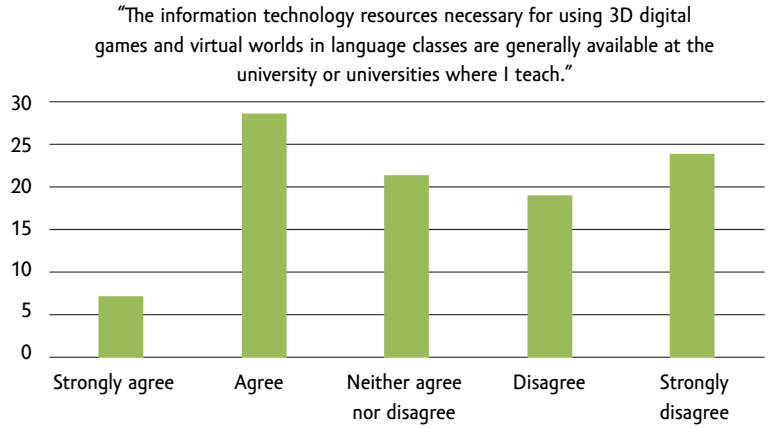

Figure 1: Percentage of responses to indicated Likert item on availability of computer technology

As shown in Figure 1, responses to a Likert item asking about the availability of the technology resources necessary to implement 3D games and virtual worlds showed a somewhat polarized range of opinion among the survey participants, with responses overall being slightly skewed toward the view that such resources are not in fact generally available. These responses include a range of experiences. Many respondents, of course, have never used or tried to use these methodologies, and 83% of respondents indicated that they did not know anyone who used 3D games or virtual worlds for teaching, so for these respondents, their view of computer resource availability may contain a degree of speculation. However, in response to open-ended questions about the reasons for not trying these technologies and about anticipated issues with their implementations, respondents who had not tried these innovations before cited equipment availability as a major concern, particularly in regard to scheduling access to computer labs. In interviews, there was clear agreement that the availability and usability of computer resources at universities is a significant hurdle. Although many universities have computer labs with machines and network infrastructure with the *capability* of running the software for 3D games and virtual worlds, none of the interviewees expressed confidence in their ability to persuade their institutions to acquire the necessary software or to install it on centrally administered computers. In the words of one interviewee: "My university would simply say 'no'". Another interviewee, a tenured

faculty member at a large private university in the Kansai area, relayed his experience of making a request to the IT administrators at his institution to install Windows Movie Maker, a free application which at the time was the main offering from Microsoft for adding basic video editing capabilities to Windows. The IT administrators declined, citing unspecified security vulnerabilities. The faculty member who made the request reported suspecting that a desire to limit workload and avoid any unnecessary complications were likely more influential factors in the decision, echoing the obstacles described by Bachnik. The faculty member did not pursue the matter, and the software was never installed. Finally, the interviewees who did have experience using these methodologies were all full-time university faculty members who used collections of computers over which they had administrative control, an arrangement that is impractical for most full-time university faculty members, and almost certainly impossible for adjunct faculty members.

Are universities generally supportive of innovative teaching methods?

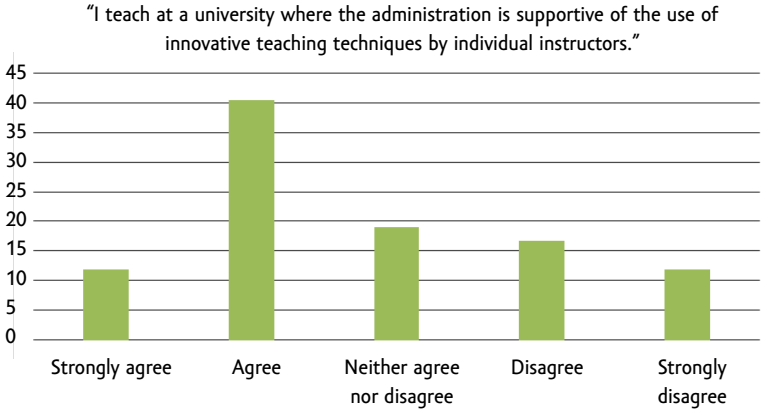

Figure 2: Percentage of responses to indicated Likert item on institutional support for innovation

The responses to the item shown in Figure 2 indicate that overall the respondents tended to feel that the universities where they worked were supportive of innovative teaching techniques. This feeling of supportiveness is significant because it may play a role in the decisions that individuals make on whether to pursue new teaching methods. However, in an open response question asking about the reasons for not having tried these technologies, fear of administrative disapproval emerged as a theme. As one part-time teacher wrote, "The folks at the top say we can customize lessons, but in reality, if you do, there is a kind of unconscious resistance and backlash." Additionally, participants who had experience implementing games (including non-digital games) or virtual worlds in the classroom indicated that they often did so quietly and largely without the knowledge of their colleagues. One key reason cited for this secrecy was a general feeling that their colleagues would not see these techniques as having educational value. "They think of games as just playing", is how one interviewee described the viewpoints of his colleagues. A second reason is that use of these techniques may sometimes be seen as inconsistent with the syllabi of the courses in question. Although interviewees reported using these techniques with language courses

that included the development of communicative competence as a goal, the prevailing viewpoint was that, perhaps due to a continuing stigmatization of both CALL and games, these innovations were so recognizably different from traditional approaches that they may be seen by colleagues or students themselves as being unacceptable, inappropriate, or lacking in academic value.

Does academic research make a difference?

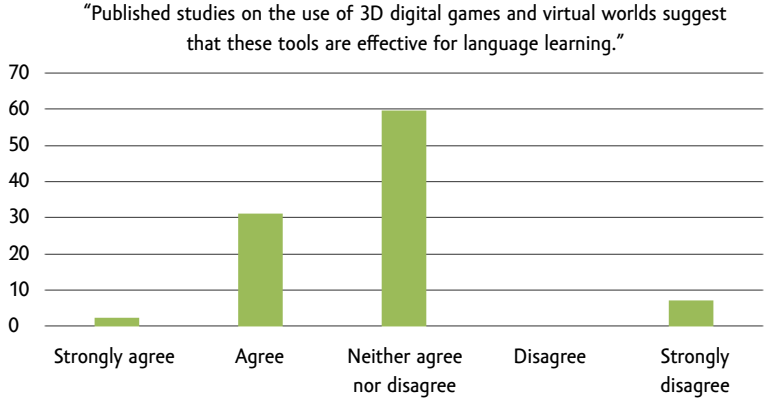

Figure 3: Percentage of responses to indicated Likert item on results of studies appearing in academic literature.

The respondents were largely noncommittal about what has been claimed regarding these methodologies in published academic studies, as shown in Figure 3. In interviews, the participants who had not used 3D digital games or virtual worlds before in their classes generally indicated that they had very little knowledge or interest in the related academic literature, while those who did have experience with these methodologies appeared to have greater familiarity with the literature, and in some cases, had conducted research on the subject themselves. There was broad agreement however, that while academic research was valuable, the results of academic studies were unlikely to be particularly persuasive to the majority of teachers. As one interviewee put it in a typical comment, "I don't think the research makes much difference. I don't think most teachers worry about that very much." A further consideration is that as the range of language education research has expanded, many positive results have emerged in many different subfields, including subjects that may be more familiar to typical teachers and less burdened by technological issues and other barriers associated with CALL applications. One survey respondent who had not used digital 3D platforms before stated, "I do not have a lot of intrinsic desire to delve into virtual worlds. To be honest, I think that VR could be a very powerful learning tool. That said, there are many paths toward student learning and I am choosing one that is more familiar to me." The importance of having a prior interest in these types of innovations was also reflected in the interview comments of teachers who had used these technologies before, with curiosity, prior experience as a learner, and a desire to experiment with the technology being cited as key factors that motivated teachers to use of these innovations with students.

Is the adoption of 3D games and virtual worlds worth the effort?

Table 3: Responses to survey items on the perceptions of non-users of the costs and benefits of 3D digital platforms, and on the satisfaction of teachers who have implemented these methodologies

	Respondents who had not used 3D platforms: *"The effort required to incorporate a 3D digital game and/or virtual world into one or more of my current classes is unjustifiable given the potential benefits for me."*	**Respondents who had experience using 3D platforms:** *"I am satisfied with the results of my efforts to incorporate a 3D digital game and/or virtual world into a language education class."*
Strongly agree	9 (28.1%)	1 (12.5%)
Agree	11 (34.4 %)	2 (25%)
Neither agree nor disagree	8 (25%)	2 (25%)
Disagree	4 (12.5%)	2 (25%)
Strongly disagree	0 (0%)	1 (12.5%)

As shown in Table 3, survey respondents who reported having no experience using 3D games or virtual worlds generally agreed that the benefits of incorporating these methodologies into even one of their classes was unjustifiable given the potential benefits, and the few respondents who did have experience implementing these methodologies did not report being more satisfied than unsatisfied overall with the results of their efforts. In interviews, teachers who had experience using 3D virtual platforms in classroom situations reported that implementation of these methodologies required significant effort. One full-time teacher reported that preparation to use a digital game one time in only one class turned into a nearly semester-long project to conduct tests of the software with volunteer students on computers in his office, troubleshoot technical issues, and prepare the necessary instructional material. Although the teacher felt that use of the game was both successful and productive for his students, he also found that the tradeoff was difficult to justify, commenting "maybe it wasn't the best use of time." For many teachers, especially those who teach part-time, the time, space, and research funds required for such preparations may be simply unavailable. A respondent who was a part-time teacher working at several universities described his situation as follows: "As a person trying to make a living by running between several different locations a day, sometimes in different cities, suddenly being put into a new class with a new plan, I have to weigh the effort/result ratio. In short, there is little incentive (or in fact there is disincentive) and time to ask for or try something new."

Conclusions

Our findings suggest that Japanese universities provide a challenging environment on many fronts for the use of 3D digital games and virtual worlds in language learning contexts. Among other issues, the teachers who shared their views on the survey and in interviews described needing to provide their own technical support, having difficulty

installing software or scheduling time to use computer labs, and feeling a sense of resistance from administrators and colleagues regarding the use of these teaching methodologies even in cases when the necessary computer equipment itself was available, suggesting that the principle obstacles identified by Bachnik (2003) continue to be factors. And in such an environment, which is already challenging for many techniques that use CALL methodologies, 3D games and virtual worlds may be faced with even greater challenges due to an ongoing stigma against games, as teachers who had tried these techniques (including, in some cases, with non-digital games) often described doing so quietly in the hope of avoiding the attention of colleagues and administrators. Our findings also suggested that working conditions, particularly of adjunct faculty members, may present challenges to the adoption of these technologies, as the teachers who were able to successfully use these techniques tended to be full-time employees who had access to office space and research funds that facilitated the necessary preparations. Finally, we found that the teachers who had experience using 3D games or virtual worlds in their classes tended to be those who had a strong prior interest in the technology, which may have provided motivation to overcome any difficulties encountered.

Given these challenges, we speculate that these platforms, in their current forms, are unlikely to ever see widespread adoption in Japanese higher education. What is more likely is that the research findings in this area and the experiences of educators who have adopted these techniques will inform future efforts. And as the technology continues to evolve, the idea of providing an immersive virtual space for language learner interaction may very well come to achieve wider adoption. For instance, innovations such as mobile computing and the bring-your-own-device model, where students use personal devices in class, may alleviate some of the challenges associated with centrally administered computer labs, and the more streamlined software typical of mobile devices may help address technical issues and other barriers to adoption (Godwin-Jones, 2011), although challenges remain (Gikas & Grant, 2013). Mobile devices may also help provide new ways of interacting with virtual features, such as *mixed reality* (Hawkinson, Mehran, & Alizadeh, 2017), in which virtual reality is combined with the real world. Regardless of the specific technological details, however, any innovations in this area that succeed in becoming widely adopted in educational contexts will likely be those for which the benefits are clear even to those who are not familiar with the associated academic research or motivated by a prior interest in the technology, and for which the skills and effort required to adopt the innovation do not present significant hurdles.

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