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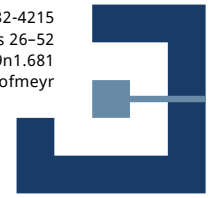

Castledown

Attitudes towards digital game-based language learning among Japanese university students

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The notion that digital games can be effectively employed as tools for learning and teaching has steadily been gaining traction among educational theorists and researchers, with numerous empirical studies pointing to the potential benefits of games for skill and knowledge development. However, a solid understanding of learners' attitudes and concerns regarding this relatively novel pedagogical approach is also necessary for effective implementation in formal learning contexts. It cannot be taken for granted that today's learners will accept game-based approaches simply because these learners tend to be more accustomed to advanced technologies than those of previous generations. The aim of this mixed-methods empirical study is thus to help elucidate learner beliefs and attitudes regarding digital game-based language learning with survey data collected from 112 undergraduate student participants at a large public university in Japan. The findings reveal that learners generally held positive attitudes towards DGBLL before taking part in any intervention and, after playing a cooperative digital game over six weekly sessions, reported stronger positive attitudes towards this pedagogical approach. In contrast to the results of earlier studies, gender was not found to be a statistically significant predictor of attitude towards DGBLL in this sample. However, two other demographic factors, namely information technology literacy and digital gaming experience, correlated positively with several measures of attitude. The learners considered enjoyment to be the most important advantage of using digital games for language learning. However, many also expressed doubts regarding the effectiveness of game-based language education.

Keywords: attitudes, digital game-based language learning (DGBLL), gender, Japan

Introduction

The potential of digital games as tools for learning and teaching foreign languages has long attracted the interest of computer-assisted language learning (CALL) practitioners and continues to inspire new research as such games become ever more popular and accessible across the world. An encouraging number of studies have found that certain digital games, including ones designed with no educational aims in mind, are able to effectively facilitate second language acquisition in various ways (see Acquah & Katz, 2020; Hung et al., 2018; Peterson, 2013, 2021; Peterson et al. 2020). Proponents of game-based learning argue that younger generations today, whom Prensky (2001) refers to as digital natives, are more amenable and open to fundamentally different forms of learning than previous generations, in whose lives technology did not play as pervasive a role. However, while developmental psychologists have long recognised the intimate connection between learning and play (Piaget, 1945), many learners still do not appear to value play as conducive to learning (Ke, 2008; Rieber, 1996). It cannot therefore be taken for granted that learners would accept digital game-based language learning (DGBLL) as a legitimate alternative or supplement to conventional learning and teaching methods, especially when the learning in question pertains to formal educational contexts.

Dörnyei and Ushioda (2011) draw attention to the important role that learners' attitudes towards tasks and the curriculum can play in strengthening their motivation to learn, which has in turn been demonstrated to lead to more positive outcomes in terms of second language (L2) proficiency (Masgoret & Gardner, 2003; Dörnyei, 2009). For this reason, it is important to gain a clearer understanding of learners' perceptions and beliefs regarding innovative new modes of learning and teaching, if these are to be effectively implemented into learning curricula in the future (Papaioannou & Charalambous, 2011; Sanford and Madill, 2007). Furthermore, since DGBLL holds the potential to facilitate learning outside of the formal classroom context as well (Reinhardt, 2019), further insight into learner attitudes towards game-based learning can help CALL researchers and practitioners to better understand and also to positively influence learners' choices of study methods in self-access environments as well as in the "digital wilds" of informal play contexts (Sauro & Zourou, 2019).

Literature review and theoretical framework

Attitudes towards the use of digital games in education

Previous studies have investigated the attitudes of different educational stakeholders towards the use of digital games for learning purposes in several different geographical contexts. In a large-scale quantitative study on learner attitudes conducted in Malta, Mifsud et al. (2013) surveyed 1,163 secondary school learners of English, as well as their teachers (n = 149) and parents (n = 783), in order to determine their attitudes towards the integration of digital game activities into the school curriculum. The results showed that a large majority (79%)

of the learners surveyed believed that digital games could be useful for learning, with the development of planning, problem-solving, and teamwork skills identified as the main benefits of in-class game activities. Teachers expressed equally positive views, with 78% of teacher respondents stating that games held the potential to facilitate learning. Furthermore, while only 9% of teachers reported having used games in their teaching prior to the study, the majority claimed that they were willing to use educational or entertainment-focussed digital games in class (74% and 61% respectively), as long as the games were relevant to the curriculum. Finally, most of the parents surveyed (83%) agreed that digital games were appropriate tools for classroom learning, but only 35% of parents stated that games designed for entertainment rather than education would also serve as effective learning tools. In another study conducted in Europe, Blume (2020) investigated attitudes and beliefs towards DGBLL among a group of pre-service EFL teachers in Germany. This researcher's findings showed that even though the teachers generally held positive attitudes towards the potential of digital games for language education, their own limited experience with games left them hesitant to integrate games into their teaching.

Further research on attitudes towards game-based language learning has been conducted in Asia. Chen et al. (2012) carried out a qualitative study in which 20 pre-service language teachers in Taiwan played the adventure game Back to the Future (Telltale Games, 2010) over a period of 12 weeks. Each teacher then wrote a report to reflect on the potential of adventure games for language learning, in which they generally expressed very positive attitudes towards DGBLL. The teachers highlighted the potentially positive effects of games on learner motivation, as well as the ability of games to facilitate L2 listening, reading, and vocabulary development. However, some teachers also pointed out that the game used in the study did not offer learners the opportunity to develop the productive language skills of speaking and writing. In a subsequent mixed-methods study, Chen and Yang (2013) asked 35 Taiwanese learners of English to play the adventure game Bone: Out from Boneville (Telltale Games, 2005) over a period of 16 weeks and then measured learning gains made as well as the learners' attitudes towards DGBLL. The findings of this study indicate that the learners were attracted to the story-driven element of the adventure game and generally felt positively towards the potential of digital games for language learning. However, some learners were more sceptical and pointed out that players may lose interest in the game if the level of challenge were inappropriate. Others felt frustrated about their lack of control over the speed at which the in-game dialogue and subtitles were presented, an aspect identified previously by deHaan (2005) as a potential limiting factor in using adventure games for language learning.

Bolliger et al. (2015) surveyed 222 undergraduate students enrolled in English language courses at a large private university in Japan to measure their perceptions towards the use of digital games for language learning. The researchers found that participants' views were generally positive, with 73% claiming that they would take university courses incorporating digital games. In response to open-ended questions about the advantages and disadvantages

of game-based learning, many participants stated that games were enjoyable and that they could be helpful in motivating learners to study, attend classes, and participate more actively in learning activities. However, the learners also expressed several concerns regarding the use of digital games in the language classroom. These included doubts about the effectiveness of games in producing successful learning outcomes, concerns about the potentially harmful impact that games may have on learners' health, and the concern that games may discourage social interaction in the classroom. In another study conducted in Japan, Wilson (2019) gave 109 low-proficiency undergraduate learners of English at another private university the opportunity to play the cooperative puzzle game Keep Talking and Nobody Explodes (Steel Crate Games, 2015) in class. This was followed by a conventional task-based learning activity in the subsequent class meeting. The learners were then given a short survey to describe how they felt about the DGBLL activity. Most of the learners rated the experience as positive and the majority even stated that they considered it to be more engaging and more or equally beneficial for the development of their L2 reading and speaking skills than the more traditional task-based class activities. In addition to these two studies, several smaller-scale studies conducted in other locations, such as in the United States (Miller & Hegelheimer, 2006; Rama et al., 2012) and Sweden (Sundqvist, 2015), have also reported that language learners generally enjoy learning with digital games.

In a final study, notable for the heterogeneity of its participants, Li (2019) analysed a dataset collected from 371 participants who all reported playing massively multiplayer online role-playing games in order to acquire new English vocabulary. The participants were spread across a large number of countries and spoke a total of 36 different first languages. The author used a path model research design to identify the main factors that influenced players' attitudes towards using games of this genre for language learning purposes and found the strongest predictor of positive attitudes to be the belief that a game presented good learning opportunities.

The effects of individual learner differences on attitudes towards DGBLL

In the field of second language acquisition (SLA), it is generally recognised that certain non-linguistic characteristics of individual learners can have a significant impact on learners' eventual L2 attainment (Gass et al., 2013). Chapelle (2001) points out that the same holds true for CALL, citing earlier studies that demonstrate the influence of individual differences among learners on the outcomes of specific instructional approaches (Abraham, 1985) as well as on the learners' acceptance of CALL in general (Chapelle & Jamieson, 1986).

In digital game-based learning too, previous research has indicated that individual difference factors may substantially affect learners' attitudes as well as learning outcomes. Several studies, for example, have investigated the effect of gender on attitudes towards games. Bonanno and Kommers (2008) surveyed 113 female and 57 male students enrolled in a biology course at a university in Malta and found that the male respondents were significantly

"less apprehensive to gaming than females and [felt] more confident when using and navigating through games" (p. 102). Female learners were also found to be more sceptical than their male counterparts about the educational potential of digital games, although this difference in attitude was not found to be statistically significant. The researchers concluded that on average, the male learners held very positive attitudes towards gaming, while the female learners reported less positive or neutral attitudes.

In another study, Bourgonjon et al. (2010) surveyed 413 female and 445 male students at a number of secondary schools in Belgium. The researchers found a weak but statistically significant relationship between gender and preference for digital games, with male learners reporting more positive attitudes towards the use of games. However, their results also showed that prior gaming experience was a much stronger predictor of positive attitude towards game-based learning than gender. Based on these findings, the researchers argue that fears about game-based education alienating female learners, as previously expressed by Carr & Pelletier (2009), are unfounded. They contend that the less positive attitudes towards games reported by female participants in some studies are simply the result of male learners being on average more experienced in playing digital games. For this reason, the impact of gender on learners' acceptance of game-based learning generally disappears soon after implementation in class (Ke, 2008; Papastergiou, 2009). The study by Bolliger et al. (2015) also supports this view, with the male respondents reporting significantly more gaming experience than their female counterparts, but with no significant differences found between males and females regarding beliefs about the educational potential of digital games or preference for their use in class.

Measurement of attitudes towards DGBLL

The Technology Acceptance Model (TAM) (Davis, 1989; Davis et al., 1989), along with its later iterations, have been empirically validated and widely employed by researchers across a diverse range of disciplines to investigate the acceptance of new technologies (Legris et al., 2003). Davis (1989) argues that a user's perception of the usefulness of a technology, along with their perception of the ease of using that technology, constitute the two main determinants for the user's behavioural intention, in other words whether the user will accept and use the technology. Extended forms of the model have been put to use in at least 50 separate studies to examine acceptance of digital games in a variety of contexts (Wang & Goh, 2017).

Bourgonjon et al. (2010) employed elements of the TAM in their study, but recognised that the generic nature of the model may render some of its constructs inappropriate for investigating certain learning contexts, technologies, and task characteristics (McFarland & Hamilton, 2006). For example, different constructs are necessary to measure users' acceptance of digital games when these games are regarded as means for achieving enjoyment and when the games are viewed as learning aids. Van der Heijden (2004) suggests that in the former case, which he describes as pleasure-oriented or hedonic in function,

the construct of perceived usefulness may be replaced by the construct of enjoyment. Bourgonjon et al. (2010) further note that the construct of ease of use can be problematic when measuring attitudes to games, as players tend to quickly become bored with a game once they perceive it as too easy. Instead, players generally seek a gaming experience that is neither too easy nor too difficult, but that causes them to experience a recurring sense of pleasant frustration. This is attained by means of the frequent successful completion of tasks experienced as challenging, but that lie within the bounds of the players' abilities (Gee, 2003). In an attempt to address the limitations of the original TAM, Bourgonjon et al. (2010) expanded the model and created a modified survey instrument to better suit the context of digital game usage in a formal educational environment. Bolliger et al. (2015), in turn, adapted the instrument created by Bourgonjon et al. (2010) for use in their own study by formulating questions to include a broader conception of digital games and by replacing the original five-point scale for Likert-type items with a four-point scale. The authors justify their removal of the neutral middle point on the scale by noting that Japanese learners tend to be culturally more inclined to avoid conflict (King, 2013) and that giving them the option to avoid expressing an opinion may therefore misrepresent their true views and thus bias the survey results. This method of forcing respondents to make a choice in Likert-type survey items has become generally accepted in current applied linguistics research (Mackey & Gass, 2016). The authors of the other studies described above developed and employed various additional survey instruments in order to measure learner attitudes towards game-based learning.

Research questions

As well as providing further empirical data to complement and to test the findings of earlier studies on learner attitudes towards DGBLL, this study aims to expand the scope of research in the field by adding additional perspectives on learner attitudes and beliefs. These include the potential effects of new individual learner differences factors as well as the possible impact of first-hand experience with in-class DGBLL on measures of learner attitudes. The study will thus aim to answer the following three research questions:

1. What attitudes and beliefs do Japanese university students hold towards DGBLL and do first-hand experience with in-class DGBLL affect these attitudes and beliefs?
2. Are certain non-linguistic characteristics of individual learners good predictors of their attitudes and beliefs towards DGBLL?
3. What do learners perceive to be the main advantages and disadvantages of DGBLL?

Methodology

Participants

Data from 112 learner participants are analysed in the study. All participants were enrolled in a four-year BA degree programme in English studies at an urban campus of a large national university in Japan at the time of data collection. 48.2% (n = 54) of the participants were in the first year of their studies and 51.8% (n = 58) were in the second year. 41.1% (n = 46) of the participants were male, while 58.9% (n = 66) were female. The ages of participants ranged from 18 to 23 years old, with a median age of 19. Of the participants who reported a standardised English proficiency test score obtained within two years before the data was collected (n = 85), most learners (n = 61) reported a score equivalent to CEFR level B2 (Council of Europe, 2021), indicating an upper-intermediate level of general English proficiency. Eight further learners reported a score equivalent to CEFR level B1, or intermediate, and the remaining 16 learners reported a score equivalent to CEFR level C1, or advanced. Scores on two measuring instruments, described in the instruments section below, indicate that most of the learners possessed a moderate degree of IT literacy as well as a moderate level of experience with playing digital games. In addition, a substantial minority of the participants reported previous experience with DGBLL, with 6.3% of participants (n = 7) reporting such experience in a classroom context and 21.4% (n = 24) reporting experience outside of the classroom. Eighteen of these participants described or mentioned examples of specific gamified language learning services and mobile phone applications that they had used in the past for the purpose of language learning, while only a single participant reported playing games designed primarily as entertainment products for this purpose. A large majority of the participants thus had no prior experience of in-class DGBLL.

Data collection and analysis

Data was gathered from student participants enrolled in two similarly structured mandatory English language courses taught by the researcher, one for first-year undergraduate students majoring in English studies and the other for second-year students in the same programme. The primary aim of both courses was to develop learners' general and academic oral communication skills in English, with the focus of the first-year course on general interest discussion topics and that of the second-year course on current affairs and contemporary social issues in Japan and abroad. Each course was attended by three separate class groups of about 20 students each, with 90-minute class meetings occurring once per week over a 15-week semester. A pre-intervention questionnaire was administered at the start of the first class session of the semester. A total of 121 students were invited to complete the questionnaire electronically by scanning a QR code link with their mobile phones. The purpose of the study was explained to all of the learners and those who chose to participate provided their informed consent before completing the survey. Learners were made

aware that, apart from the potential learning gains resulting from playing the game, their choice to participate or not and their performance in the game would have no bearing on their grades for the course. While not all learners completed the questionnaires, all of the learners chose to participate in the weekly play sessions.

The remaining time of the first class session was used to familiarise learners with the cooperative digital puzzle game Keep Talking and Nobody Explodes, which was integrated as a DGBLL component into the language course. The game requires players to work together in order to disarm a time bomb on the computer screen. Only one player may look at the bomb, while the other player or players have access to a Bomb Defusal Manual providing instructions on how to disarm the bomb. The goal is for players to work together to disarm the bomb before it explodes and this is achieved by means of effective communication. This particular game was not designed for education, but it was selected because it had previously proven popular with other groups of Japanese university students (Wilson, 2019) and also because of its demonstrated potential to facilitate SLA and to elicit ample spoken interaction from groups of learners during unstructured and informal play (Hofmeyr, 2021, 2022a, 2022b). Learners played the game in small groups of three or four, with one tablet computer preloaded with the game handed out to each group at the start of the session. Each learner was also given a printed copy of the Bomb Defusal manual. Groups were randomly assigned at the start of each class session and the learners were asked to communicate with each other only in English while playing the game. From the second class session onwards, learners spent roughly the first hour of the class engaged in more conventional speaking activities involving discussion and debate. In the final part of each class, usually lasting between 15 and 30 minutes, learners continued playing Keep Talking and Nobody Explodes in small groups, gradually mastering the easier levels of the game before progressing to the more challenging puzzles. As DGBLL has not yet been widely adopted in formal classroom settings in Japan or elsewhere (Swier & Peterson, 2018), it has been pointed out that the novelty of introducing game-based activities in class may temporarily skew participants' perspectives towards an unrealistically positive assessment of the potential educational benefits of games (All et al., 2016; Chen et al., 2020). In order to control for this possible novelty effect, an extended intervention timeline of six weeks was implemented in the research design. At the end of the sixth play session, all learners were invited to complete the post-intervention questionnaire in class.

A total of 113 learners completed all of the required items on both questionnaires. However, one of these participants was excluded from the study after consistent straightlining (Kim et al., 2018) was observed in their answers on the second questionnaire. As a result, data from 112 participants were included in the final analysis. Descriptive and inferential statistical procedures were employed to analyse the central tendencies and dispersion in quantitative responses. To describe the participants' baseline attitudes towards DGBLL, means and standard deviations were calculated. To measure the effect of the

intervention, paired samples t-tests were carried out using the pre- and post-intervention attitude means. In order to determine the influence of individual difference variables on the attitude variables, independent-samples t-tests, Pearson correlation coefficient analyses, and chi-squared tests were performed. For the sake of simplicity, only the pre-intervention results are considered in the section of the analysis dealing with individual difference factors. Responses to open-ended questions were analysed by means of thematic analysis. To this end, a coding framework was devised based on an initial review of learners' responses. Appropriate labels were assigned to thematically similar or closely related responses, after which each response was sorted into an appropriate category, following Braun and Clark (2006).

Instruments

Two original questionnaires were created to gather the data analysed in this study. The first questionnaire included a series of items to collect demographic data from participants. The demographic variables include the participants' year group, gender, age, level of English proficiency, and previous experience with DGBLL. In addition, data on each participant's general information technology (IT) literacy as well as on their level of experience with digital games were collected. IT literacy was measured by means of a list of ten can-do statements evaluating a range of skills from the elementary level, such as sending an email, to the advanced level, such as proficiency in a programming language. Digital gaming experience was measured by asking participants to report by means of three five-point scales the total number of digital games that they had ever played, the average number of hours per week that they spent playing digital games, and the number of years for which they had actively been playing such games. The aggregate mean scores for these three subscales were taken to indicate the participants' digital gaming experience.

Taking into consideration the limitations of TAM as a measure of learner attitudes towards DGBLL, a new and simplified model was devised specifically to fit this purpose. In this new model, learner attitudes towards DGBLL consists of four constructs: intuitive attitude towards DGBLL, attitude towards the effectiveness of DGBLL, attitude towards the efficiency of DGBLL, and attitude towards the enjoyability of DGBLL. Intuitive attitude refers to the learner's general feeling towards this method of learning, without focussing on any specific aspect or reason for the feeling. Attitude towards effectiveness represents the extent to which learners believe that the approach can facilitate language learning, while attitude towards efficiency represents the extent to which learners think that DGBLL will facilitate SLA in a time-efficient manner. Attitude towards enjoyability indicates how much pleasure learners expect to derive from engaging in DGBLL. Each of these four constructs were measured by means of four statements on a six-point Likert scale, with participants asked to indicate their level of agreement with each statement ranging from strongly disagree to strongly agree. The aggregate mean score for the four items of each construct was utilised to represent the total score for that construct. On the

digital questionnaire, these sixteen items were displayed in random order, with two of the items for each construct negatively worded in order to control for straightlining. A second researcher with relevant knowledge of the field was asked to review the content of each item and modifications were made based on their comments, following best-practice guidelines by Richards et al. (2012) for improving content validity. Furthermore, once the data for the first survey had been collected, a Chronbach's alpha score was calculated for each attitude construct in order to test the reliability of this part of the instrument. An internal consistency score of greater than .80 was obtained for all four constructs, indicating acceptable levels of internal consistency (Richards et al., 2012).

In addition to the four main attitude constructs, participants were also asked to indicate on a 6-point Likert scale the extent to which they believed DGBLL to hold the potential to improve nine specific aspects of SLA, namely listening, speaking, reading, writing, vocabulary, grammar, pronunciation, spoken fluency, and practical communication skills. The learners were also asked to indicate which types of learning environments they believed to be appropriate for DGBLL, with the three options provided being formal language classrooms, semi-formal environments, such as self-access learning centres, and informal environments, such as at a learner's home. In addition, learners were asked to indicate which category of games they believed to be appropriate for DGBLL, those designed primarily for education or those designed mainly for entertainment. Learners were not asked to rank their responses to the previous two questions, but simply to state whether each type of learning environment and game category were appropriate or inappropriate. Finally, learners were invited to reflect on the main advantages and disadvantages of the DGBLL approach by means of two open-ended questions.

The second questionnaire contained the exact same items as the first questionnaire, with only the demographic variable question section omitted. Both surveys were first written in English and then translated into Japanese by a qualified professional translator. Participants had the option of completing the digital questionnaires in either language and could change their language choice at any point while the survey was in progress. The open-ended answers that were completed in Japanese were translated into English by the researcher prior to the analysis.

Results and discussion

Attitudes of participants towards DGBLL

Table 1. Participants' attitudes towards aspects of DGBLL before and after intervention

Variable	Baseline		Post-intervention				
	M	*SD*	*M*	*SD*	*t*(111)	*p*	Cohen's *d*
General attitude towards DGBLL	4.92	0.78	↑4.98	0.73	−0.788	.432	0.773
Attitude towards effectiveness	4.73	0.77	↑5.02	0.83	−3.846	<.001	0.805
Attitude towards efficiency	4.36	0.90	↑4.83	0.90	−6.061	<.001	0.830
Attitude towards enjoyability	5.17	0.64	↑5.37	0.70	−3.205	.002	0.663
Potential to improve listening	4.56	0.83	↓4.43	1.05	1.347	.181	1.052
Potential to improve speaking	3.93	1.11	↑5.00	0.95	−10.117	<.001	1.121
Potential to improve reading	4.42	0.97	↑4.53	1.09	−0.879	.381	1.290
Potential to improve writing	3.54	1.09	↓3.30	1.29	1.692	.093	1.452
Potential to improve vocabulary	4.96	0.82	↓4.70	0.97	2.798	.006	1.013
Potential to improve grammar	3.95	1.06	↓3.57	1.11	3.186	.002	1.246
Potential to improve pronunciation	4.16	1.02	↓4.08	1.08	0.636	.526	1.337
Potential to improve spoken fluency	3.98	1.18	↑4.62	1.11	−4.621	<.001	1.452
Potential to improve practical communication	4.23	1.16	↑5.04	1.10	−6.206	<.001	1.385

Note: N = 112. Scale ranging from 1 – strong negative attitude to 6 – strong positive attitude.

The first four baseline values shown in Table 1 each represents the mean score for the entire group of participants for one of the four component constructs of learner attitudes towards DGBLL before the in-class intervention. A mean score smaller than 3.50 indicates a negative attitude, while a mean score greater than 3.50 indicates a positive attitude. All four of the baseline value means are well above this threshold, indicating that before the intervention, on average, learners already held positive intuitive attitudes towards DGBLL in general, and also towards the effectiveness, efficiency, and enjoyability of DGBLL. Of the four constructs, the baseline mean was the lowest for attitude towards the efficiency of DGBLL (*M* = 4.36), indicating only slight agreement that DGBLL constitutes a time-efficient method of learning. The baseline mean was the highest for attitude towards enjoyability (*M* = 5.17), indicating moderate to strong agreement that DGBLL is an enjoyable activity. Prior to the intervention, the participants

also reported positive beliefs on average regarding the potential of DGBLL to facilitate each of the nine aspects of SLA included in the questionnaire. They expressed only a slight degree of confidence in the ability of DGBLL to improve L2 writing skills (M = 3.54), speaking skills (M = 3.93), grammar (M = 3.95), and spoken fluency (M = 3.98), while reporting stronger positive beliefs about the potential of DGBLL to strengthen pronunciation (M = 4.16), practical communication (M = 4.23), reading skills (M = 4.42), and listening skills (M = 4.56). The participants believed the aspect of SLA for which DGBLL holds the most potential to be vocabulary acquisition (M = 4.96). Overall, analysis of this data indicates that the university-aged learners already held generally positive attitudes and beliefs towards DGBLL before the intervention, thus supporting the findings of Bolliger et al. (2015), Wilson (2019), Li (2019), and others.

After the six-session intervention through which all of the participants gained substantial first-hand experience in in-class DGBLL, they reported a mean level of positive intuitive attitude towards DGBLL similar to that reported before the intervention. However, their attitudes towards the effectiveness, the efficiency, and the enjoyability of DGBLL were all significantly more positive (p < .01) after the intervention than had been the case before the intervention, with effect sizes ranging from moderate to large. Five of the post-intervention measures of participants' beliefs about the potential of DGBLL to facilitate SLA also differed significantly (p < .01) from the pre-intervention results. Beliefs about the potential of DGBLL to improve L2 vocabulary and grammar were significantly less positive after the intervention, while beliefs about the potential of this approach to improve L2 speaking, fluency, and practical communication skills were significantly more positive. In all five of the cases, the effect sizes were large. These findings indicate that the experience of playing this particular game over six weeks in class affected the learners' attitudes and beliefs about how and to what extent DGBLL in general can facilitate SLA, generally in a positive direction.

Table 2. Participants' beliefs regarding the suitability of three different learning contexts and two broad categories of games for DGBLL

		Baseline		Post-intervention	
		n	**%**	***n***	**%**
Suitable learning context	Formal	60	53.57	↑67	59.82
	Semi-formal	75	66.96	↓74	66.07
	Informal	88	78.57	↓65	58.04
Suitable game category	Education-focussed	68	60.71	↑81	72.32
	Entertainment-focussed	88	78.57	↓82	73.21

Note. N = 112.

Table 2 shows that before the intervention, slightly more than half of the participants (53.57%) considered a formal classroom setting to be a suitable venue for DGBLL. A larger number of learners (66.96%) considered a semi-formal

learning context, such as an on-campus self-access learning centre, to be suitable, while over three quarters of the learners (78.57%) considered an informal learning context, such as a learner's home, to be suitable. After the in-class intervention, a larger number of learners (59.82%) believed a formal learning context to be an appropriate venue for DGBLL. This may be the result of having had a positive first-hand experience of DGBLL in such a context. Interestingly, there was a sharp drop in the number of learners who considered informal learning contexts to be suitable for DGBLL after the intervention (58.04%). The reason for this decrease is unclear, but one possible explanation is that a number of participants came to believe during the intervention that the teacher played an important role in the success of the DGBLL activity by managing participation and enforcing the English-only rule during play.

Another interesting finding concerns learners' beliefs about which kinds of games are suitable for DGBLL. Prior to the intervention, considerably more learners (78.57%) believed that games designed primarily as entertainment were suitable for DGBLL purposes than the number of learners who believed that games designed specifically for foreign language learning were suitable (60.71%). However, after the intervention, the number of learners who found entertainment-focussed games suitable decreased to 73.21%, while those who found education-focussed games suitable increased to 72.32%. The reason for this change is not clear either. It may be the case that in spite of reporting greater confidence in the effectiveness and efficiency of DGBLL after the intervention, learners were nevertheless left with the impression that a game designed for education would be more focussed. This interpretation is supported by the participants' responses to the open-ended questions, which are discussed in a later section. One can further speculate that the addition of supplemental tasks or materials to focus learners' attention on specific target L2 structures before, during, or after play, as Miller and Hegelheimer (2006) as well as others have suggested as best practice, may have increased the learners' positive perceptions of the use of entertainment-focussed games for DGBLL.

Individual differences as predictors of attitude towards DGBLL

No significant correlations were found between the population variables of year group, gender, age, and English proficiency, on the one hand, and any of the baseline attitude variables, on the other. However, significant correlations were found between the population variables of IT literacy and digital gaming experience, and several measures of attitude. IT literacy scores correlated positively with intuitive attitude towards DGBLL, $r(110) = .242$, $p = .01$, and attitude towards the enjoyability of DGBLL, $r(110) = .317$, $p < .001$, as well as with beliefs about the potential of DGBLL to improve reading skills, $r(110) = .213$, $p = .024$, and vocabulary, $r(110) = .211$, $p = .026$. Digital gaming experience scores also correlated positively with general attitude towards DGBLL, $r(110) = .276$, $p = .003$, attitude towards the efficiency of DGBLL, $r(110) = .199$, $p = .035$, attitude towards the enjoyability of DGBLL, $r(110) = .337$, $p < .001$, as well as with beliefs about the potential of DGBLL to improve reading skills, $r(110) = .217$,

p = .022. The degree of correlation is moderate between both population variables and the variable of attitude towards enjoyability, while for the remaining variables, the degree of correlation is small. These findings suggest that learners with a higher degree of IT literacy as well as learners with more digital gaming experience are more likely to hold positive attitudes and beliefs towards DGBLL, especially in terms of expected enjoyability.

It is interesting to note that the above results support those of Bolliger et al. (2015), who found no significant differences between the preferences expressed by male and female learners in Japan towards DGBLL. These results stand in contrast to those of the earlier studies by Bonanno et al. (2008) and Bourgonjon et al. (2010), whose findings indicated that male learners in Malta and Belgium were significantly more likely than their female counterparts to prefer game-based learning. One possible reason could be that female learners in Japan are more open to DGBLL than female learners in Europe. Another explanation could be that over the past ten years, learners have gradually become more accepting of technology or games for educational purposes. It is also worth noting that while no significant relationship was found between gender and IT literacy in this study, male participants (M = 3.12, SD = 1.30) reported significantly greater levels of digital gaming experience than female participants (M = 2.22, SD = 0.80), $t(68.75) = 4.20$, $p < .001$, $d = 1.036$. This finding again mirrors the results of the earlier study by Bolliger et al. (2015). The lack of a significant difference in attitudes between male and female participants is somewhat surprising, considering that the male participants reported significantly more digital gaming experience than the female participants and that more digital gaming experience is associated with more positive attitudes towards DGBLL. The relationships among these variables are clearly complex and further study will be necessary to better understand the possible causal relationships involved.

In spite of the lack of a significant relationship between gender and the attitude variables discussed above, chi-squared tests revealed significant differences between the male and female participants' beliefs regarding suitable learning contexts for DGBLL and also regarding suitable categories of games. Female participants were more likely than male participants to regard informal learning environments as suitable venues for DGBLL, X^2 (1, N = 112) = 5.114, p = .024. Gender was not found to have had a significant effect on suitability judgements regarding formal or semi-formal learning environments. Female participants were more likely than male participants to have regarded education-focussed games as suitable for DGBLL, X^2 (1, N = 112) = 5.436, p = .020, while gender was not found to have had a significant effect on beliefs regarding the suitability of entertainment-focussed games. These findings may be taken to suggest that the female respondents were in general slightly more conservative in their attitudes towards learning than the male learners, as a larger proportion of females reported beliefs to the effect that informal learning environments and education-focussed games were suitable for DGBLL. However, the facts that the female learners did not believe the language classroom to be a less appropriate place for DGBLL than male learners did and that they did

not consider entertainment-focussed games to be less appropriate for DGBLL activities than their male counterparts do cast some doubt on this interpretation. Further research thus will be necessary here too in order to arrive at more definite conclusions.

Perceived advantages and disadvantages of DGBLL

Table 3. Five most commonly perceived advantages and disadvantages of DGBLL reported by participants before and after intervention

	Pre-intervention	%	Post-intervention	%
Perceived advantages of DGBLL	1) enjoyment	61.82	1) enjoyment	73.56
	2) ease and comfort	25.45	2) effectiveness for SLA	11.49
	3) positive effect on motivation	17.27	3) positive effect on motivation	10.34
	4) effectiveness for SLA	11.82	4) ease and comfort	6.90
	5) exposure to practical or authentic language	10.00	5) social dimension	2.30
Perceived disadvantages of DGBLL	1) ineffectiveness for SLA	31.96	1) ineffectiveness for SLA	30.88
	2) limited quality and range of language	18.56	2) limited quality and range of language	13.24
	3) health concerns	14.43	3) opportunity to avoid learning	8.82
	4) learners' negative perceptions of games	7.22	4) health concerns	8.82
	5) opportunity to avoid learning	6.19	5) inefficiency for SLA	7.35

Note. Open-ended questionnaire items were optional and were not completed by all learners. Percentages indicate proportions of complete answers to each questionnaire item related to the advantage or disadvantage stated. Pre-intervention advantages $n = 110$. Post-intervention advantages $n = 87$. Pre-intervention disadvantages $n = 97$. Post-intervention disadvantages $n = 68$.

In response to the open-ended question on the pre-intervention questionnaire asking participants to describe what they perceived to be the main advantages of using digital games for language learning, the majority of those who responded to this item (61.82%) mentioned that DGBLL makes learning enjoyable, fun, or exciting, with some adding that the enjoyment aspect may facilitate learning. The proportion of learners who gave this answer increased to 73.56% after the intervention. Before the intervention, a substantial number of participants also mentioned points relating to the ease or comfort of learning with games (25.45%), including the reduction of stress or anxiety. Other advantages reported were the potential of games to motivate learners to continue to improve their L2 skills (17.27%), the effectiveness of games for developing specific L2 skills (11.82%), and the perception that games may expose learners to practical or authentic L2 usage (10%). After the intervention, a smaller proportion of participants mentioned effectiveness for SLA and effects on motivation, and only a small number mentioned ease and comfort. Two learners

also mentioned that certain games facilitate cooperation or communication with others. These findings closely resemble those of Bolliger et al. (2015), who reported that learners at a private university in Japan also considered enjoyment, a positive influence on motivation, and benefits to learning to be the main advantages of DGBLL.

In response to the open-ended question about the disadvantages of DGBLL, participants' responses were more varied. The most common disadvantages listed relate to doubts about whether learning with digital games could be effective or as effective as conventional teaching methods for developing L2 skills, with 31.96% of participants raising such concerns before the intervention and 30.88% after the intervention. Many of the comments revealed lingering doubts as to whether an activity that is enjoyable can really be educational. One learner articulated this concern as follows: "When the game becomes the main focus, one deviates from the true goal of learning." The fact that a substantial minority of learners expressed such reservations is somewhat surprising, as it stands in contrast to the general picture of strong acceptance towards DGBLL among learners that emerged from the data described up to this point, with the only notable exception being the finding that a mere 60% of the learners considered the classroom to be a suitable place for DGBLL after the intervention. Other disadvantages of DGBLL mentioned by multiple participants before the intervention included the limited quality and range of language that players are likely to encounter in a game (18.56%), mental and physical health concerns, such as addiction and damage to players' eyesight (14.43%), and the perception that some learners simply do not like digital games or may find them too difficult (7.22%). Another interesting disadvantage that several participants mentioned before and after the intervention is that playing games can make it easier for learners to avoid learning in class, for example through the clandestine use of the device for other, unrelated, purposes or by speaking in their L1 when the teacher is elsewhere occupied. Finally, while the distribution of perceived disadvantages did not change much after the intervention, a number of learners did express concern that unstructured DGBLL may be an inefficient method of learning. As with the perceived advantages, the results here are very similar to the findings of Bolliger et al. (2015), whose participants reported lack of effectiveness for SLA, detrimental effects to mental and physical health, and inefficient implementation in class as their main points of concern regarding DGBLL.

Conclusion

The learners who participated in this study generally held positive attitudes towards DGBLL even before the in-class intervention, which was for the large majority their first experience with this approach to language learning. They considered DGBLL to be an effective and enjoyable way to learn, and also held an intuitively positive attitude towards the approach in general. To a slightly lesser extent, they also considered DGBLL to be efficient. Before the intervention, just over half of the learners considered the language classroom to be an

appropriate context for DGBLL, while over three quarters of the learners considered an informal play context to be appropriate for such activities. In addition, a large majority of learners considered games made for entertainment to be appropriate for language learning, while a smaller majority considered games made with educational goals in mind to be appropriate. These results lend further support to the view that learners today tend to be open to the concept of DGBLL, as previous studies conducted in Japan and elsewhere have also concluded. Furthermore, by supplementing the findings obtained from a sample of learners at a private Japanese university by Bolliger et al. (2015) with similar findings from learners at a public Japanese university, who are likely to differ from the private university sample in terms of socioeconomic background, this study strengthens the case for generalising the results to the entire population of Japanese young adult learners.

After having experienced DGBLL in class for six weeks, the participants' positive attitudes towards the effectiveness, the efficiency, as well as the enjoyability of this approach had increased significantly. The post-intervention data also shows that learners' views regarding the specific aspects of SLA that DGBLL may facilitate had changed, towards a much more positive perception about the potential of the approach to improve L2 speaking skills and a less positive perception about its potential to improve knowledge of grammar. Furthermore, a larger majority of learners now considered the formal classroom context to be suitable for DGBLL, while the proportion of learners who considered an informal context to be appropriate showed a sharp decline. Although large majorities still believed that both entertainment- and education-focussed games were suitable for DGBLL, the proportion who thought the former to be suitable had decreased and the proportion who thought the latter to be suitable had increased. These results suggest that first-hand experience with DGBLL in class influences learners' attitudes and beliefs towards the approach. It is not possible to make generalisations from this data about the direction or the degree to which learner attitudes will be influenced, as this will clearly depend on the particular nature of their in-class DGBLL experience. However, we may venture to say that a generally positive experience is likely to result in more positive attitudes.

IT literacy and experience with digital games were the only two individual characteristics of learners that were found to correlate with attitudes towards DGBLL. Learners with a higher degree of IT literacy and learners with more digital gaming experience were both more likely to hold positive attitudes and beliefs towards the approach. Unlike some previous studies, the current study found no significant relationship between the gender of participants and their attitudes towards DGBLL. This applies to attitudes towards the effectiveness, efficiency, and enjoyability of DGBLL, as well as to beliefs regarding specific benefits to SLA. However, a greater proportion of female participants regarded informal learning environments and education-focussed games as suitable for DGBLL.

Participants generally believed the enjoyability of games to be the main advantage of the DGBLL approach, with a large majority mentioning this point

after the intervention. Ease and comfort, positive effects on learner motivation, the potential of games to facilitate SLA, and exposure to practical or authentic language were also identified as advantages. A lesser degree of consensus was apparent regarding the disadvantages of the approach, but a substantial number of learners expressed concerns that DGBLL might be ineffective or less effective than conventional teaching approaches. The perceived limits on the quality and range of language content present in games, concerns about mental and physical health, learners' negative attitudes towards games, and the perception that games may make it easier for some learners to avoid learning were also identified as potential disadvantages.

Overall, the findings of the study should encourage language teachers, curriculum planners, self-access administrators, and other CALL practitioners who are already using games to teach or who are considering introducing a DGBLL component into their work, but are concerned about encountering opposition, either from learners themselves or from educational decision-makers who are reluctant to permit new and experimental teaching methods that may prove unpopular. The broadly positive attitudes of learners across a wide range of different locations and teaching contexts, as demonstrated by this study as well as by the studies preceding it, suggest that school- and university-aged learners in most educational contexts today would generally respond positively to the introduction of digital game-based pedagogy into their language classes and would also be receptive to opportunities and encouragement to learn with digital games in semi-formal or informal learning environments, perhaps even more so than in the classroom. However, since learner attitudes and beliefs are also shaped by their actual experiences with DGBLL, it is important to ensure that appropriate games are selected so that learners may effectively develop L2 skills in alignment with their learning curricula. This is especially important in the case of in-class DGBLL, where instructors may also wish to provide additional structure to game-based activities as well as supplementary materials and tasks in order to better integrate game-based learning with their institutional goals and to thus make the most effective and efficient use of limited in-class time.

Limitations and future directions

As the data for this study were collected in an institutional setting, a convenience sampling method was used. It is acknowledged that this type of sampling method increases the risk of selection bias, as the sample is unlikely to accurately represent the wider population of university students in Japan, owing to the fact that "educational institutions and the learners situated in them are often the consequence of prior selection and sorting processes" (Richards et al., 2012). The findings may thus only be generalisable to a very narrow slice of the population, namely other Japanese students studying English as their main subject at selective public universities. This risk of selection bias was partially mitigated by comparing the results to the findings described by Bolliger et al. (2015), whose participants were enrolled in a variety of different subject

courses at a high-tier private university in Japan. The large number of similar findings across the two studies strengthens the case for generalising the results to the population of Japanese university students as a whole. Furthermore, the fact that studies elsewhere in Asia and also in Europe have found that school and university-aged learners generally tend to hold positive attitudes towards the use of digital games in a formal educational environment further supports the wider generalisability of these findings.

The existing research on learner attitudes towards digital games as a means for language learning, and for attaining educational goals more broadly, is still very limited. Further robust and empirical studies will be necessary in order to gain a fuller, more accurate, and more up-to-date understanding of what learners in different cultural and institutional contexts think about the use of DGBLL, both within and outside of the formal educational context. Such knowledge can in turn help CALL practitioners to more effectively incorporate games into their curricula. Studies that examine learner attitudes towards DGBLL in geographical and educational contexts not yet represented in the literature would be especially welcome.

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Appendix

This appendix contains the full contents of the pre-intervention questionnaire. The instrument consists of three sections: an informed consent statement containing information about the purpose of the study and the measures taken to protect participants' personal data, a set of questions to gather relevant demographic data about the participants, and another set of questions to gather data regarding the participants' attitudes and beliefs towards DGBLL. The post-intervention questionnaire consisted of the same informed consent statement appearing on the questionnaire below, along with the full set of attitudes and beliefs questions. The second section of the pre-intervention questionnaire, which contains the demographic questions, was omitted in the post-intervention questionnaire.

Both questionnaires were administered electronically during class time, with the Likert scale items for questions one to four of the third section appearing in randomised order on each questionnaire. Information included in square brackets following some questions below indicate multiple answer options or notes.

Pre-Intervention questionnaire

SECTION 1 – INFORMED CONSENT STATEMENT

This semester, students will participate in a digital game-based language learning activity over several weeks as part of their English communication course. Students will be invited to complete two surveys. The purpose of these surveys is to collect data for a research project that aims to investigate university students' attitudes towards the use of digital games for language learning.

Please note the following points:

- I will greatly appreciate your participation in this research, but participation in the study is completely voluntary and you may withdraw your participation at any time.
- Neither your participation in the game nor your answers on the surveys will influence your assessment for the course in any way.
- One of the survey questions will ask you to enter your name. The reason I need this information is to compare each participant's answers in the first survey with their answers in the second survey to see if their opinions have changed over time. Appropriate measures will be taken to protect the privacy of participants, including the password-protected storage of research data that contains personal information. Publication of the research findings will be completely anonymised and I will not share any identifiable information about any participant with anyone else.
- Please answer all the survey questions as honestly as you can.

By clicking on the "next" button below and completing this survey, you are giving me permission to store and analyse your answers and to publish my findings at a later stage.

Thank you very much for your help!

SECTION 2 – DEMOGRAPHIC QUESTIONS

1. Name (first name and family name)

2. Course [*Discussion and Debate 1* course (first year), *Discussion and Debate 2* course (second year)]

3. Class [A, B, C]

4. Gender [male, female, other/prefer not to say]

5. Age

6. If you have taken one or more English proficiency test(s) **after October 2019** (EIKEN, IELTS, TOEFL, TOEIC, etc.), please enter your score(s) below.

7. Below are ten statements regarding information technology skills. Check the box on the left for each statement with which you agree.

- □ I can find information online using search engines such as *Google* or *Yahoo*.
- □ I can send and receive emails.
- □ I can order items from an online shop such as *Amazon* or *Rakuten*.

- □ I can use word processing software such as *Microsoft Word*.
- □ I can make presentations in software such as *Microsoft PowerPoint*.
- □ I can use spreadsheet software such as *Microsoft Excel*.
- □ I can install an operating system such as *Microsoft Windows*.
- □ I can create or edit a website.
- □ I can add new hardware, for example RAM or a new hard disk, to a computer.
- □ I can use one or more programming language such as *Python*, Java or *C++*.

8.1 Approximately how many digital games have you played in your life? (Digital games include games on any type of digital device, for example on a PC, Sony Playstation, mobile phone, etc.) [0 games, 1–10 games, 11–25 games, 26–50 games, over 50 games]

8.2 In a typical week over the past year, how many hours did you spend playing digital games? [0 hours, 1–5 hours, 6–10 hours, 11–15 hours, over 16 hours]

8.3 For how many years have you been playing digital games regularly? [0 years, 1–2 years, 3–5 years, 6–10 years, over 11 years]

9.1 Have you ever played a digital game in class with the aim of improving your foreign language (for example English) skills? [yes, no]

9.2 Have you ever played a digital game outside of class with the aim of improving your foreign language (for example English) skills? [yes, no]

9.3 If you answered "yes" to either (or both) of the previous two questions, please provide more information. (for example, the name of the game you played, where you played it, what language you wanted to learn, etc.)

9.4 Have you ever played the game *Keep Talking and Nobody Explodes*? [yes, no]

9.5 If you answered "yes" to the previous question, please provide more information.

SECTION 3 – QUESTIONS ON ATTITUDES AND BELIEFS

On a scale of 1 (strongly disagree) to 6 (strongly agree), to what extent do you agree with each of the following statements? [note: These instructions appear with questions one to five below.]

1. INTUITIVE ATTITUDE TOWARDS DGBLL ITEMS

1.1 I would like to play digital games to help me improve my foreign language skills.

1.2 I think it is a good idea to learn a foreign language by playing digital games.

1.3 Practising my foreign language skills by playing a digital game does not appeal to me. [note: This statement is negatively phrased.]

1.4 I am not interested in playing digital games to learn and practice a foreign language. [note: This statement is negatively phrased.]

2. ATTITUDE TOWARDS EFFECTIVENESS OF DGBLL ITEMS

2.1 Playing digital games can be useful for improving my foreign language skills.

2.2 Digital games can be an effective tool for foreign language learning.

2.3 Playing digital games for language learning will not improve my foreign language skills. [note: This statement is negatively phrased.]

2.4 I do not think that my foreign language ability can improve while I play digital games. [note: This statement is negatively phrased.]

3. ATTITUDE TOWARDS EFFICIENCY OF DGBLL ITEMS

3.1 Digital games have the potential to make a big difference in a language learner's proficiency level.

3.2 Playing appropriate digital games can be just as helpful or more helpful than regular language class activities to improve my foreign language skills.

3.3 Playing digital games for foreign language learning is not as helpful as regular language class activities to improve my foreign language skills. [note: This statement is negatively phrased.]

3.4 Digital games are unlikely to significantly improve a learner's foreign language skills. [note: This statement is negatively phrased.]

4. ATTITUDE TOWARDS ENJOYABILITY OF DGBLL ITEMS

4.1 Playing digital games for foreign language learning sounds like a fun way to learn.

4.2 Learning a foreign language by playing a digital game can be very enjoyable.

4.3 I am not likely to enjoy playing digital games for language learning purposes. [note: This statement is negatively phrased.]

4.4 Playing digital games to learn a foreign language sounds like an unpleasant experience. [note: This statement is negatively phrased.]

5. BELIEFS ABOUT THE POTENTIAL OF DGBLL TO IMPROVE SPECIFIC ASPECTS OF SLA

5.1 Digital games can help foreign language learners to improve their listening skills.

5.2 Digital games can help foreign language learners to improve their speaking skills.

5.3 Digital games can help foreign language learners to improve their reading skills.

5.4 Digital games can help foreign language learners to improve their writing skills.

5.5 Digital games can help foreign language learners to improve their vocabulary.

5.6 Digital games can help foreign language learners to improve their grammatical knowledge.

5.7 Digital games can help foreign language learners to improve their pronunciation.

5.8 Digital games can help foreign language learners to improve their spoken fluency.

5.9 Digital games can help foreign language learners to improve their practical communication skills.

6. Which of the following learning environments, if any, do you think are good places for digital game-based language learning activities to take place? (Select all that apply.) [formal learning environments (for example, a school or university classroom); semi-formal learning environments (for example, an "English corner" or a self-access learning centre on campus); informal learning environments (for example, at a student's home or at a coffee shop)

7. Which types of digital games, if any, do you think are good for language learning? (Select all that apply.) [digital games that were designed specifically for foreign language education; digital games that were designed for entertainment, but that requires players to use their foreign language skills]

8. What do you think are the main advantages of using digital games for language learning, if any?

9. What do you think are the main disadvantages of using digital games for language learning, if any?

10. If you have any further comments about the use of digital games for language learning, please write them here.