Cultural Preferences in Online Learning Environments: How Japanese and American University Students Evaluate 3-Dimensional Learning Spaces

OHTANI Kazuhiro, WALLACE Paul[*], YAMAGUCHI Yosuke, SANNOMIYA Machiko

【要旨】

　IT技術の発展に伴い，オンライン上で自分のアバター（分身）を作り，友人と仮想空間で合流したり，独自の生活空間を創造したり，冒険したりできるようになった。こうした技術は教育の分野にも応用されつつあり，授業をオンラインの仮想的な学習空間（３Ｄ CVE）で受講できるようなシステムが構築されてきた。本研究は，３Ｄ学習環境について，日本人と米国人大学生がどのような評価をするのか日米比較実験を行った。実験参加者は，日本人大学生43名（男性15名，女性27名，不明１名）米国人大学生105名（男性33名，女性72名）であった。４種類の学習環境について映像刺激が提示され，それらについての態度を評定した。結果，オンライン学習空間は場面によって印象が異なるということ，また，それぞれの文化に適切な場面が存在する可能性が示唆された。

1. Background

　Advances in information technology have promoted three-dimensional (3D) virtual worlds, such as Second Life (Linden Lab) and The Sims (Electronic Arts). Within these 3D virtual worlds, people create avatars, which are visual characters that take several forms, including animals, humans, and objects. These avatars allow users to create a virtual "second life," where they can shop, meet friends, and participate in a virtual world.

　Several universities and schools around the world offer classes in 3D virtual worlds (e.g., Dickey, 2005). A three-dimensional collaborative virtual environment (3D CVE) refers to a 3D virtual environment used for student education. Using 3D CVEs for online education has two main benefits. First, they offer the same benefit as traditional distance learning, in which students can take classes anywhere as long as they have internet access. Second, 3D CVEs offer a unique benefit, because they can provide a collaborative learning experience (e.g., small group discussion) in virtual classrooms (Wallace & Maryott, 2009) where students can operate avatars in the virtual world, mimicking the real world.

　However, there is limited research on students' attitudes toward these 3D CVEs. Existing research tests students' willingness to collaborate with nonhuman avatars (Wallace & Maryott, 2009) and with avatars that differ from the user with respect to gender and ethnicity (Wallace, 2009). However, research that reports students' emotional and motivational outcomes regarding 3D CVEs is sparse. If the 3D CVEs are beneficial for student learning, then students' attitudes toward virtual learning environments should be considered. Thus, this article examines the attitude of university students toward 3D CVEs.

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Culture and the Three-Dimensional Collaborative Virtual Environment

Because 3D CVEs are not limited geographically, students can potentially attend a class from anywhere in the world. Thus, cultural differences among students and their preferences for 3D CVEs should be considered. Yet, existing research neglects this issue. To that end, this study compares the preferences of Japanese students with those of American students. Japan is an Asian culture that has not introduced 3D CVEs in its public education system. The United States is a Western culture that has limited integration of 3D CVEs in its education system, though the traditional face-to-face classroom environment is more popular.

This study uses high-context and low-context communication styles to explain the cultural differences among preferences for 3D CVEs. High-context communication refers to cultural norms that include indirect verbal expression and implicit messaging to maintain harmony with in-group members. Low-context communication employs direct verbal expression, in which the meaning is embedded in the message because of weak group cohesiveness. Japan and United States were selected because they represent a typical high-context culture and low-context culture, respectively, and because existing research compares both countries (e.g., Gudykunst & Nishida, 1986; Hasegawa & Gudykunst, 1998; Richardson & Smith, 2007).

High-context and low-context communication styles may affect attitudes toward 3D CVEs. For example, Richardson & Smith (2007) find that Japanese students tend to prefer face-to-face, telephone, and written communications to contact their professors, whereas American students prefer e-mail. These results may stem from cultural differences. In high-context cultures like Japan, nonverbal cues are emphasized. Therefore, students from high-context cultures tend to choose communication media with more formality and legitimacy, such as face-to-face communication, rather than e-mail. Similarly, Japanese students may show less positive attitudes toward 3D CVEs than American students do, because these environments offer fewer communication channels compared with traditional face-to-face learning environments.

Varieties of Virtual Environments

In 3D CVEs educators can choose from a variety of classroom environments; both traditional environments (such as a large classroom) and nontraditional environments (such as a coliseum or meadow) are available. Additionally, large-lecture style classrooms or seminar rooms can be used for small discussions. Each of these environments may provide a different impression. This study takes the various kinds of virtual environments into consideration by testing several kinds of environments.

Study and Hypothesis

This study tests how Japanese and American students evaluate 3D CVEs for online learning. Although an increasing number of educational institutions use 3D CVEs, few empirical studies have measured students' attitudes toward 3D CVEs. This study has two primary functions. First, this study could be a prime resource for educators who are considering using a 3D CVE. Because 3D CVEs are not yet widely used for online education in the United States nor Japan, this study could be beneficial to educators or

policy makers who design curricula for online education who are considering using 3D CVEs. For example, if cross-cultural differences exist, educators can change the environment used based on this research; if US students are more motivated to study around the campfire of a 3D CVE than Japanese students are, US educators may choose a campfire 3D CVE over alternatives. Second, this research could help guide subsequent research endeavors in this topic. Since there is limited research available on the effects of 3D CVEs, this study stimulate other studies on this topic.

Our hypothesis is as follows:

(1) Students from the United States had better attitudes toward 3D CVEs than did Japanese students.

(2) Japanese students had higher-context communication styles than US students did.


2. Methods

Participants

The participants of the study were 43 (Male = 15, Female = 27, unknown = 1) Japanese university students and 105 (Male = 33, Female = 72) American university students. None of them have taken classes in 3D CVEs or other forms of online education.

Materials and procedures

Stimuli. To develop our 3D CVE stimuli, a survey was conducted on university instructors from around the world (N =50) who use virtual environments as a daily educational practice. From the results of survey, 4 kinds of virtual environment were identified as being the best fit for use in a small group and large class meeting: Campfire, Large Classroom, Seminar Room, and Coliseum. Venuegen, a 3D virtual world platform, was used to create these 4 virtual environments. Among these stimuli, the Large Classroom and Seminar Room are the traditional classroom environments, while the Campfire and Coliseum are the nontraditional classroom environments. Each stimulus was presented as a video of the screen in which the students were taking a university class in the virtual environment. The stimuli were each 90 seconds in length. Figure 1 shows a scene from each environment. The virtual environments were viewed from the avatar's point of view. In the movie the avatar sits on a chair, looking around the environment as if a student in a real classroom. Classmates come to the class, and then the instructor appears and stands in front of the screen; the class then begins. The movies do not show actual learning materials. The appearances of the avatars, including the instructor and classmates, were changed depending on the country. The avatars appeared Asian for the Japanese participants, while they were more multicultural for the US participants.
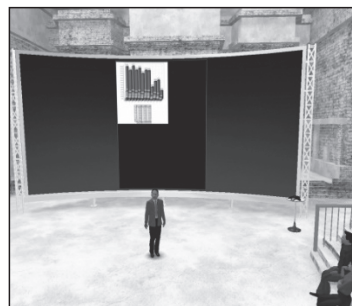
(A). Campfire
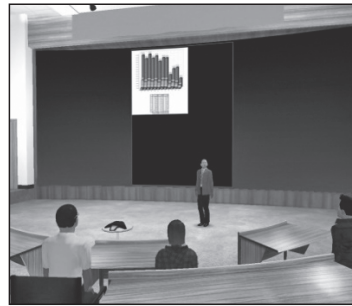
(B). Large classroom
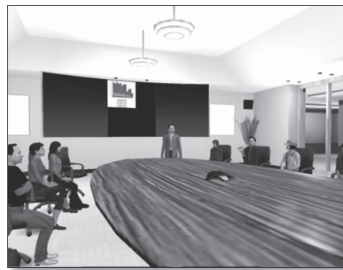
(C). Seminar room

(D). Coliseum

Note. The figures here are those used for Japanese participants.

Figure 1. Examples of 3D collaborative virtual environments

Psychological measures

High-context versus low-context communication. A context communication scale (Gudykunst, Matsumoto, Ting-Toomey, Nishida, Kim & Heyman, 1996) was used to assess the context of student communication styles. The scale consisted of 7 subscales with 4 items in each subscale, totaling 28 items. The reliability and validity of this scale have been demonstrated in previous research (Gudykunst et al., 1996). The subscales used were Self-Expression (low context, sample item: "I dramatize a lot when I communicate."), Inferring (low context, sample item: "I am very good at knowing the feelings that other people are experiencing."), Feeling (low context, sample item: "My feelings tell me how to act in a given situation."), Indirectness (high context, sample item: "I am ambiguous when I communicate with others."), Sensitivity (high context, sample item: "I maintain harmony in my communications with others."), Silence (low context, sample item: "I can sit with another person, not say anything, and still be comfortable."), and Preciseness (low context, sample item: "I openly show my disagreement with others."). For this study, the scale was translated into Japanese for the Japanese sample by two Japanese university instructors and one doctoral student. To confirm its accuracy, the Japanese version of the scale was translated back into English, and an American university instructor checked its contents so that the original meaning of the scale was maintained. Cronback's alpha coefficient was calculated to test the internal consistency of the scale. We calculated the following coefficients: Self-Expression (α = .55), Inferring (α = .71), Feeling (α = .79),

Cultural Preferences in Online Learning Environments:
How Japanese and American University Students Evaluate 3-Dimensional Learning Spaces

31

Indirectness (α = .33), Sensitivity (α = .37), Silence (α = .80), and Preciseness (α = .61). These results show that some subscales have extremely low internal consistency (<.60). Therefore, the Self-Expression, Indirectness, and Sensitivity subscales were omitted in the subsequent analysis.

Attitudes toward 3D CVEs. To assess students' attitudes toward the virtual environment, we developed the following measures.

Enjoyment. Three items assessed enjoyment toward studying in a virtual environment; these items were: "I enjoyed being in this class environment," "I was satisfied with my experience in this class environment," and "Given a choice, I would probably not go back to this class environment (reversed)." This scale was internally consistent across the environments (α = .86–.89).

Stimulation. Three items assessed stimulation while studying in a virtual environment; these items were: "I feel stimulated in this learning environment," "This learning environment makes me sleepy (reversed)," and "This learning environment makes me bored (reversed)." This scale had acceptable reliability across the environments (α = .61–.83).

Efficacy. Three items assessed students' efficacy when studying in a virtual environment; these items were: "I would be motivated to learn in this classroom", "My grade would go down if I attended class in this environment (reversed)", and "I think that I could remember the contents of the class more easily." This scale was internally consistent across the environments (α = .81–.83).

Comfortableness. Three items assessed students' comfort while studying in a virtual environment; these items were: "This learning environment is off-putting (reversed)," "This learning environment is relaxing," and "This learning environment is comfortable." This scale was internally consistent across the environments (α = .79–.84).

Appropriateness. Three items assessed the appropriateness of the virtual environments as study environments; these items were: "I am okay with this environment as a classroom," "I think that this environment is inappropriate as a classroom (reversed)," and "In this environment, I could concentrate on the course." This scale was internally consistent across the environments (α = .79–.87).

Instruction. Participants were asked to answer questions on the context communication scale. They were then taught the nature of 3D CVEs. Specifically, they were told that in 3D CVEs they could create their own avatar and move it freely, performing actions such as walking around the environment and talking to others in the same environment. They were also told that, for this study, they cannot move their avatar but should imagine that they have those capabilities while watching the movies. After watching each stimulus, they were asked to rate their attitude toward the 3D CVEs.

3. Results

Cultural Differences in Communication Style

To check if Japanese students were high context and WE students were low context, one-way multivariate analysis of variance (MANOVA) was conducted. The results are presented in Table 1. There were significant cultural differences for the Inferring and Feeling subscales: F (1, 146) = 7.81, p < .01, η_p^2 = .051; F (1, 146) = 5.02, p < .05, η_p^2 = .033, respectively. These results suggest that the US students scored

OHTANI Kazuhiro, WALLACE Paul,
YAMAGUCHI Yosuke, SANNOMIYA Machiko

higher on the Inferring and Feeling subscales; these dimensions are considered low-context characteristics.
No differences were observed for the Silence and Preciseness subscales.

Table 1. Mean differences between Japanese and American students on a high-low context scale

	M(SD)		F	$\eta_p{}^2$
	Japan	USA		
Inferring (LC)	3.48(0.64)	3.80(0.64)	7.81＊＊	.051
Feeling (LC)	3.26(0.75)	3.58(0.83)	5.02＊	.033
Silence (LC)	3.34(0.92)	3.19(0.98)	0.68	.005
Preciseness (LC)	3.01(0.85)	3.05(0.74)	0.09	.001

＊$p< 05$, ＊＊$p < .01$.　　　　　　　　　　　　　　　*Note*: LC stands for low context.

Evaluation of 3D CVEs

To assess students' attitudes toward virtual environments, a series of 2 (country) ×4 (environment) mixed analysis of variance was performed. The second factor (the 3D CVE used) was the repeated measure. The mean scores for each environment and country as well as the results of the primary analysis are presented in Table 2.

Table 2. Preferences of 3D CVEs

	Dependent Variables									
	Enjoyment		Stiumulation		Efficacy		Comfortableness		Appropriateness	
	Japan	USA	Japan	USA	Japan	USA	Japan	USA	Japan	USA
3D CVE	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)
1. Campfire	2.20(0.88)	3.20(1.19)	2.98(0.88)	3.34(0.90)	2.26(0.76)	2.69(1.14)	2.18(0.83)	3.53(1.05)	2.19(0.82)	2.63(1.26)
2. Large classroom	2.40(1.00)	3.40(1.06)	2.47(0.94)	3.09(1.01)	2.60(1.02)	3.46(0.87)	2.75(0.95)	3.29(0.86)	2.89(1.00)	3.81(0.98)
3. Seminar room	2.38(0.87)	3.17(1.15)	2.70(0.90)	3.25(0.95)	2.62(0.94)	3.34(0.94)	2.83(0.93)	3.49(0.98)	2.83(0.91)	3.49(1.04)
4. Coliseum	2.14(0.78)	3.15(1.01)	2.57(0.90)	3.27(0.89)	2.33(0.87)	3.03(0.93)	2.29(0.78)	3.23(0.92)	2.45(0.87)	3.20(0.97)
Main effects	F	$\eta_p{}^2$	F	$\eta_p{}^2$	F	$\eta_p{}^2$	F	$\eta_p{}^2$	F	$\eta_p{}^2$
3D CVE	1.66 *ns*	.011	4.16 **	.028	11.86 ***	.075	2.06 *ns*	.014	23.27 ***	.138
Multiple comparison			2 < 1		1, 4 < 3, 2				1 < 4 < 3, 2	
Country	66.74 ***	.314	28.68 ***	.164	37.97 ***	.206	67.43 ***	.316	37.14 ***	.249
	Japan < USA		Japan < USA		Japan < USA		Japan < USA		Japan < USA	
Interaction	0.37 *ns*	.003	0.95 *ns*	.006	1.32 *ns*	.009	5.67 ***	.037	1.32 *ns*	.013

＊＊$p <.01$, ＊＊＊$p < .001$

Note: The values in the country and 3D CVE cells are the means (*M*) of the dependent variables. The values in parentheses are the associated standard deviations (*SD*).
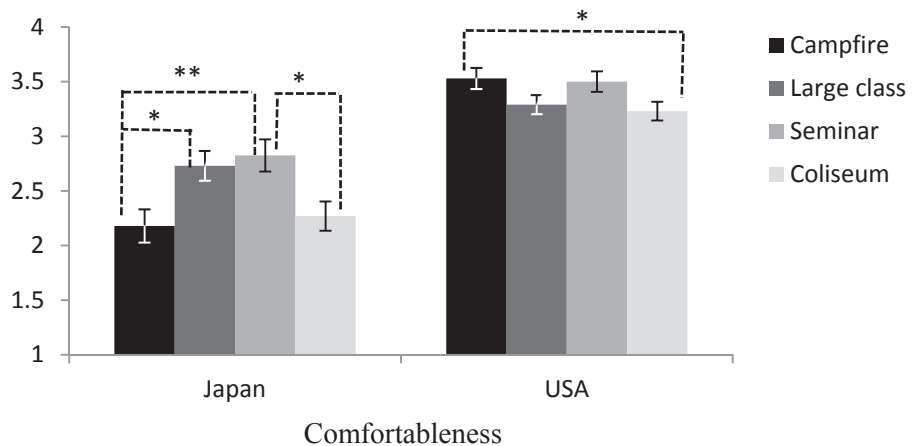
Enjoyment. There was a significant main effect of country: F (1, 146) = 66.74, $p < .001$, $\eta_p{}^2$ = .314, such that the American students tended to rate a higher enjoyment than the Japanese students did. The main effect of both the 3D CVE and interaction were not observed: F (2.83, 412.83) = 0.66, *ns*, $\eta_p{}^2$ = .011; F (2.83, 412.83) = 0.37, *ns*, $\eta_p{}^2$ = .003, respectively.

Stimulation. There was a significant main effect of country: F (1, 146) = 28.68, $p < .001$, $\eta_p{}^2$ = .164, such

that the American students tended to rate a higher stimulation than the Japanese students did. The main effect of the 3D CVE was also observed: $F (3, 438) = 4.16$, $p < .01$, $\eta_p^2 = .028$. Multiple comparison revealed that the Campfire environment was more stimulating than the Large Classroom: $p < .01$ (Cohen's $d = 0.38$). However, the main effect of interaction did not reach significance: $F (3, 438) = 0.95$, ns, $\eta_p^2 = .006$.

Efficacy. There was a significant main effect of country: $F (1, 146) = 37.97$, $p < .001$, $\eta_p^2 = .206$, such that the American students tended to rate a higher efficacy than the Japanese students did. The main effect of the 3D CVE was also observed: $F (2.64, 385.47) = 11.86$, $p < .001$, $\eta_p^2 = .075$. Multiple comparison revealed that the Campfire environment was less efficacious than the Lecture: (Cohen's $d = -0.61$) and Seminar Room: $p < .001$ (Cohen's $d = -0.54$). Also, the Coliseum was less efficacious than the Large Classroom $p < .001$ (Cohen's $d = -0.40$) and the Seminar Room: $p < .01$ (Cohen's $d = -0.33$). Stimulating than Large classroom, $p < .01$ (Cohen's $d = 0.38$). The main effect of interaction did not reach significance: $F (2.64, 358.47) = 1.32$, ns, $\eta_p^2 = .006$.

Comfortableness. There was a significant main effect of country: $F (1, 146) = 67.43$, $p < .001$, $\eta_p^2 = .316$, such that the American students tended to rate a higher comfortableness toward virtual environments than the Japanese students did. The main effect of the 3D CVE was not observed: $F (3, 438) = 2.06$, ns, $\eta_p^2 = .014$. The interaction between country and 3D CVE did not reach significance: $F (3, 438) = 5.67$, $p < .001$, $\eta_p^2 = .037$. The results of a simple main effect test (Bonferroni) revealed that, for Japanese students, the Large Classroom was more comfortable than the Campfire: $p < .05$ (Cohen's $d = 0.71$). In addition, the Seminar Room was more comfortable than the Campfire and Coliseum: $ps < .01$ and $.05$, respectively (Cohen's $ds = 0.84$ and 0.73, respectively). For American students, the Campfire was more comfortable than the Coliseum: $p < .05$ (Cohen's $d = 0.31$).

*$p < .05$, **$p<.01$ *Note*. Error bars represent standard errors.

Figure 2. Comfortableness as a function of the 3D CVE and country

Appropriateness. There was a significant main effect of country: $F (1, 146) = 37.14$, $p < .001$, $\eta_p^2 = .249$, such that the American students tended to judge the virtual environment as an appropriate learning place

more than Japanese students did. The main effect of the learning environment was also significant: F (2.69, 389.57) = 23.27, p < .001, $\eta_p{}^2$ = .138. Multiple comparison revealed that the Campfire was less appropriate than the Coliseum, Seminar Room, and Large Classroom: ps < .05, .001, .001, respectively (Cohen's ds = −0.39, −0.65, and −0.83, respectively). The Coliseum was less appropriate than the Seminar Room and Large Classroom: ps < .01 and .001, respectively (Cohen's ds = −0.33 and −0.56, respectively).

4. Discussion

We investigated the attitudes of university students toward virtual learning environments in this report, focusing on how cultural differences and situational differences affect attitude. To test the cultural differences, Japanese and American students participated in the experiment. For the situational differences, 4 kinds of virtual-environment movies were created: Campfire, Large Classroom, Seminar Room, and Coliseum. The result of mixed ANOVA suggests that there were both cultural and situational differences.

Differences among 3D CVEs

Our results suggest that there are significant differences in students' impressions towards the different 3D CVEs. The Campfire environment was the most stimulating, while the traditional classroom environments (Large Classroom and Seminar Room) were more efficacious and appropriate as learning environments than the others. Interestingly, even when the students imagined to be in 3D CVEs, they tended to evaluate the traditional learning environments as more effective than the other environments. However, the traditional classroom environments were not as stimulating as the other environments. Those differences provide effective information for future educational practices; these implications will be discussed later.

Cultural Differences

Our experimental results showed relatively large cultural differences ($\eta_p{}^2$ = 0.164−0.316) between the attitudes toward virtual environments; the American students tended to view the virtual environments more positively than the Japanese students did. These results are consistent across the dependent measures. The American students rated higher values of enjoyment, stimulation, efficacy, comfortableness, and appropriateness in the virtual environments than the Japanese students did.

These disparities could be caused by differences in the two cultures' context communication styles. Our findings showed that the American students scored high on the Inferring and Feeling subscales, which are considered low-context communication styles; this result partly confirms our hypothesis. We hypothesize that the Japanese students tend to have high-context communication styles, while the American students tend to have low-context communication styles. In high-context culture, people tend to communicate with indirect messages and implications; thus, they prefer more face-to-face communication. However, 3D CVEs do not have as many communication channels (gesture, face, etc.) compared to traditional face-to-face classrooms. On the other hand, people in low-context cultures tend to communicate with more concrete

Cultural Preferences in Online Learning Environments:
How Japanese and American University Students Evaluate 3-Dimensional Learning Spaces

35

verbal expressions than people in high-context cultures. Low-context cultures may be more open-minded toward 3D CVEs, even though 3D CVEs have comparatively fewer communication channels.

Although we observed some cultural differences between the high-context and low context-communication styles, these findings did not fully confirm our hypothesis for two reasons. First, the scale used in this study might not have sufficient reliability and validity; the scale that assessed high-context versus low-context communication styles had low reliability, and we omitted some subscales. Second, Richardson & Smith (2007) reported that although there was a significant difference in communication style between Japan and the United States, the difference was relatively small and Japanese students scored near the midpoint (i.e., 3) on a 5-point context scale. They concluded that, "claiming the US as an LC culture and Japan as an HC culture may be an overstatement" (Richardson & Smith, 2007). However, empirical studies that test communication style are still limited, and additional research will be needed on this topic.

Implications and Limitations

This research may have several educational implications. First, educators might want to choose a stimulating learning environment for boring content. In this study, the Campfire environment was the most stimulating, which may attenuate the negative effect of boring, routine work. Second, cultural differences may need to be considered when selecting a virtual environment. There was significant effect of environment choice on student comfortableness. When the instructor teaches Japanese students, traditional classroom environments such as the Large Classroom or Seminar Room may be recommended. For American students, nontraditional classrooms such as the Campfire may be recommended.

The results of this research should be interpreted with those limitations. First, the study used movies of 3D CVEs instead of actual 3D CVEs. In actual 3D CVEs, students can move their avatars on their own; because of this limitation, students' evaluations of actual 3D CVEs might differ from the results of this study. In addition, this research did not measure actual performance (i.e., academic performance). To fully evaluate a 3D CVE, the actual performance must be considered. Finally, this study did not compare 3D CVEs to either traditional classroom environments or traditional online education. Further research will be needed to address these differences to evaluate students' attitudes toward online education using 3D CVEs.

References

Dickey, M. D. 2005 "Three-dimensional virtual worlds and distance learning: Two case studies of Active Worlds as a medium for distance education", British Journal of Educational Technology, Vol. 36, pp. 439-451.

Gudykunst, W. B., Matsumoto, Y., Ting-Toomey, S., Nishida, T., Kim, K., & Heyman, S. 1996 "The influence of cultural individualism-collectivism, self construals, and individual values on communication styles across cultures", Human Communication Research, Vol. 22, pp. 510-543.

Gudykunst, W. B., & Nishida, T. 1986 "Attributional confidence in low- and high-context cultures", Human Communication Research, Vol. 12, pp. 525-549.

Hasegawa, T. & Gudykunst, W. B. 1998 "Silence in Japan and the United States", Journal of Cross-Cultural Psychology, Vol. 29, pp. 668-684.

Richardson, R. M. & Smith, S. W. 2007 "The influence of high/low-context culture and power distance on choice of communication media: Students' media choice to communicate with professors in Japan and America", International Journal of Intercultural Relations, Vol. 31, pp. 479-501.

Wallace, P. 2009 "Avoidance and attraction in virtual worlds: The impact of affiliative tendency on collaboration", The International Journal of Technology, Knowledge and Society, Vol. 5, pp. 119-126.

Wallace, P. & Mayott, J. 2009 "The impact of avatar self-representation on collaboration in virtual worlds", Innovate: Journal of Online education, Vol. 5.

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The study reported in this paper examined how Japanese and US students evaluate three-dimensional collaborative virtual environments (3D CVE). Advances in information technology have promoted 3D virtual worlds, within which people create avatars. An avatar is a visual character that may take one of several forms, including animals, humans, and objects. The participants in the present study were 43 Japanese university students (15 males, 27 females, and one of unknown gender) and 105 American university students (33 males, 72 females). Participants were asked to rate their attitudes toward four different learning environments they had experienced, namely large classroom, seminar room, campfire, and coliseum. The results suggest that students' attitudes varied across learning environments. In addition, there were several cultural differences in terms of preferences for certain environments.