Asian Education Studies; Vol. 6, No. 1; 2021
ISSN 2424-8487 E-ISSN 2424-9033
Published by July Press

A Novel Platform for Integrating 360° Videos Within a Virtual Study Abroad Experience

Steven H. Urueta[1,2] & Tetsuro Ogi[1]

[1] Graduate School of System Design and Management, Keio University, Yokohama, Japan

[2] Department of English Language Studies, Mejiro University, Tokyo, Japan

Correspondence: Steven H. Urueta, Graduate School of System Design and Management, Keio University, Yokohama, Kanagawa, Kyoseikan Room C6S12, Japan. Tel: 81-80-5454-5486.

Received: April 17, 2021 Accepted: May 31, 2021 Online Published: June 7, 2021

doi:10.20849/aes.v6i1.900 URL: https://doi.org/10.20849/aes.v6i1.900

Abstract

The rising popularity of high-immersion media has found its way to educational use cases, but such media have not yet been extensively evaluated in their ability to provide fully featured study abroad experiences. As recent events have catapulted virtual study abroad programs to the forefront, and as universities seek to build attractive and effective programs, the necessity of systems that provide immersion and student engagement has become apparent. Using the new concept of Dual-Frame System Design, this paper seeks to find if design thinking methodologies can meet these needs while maintaining system reliability, flexibility, and ease of use. Using off-the-shelf components, including a 360° video camera, smartphones, and personal computers, a system was created and tested through a mixed-methods approach based on a user study of 25 US college students. The results of this research may be useful in the creation of high-immersion virtual study abroad experiences, as well as advancing the interdisciplinary frameworks necessary to make these systems broadly available.

Keywords: virtual study abroad, 360° video, design thinking, distance learning

1. Introduction

1.1 Background

Providing students with opportunities to study abroad has been shown to engender many positive effects, from skill development in a foreign language to intercultural competence. However, the COVID-19 pandemic and ensuing travel restrictions have caused many universities across the globe to shutter their physical study abroad programs. Universities in Asia are no exception, forced to stop accepting students from other countries while having their own students unable to study at foreign institutions. In the case of Japan, the focus of this research project, there is a restriction on student visa applicants as of April 2021 (MOFA, 2021), effectively preventing new international students from entering the country.

For universities seeking to increase international interest and foster global ties, as well as for students outside of Japan hoping to experience the country, this is unfortunate news. In response, universities have begun offering virtual study abroad opportunities as an alternative, and there seems to be some demand for them. In a survey of prospective and current international students from around the world, while the majority prefer on-campus study to virtual study abroad, about a quarter of students (22.5%) are very or extremely interested in studying online (Pang 2020). While this is a small proportion, it is still significant.

This interest has been met with opportunities by universities and specialist providers. For example, Middle Tennessee State University has partnered with Kansai Gaidai University to provide virtual international courses at Kansai Gaidai (MTSU, 2021). Another example is CET Japan, which partners with universities like Washington State University to provide a virtual intensive language and culture course (WSU, 2021). Finally, the Associated Kyoto Program, partnered with Doshisha University, has published 2-dimensional videos of life in Kyoto at their “Virtual Study Abroad” page (Associated Kyoto Program, 2021). Still, while virtual study abroad opportunities centered on Japan are available, very few provide access to highly immersive content, such as 360° videos and virtual reality (VR) videos, and immersion can be an essential component of studying abroad.

1.2 Roadblocks to Immersive Virtual Study Abroad Experiences

The use of high-immersion content such as 360° or VR videos in virtual study abroad experiences has been previously explored, but there have been few studies related to its use in a total distance learning situation. To elaborate, there are two possible paradigms for high-immersion virtual study abroad. The first is conducted in full or partially at an educational institution with in-person administration, through which the guided use of specialized tech like VR headsets and providing personalized help are possible. The second is where students complete the virtual study abroad program entirely at home or some other location without the ability for in-person administrative guidance. In such a situation, it is difficult to use or borrow high-immersion technologies like VR headsets or cameras. Current issues with at-home high-immersion content include the expense of specialized equipment, hardware compatibility issues, training required for use, a long setup time for some headsets, and the difficulty of integrating such technology with personal computers. Personal computers, in a laptop or desktop form factor, are often necessary for accessing a school's learning management system (LMS) and completing written assignments, but they are not as useful for viewing high-immersion media. Current smartphones, in contrast, usually have built-in sensors such as gyroscopes, which are useful when viewing 360° videos, and the smartphones can also be placed in head-mounted display "goggles" for ease of use with VR video. However, school LMSs are often incompatible with smartphones: the primary author teaches at four separate universities in Japan, and the LMSs for two institutions are smartphone incompatible, and the LMSs for the other two institutions could be considered difficult to use on a smartphone (non-optimized pages, small buttons, etc.).

1.3 Research Overview

This research proposes a virtual study abroad system that allows for highly immersive media use, even at a student's home or other location without face-to-face support. A system using both a smartphone and personal computer was conceived, with quick switching from one to the other facilitated through QR codes.

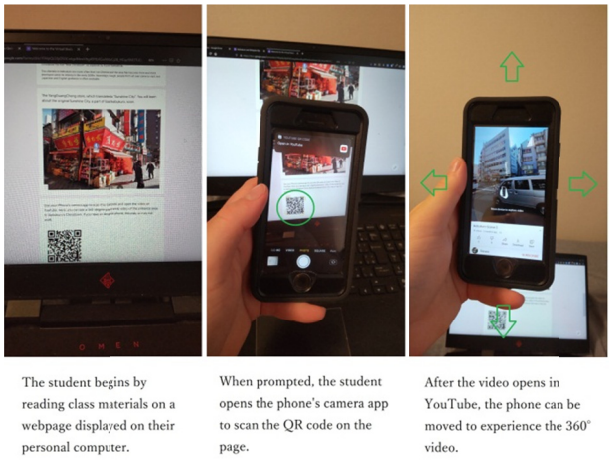

Figure 1. Using the system

In addition, to ensure reliability and future compatibility with other high-immersion media such as VR video, a new method of system design, Dual-Frame System Design, was conceived and implemented, as expanded in Section 3. Contents for the system were also created, in this case a virtual exploration of two cities in the Tokyo Metropolitan Area, Ikebukuro and Shinjuku. For each city, three separate locations, each with its own theme, were chosen, and a 360° video of each location was recorded and edited, for a total of six videos. Information on the videos can be found in Table 1. These contents were designed as a module to be used in a larger study-abroad program that is exclusively conducted through distance learning.

Many universities in Japan are offering virtual study abroad programs as well, to both their own students and prospective international students. However, few offer highly immersive media, so the results of this project may guide the next generation of virtual study abroad, a generation that can take advantage of VR180 video, head-mounted displays, and spatial audio.

2. Literature Review

The use of 360° videos in educational contexts has reached wider popularity in the past few years, and a major impetus for their adoption is the potential to provide flexible and immersive experiences (Reyna 2018; Rupp et al. 2019). Reduced barriers to entry, including easier content consumption through smartphone applications, have accelerated this uptake, but technical integration and the knowledge of creating 360° content still remain as challenges (Feurstein 2018). While they have been used in a distance learning context as well (Hilliker 2020), little is known about emerging trends in this field (Snelson and Hsu 2020).

While little mention of 360° video use in virtual study abroad programs has been found, particularly in Japan, the use of such media in tourism and cultural heritage activities has been examined (Argyriou, Economou, and Bouki 2020). As tourism and studying abroad are deeply connected, and even overlap in many ways (Breen 2012; Michelson and Álvarez Valencia 2016; Tomasi, Paviotti, and Cavicchi 2020), the results can be broadly applicable. In addition, the use of multimedia like video chat software has been shown to improve student engagement and learning (Pellettiere Calix, Prusko Torcivia, and Leon 2012). According to Bodinger de Uriarte and Di Giovine (2021), the arrival of COVID-19 has meant that the most profound and lasting change of the college experience is found in none other than study abroad programs.

From the middle of 2020, many universities have begun offering virtual study abroad programs, but high-immersion activities usually include face-to-face components with students in a partner institution or face-to-face components with teachers or administrative staff at their home institution. High-immersion virtual study abroad in a pure distance learning environment, where there is no access to communal technology or face-to-face support, has been understudied.

To that end, the idea of scaffolding remains paramount in the preparation of 360° virtual study abroad experiences conducted exclusively from students' homes or other areas outside of the physical educational institution. Scaffolding consists of training and demonstrations to build familiarity with a new learning paradigm (O'Connor and Worman 2019), and this can be doubly important for online courses using high-immersion media such as VR (Liu and Shirley 2021).

3. System Description and Architecture

Figure 2 shows an architectural diagram of the proposed system, which has undergone preliminary testing. On the content creation front, a specialized 360° video camera, the Vuze XR, is used to record class contents. The camera has an auto-upload feature to YouTube that allows for uploading video to the content creator's channel. Once uploaded to the channel, the video link is converted by the content creator into a QR code. Whether the content creation is conducted by an instructor or a third party, the QR code can then be added into a class webpage. That webpage, which has a Google Form (an editable web-based form in which various contents can be added), is relatively easy for a teacher to edit or create new content for. On the student side, a student would possess both a personal computer and smartphone. Accessing the class webpage on their computer allows for both accessing the virtual study abroad content and the school's learning management system. When prompted, the student would use their smartphone to scan a QR code on the webpage, which would open an explorable 360° video on their phone using the YouTube app.

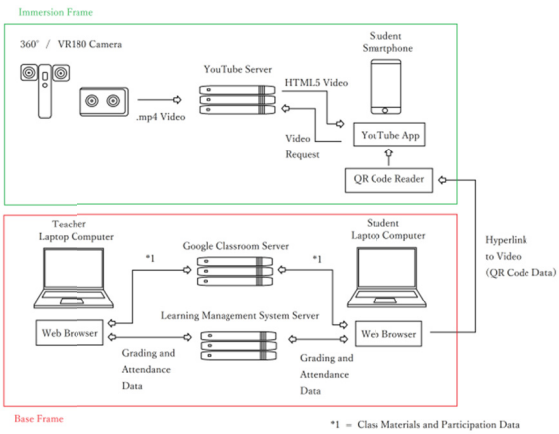

Figure 2. Architectural diagram of the system

In addition, there are two boxes, in red and green, dubbed the "Base Frame" and "Immersion Frame." A method proposed by this research to address complications with 360° video, allowing for the use of classroom management and content creation with a lower barrier to teacher entry, has been dubbed Dual-Frame System Design. Using structure and function mapping in the system design process, two separate frames provide two separate feature sets. The first frame, in red, is called the "Base Frame." The contents are editable by instructors with a modicum of computer skill, and support of the underlying technologies has and should continue to remain relatively stable. Based on legacy platforms and text-based editing, it is designed with user-friendliness in mind and does not require specialized programming or 360° video / VR content creation skills. Example platforms include Google Classroom and WordPress, though Google Classroom is used in this case. The second frame uses new media technologies and is called the "Immersion Frame". The contents are not easily editable, and the platforms and technologies are relatively unstable, with services changing or disappearing, and many software and hardware updates may be necessary for continued operation. However, this frame provides the high-immersion content useful for study abroad experiences While the immersion frame concept uses 360° video in this project, it has been designed to be "swappable." For example, the 360° video immersion frame could be replaced by a VR180 livestreaming video immersion frame.

Separating the two frames allows for two preeminent qualities. The first is that the teacher-produced content of the base frame, as well as the platforms that the teacher is familiar with, can remain unchanged even as media platforms are switched on the immersion frame. For example, in 2019, YouTube prevented livestreaming of VR content from portable sources for streamers with fewer than 1,000 subscribers. Rather than having to start from scratch on a new platform, a Dual Frame system would allow the contents of the immersion frame to be switched to a different platform, in one case Facebook Livestreaming, without disrupting the existing workflow, class contents, and other data on the base frame used by the instructor.

4. Creating and Using the Virtual Study Abroad Module

The creation of this module followed the theme of "A Changing Tokyo," conceived as an activity within a greater virtual study abroad program. The content for the base frame was made using Google Classroom, and relevant facts and figures were used to create short explanations for each of the locations visited. The contents for the immersion frame were recorded on a Vuze XR camera, with six locations in total, as shown in Table 1 below.

Table 1. Video locations and themes

Video Location	Theme of Change
Ikebukuro – Ikebukuro Owl Mascot Plaza	The rise of mascots in Japan.
Ikebukuro – Ikebukuro Chinatown	The growth of foreign communities.
Ikebukuro – Ikebukuro West Gate Park	Changing depictions of Tokyo youth culture.
Shinjuku – Shinjuku Station Keio Line	The expansion of Japan's railways.
Shinjuku – Suica Penguin Park	Transport pivot to sustainability and eco-friendliness.
Shinjuku – West Exit Area	Creating and expanding an urban core.

Each video was a 30- to 45-second clip taken at a standstill with the camera above the head of the person recording. There was no voiceover or external audio such as music added, the purpose being to create a high-immersion "mini-experience" of being in that location.

5. Research Questions and Methods

This study aims to ask two main questions. The first explores if it is possible to create a reliable high-immersion learning system using 360° video within a full distance learning context. This includes the efficacy of QR-code based transitions between a smartphone and personal computer. Second is evaluating student interest in using high-immersion media such as 360° videos for a virtual study abroad program, including how the students rate immersiveness, and if such experiences impact their interest in the country under consideration.

To answer these questions, a user study was conducted with 25 university students from the United States. Each student, required to have a personal computer and a phone with QR-code-reading capability, conducted the activity within a one-hour maximum time limit. The time to complete the activity was logged, as well as the

amount of time (average view duration and average percentage) each video was viewed. Finally, the proper use of QR code scanning software was confirmed using YouTube Analytics.

After testing the system, each student completed an eleven-question survey with mainly Likert scale responses. Finally, three open-response questions were given to the students, and their responses were coded to find themes through content analysis (Stemler 2019), with the questions asking for positive experiences, negative experiences, and areas for improvement. The questions can be found in Table 2. The change in student attitudes before and after the experience was tested using a Wilcoxon signed-rank test. Student smartphone OS types were also checked.

Participants were selected on the Amazon "Mechanical Turk" platform, which allows for vetting possible respondents by a number of filters. Two filters were used: "18-25 Years of Age" and "US High School Graduate." Participants were also asked to fall under two additional requirements: 1) to have a personal computer as well as a smartphone with the YouTube app installed and the ability to read QR codes, and 2) be a current student at an institute of higher education in the US. The participants were briefed on the purpose of the study, and each participant received a $10 payment through the Mechanical Turk payment system. Given that the average time for activity completion was slightly over 31 minutes, with the single highest being 55 minutes, this meets many concerns on wage-related ethics of crowdsourced research (Fort, Adda, and Cohen 2011; Williamson 2016).

6. Results

The US market shares of mobile operating systems, which stood at 59% for iOS and 40% for Android, were not reflected by the participants' smartphones. To begin, 58% of the smartphones in the study used were Android, and 42% were iOS. As only modern iOS phones all come with a built-in QR code reader in the camera app, and only some Android models do, an extra step of installing a QR code reading app was required for some Android participants. This was corroborated in the open-ended questions section, which will be discussed later.

Out of the 11 questions on the survey, ten were Likert scale questions following Table 2 below (Q5 is not a Likert scale question). In addition, there were three open-ended questions, in which response themes were found and coded. *(Was there anything you particularly liked about the virtual study abroad experience?, Was there anything you disliked about this experience?, How could this experience be improved?*)

Table 2. User study questions

Question Number	Question Content
Q1	How would you describe the overall ease of use of this experience?
Q2	How would you rate the ease of use of the QR code scanning?
Q3	How would you rate the overall quality (video and audio) of the 360 videos?
Q4	Did you feel that transitioning from your computer to your smartphone to watch the videos impacted your experience?
Q5	Around how long did it take to transition from your computer to your smartphone to watch a video. (From picking up your smartphone to watching the video.
Q6	Would you consider this an interesting virtual study abroad experience?
Q7	Do you feel the 360 video clips were immersive?
Q8	Did today's experience affect your interest in learning using 360 video and smartphone-aided experiences in the future?
Q9	How likely would you recommend this virtual study abroad experience to someone else?
Q10	Before this activity, how interested were you in visiting Japan?
Q11	After this activity, how interested are you in visiting Japan?

As seen in Figure 3 below, there were positive responses on the system's ease of use, found in Question 1 and Question 2, as 87.5% of respondents felt the system was very easy or somewhat easy to use. 91.7% of the respondents felt the QR code scanning was very easy or somewhat easy to use.

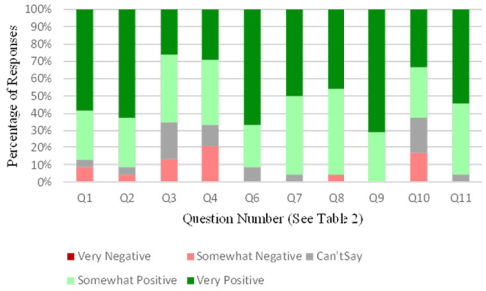

Figure 3. Student responses (Likert Scale)

The reactions to the video and audio quality of the 360° videos were mixed. Only 26% of the respondents felt it was very high, and 34.7% could not say or felt it was somewhat low. This is not a surprising response, as the Vuze XR camera is considered an entry-level model. In addition, as explained in the open-ended questions, several students found that YouTube automatically throttled the bitrate of the videos, most likely because of a poor internet connection.

The transition process between the computer and smartphone was better received. 66.7% of the respondents had a positive impression of the impact of the transition. In the open-ended questions, however, two students stated that they had to spend time downloading a third-party QR code scanning app, which resulted in more time spent transitioning. Still, transition speeds were on average quick, with 62.5% of respondents taking under ten seconds and no respondents taking more than a minute.

Catching student interest and providing a sense of immersion seemed to be the strong points of this experience. 91.7% of students considered it a somewhat or very interesting study abroad experience, and 95.8% felt that the videos were somewhat or very immersive. 95.8% of the students also felt that their interest in using 360° smartphone-aided experiences increased somewhat or a lot. In addition, 100% of the students were very or somewhat likely to recommend the experience to someone else.

Finally, the effects of the experience on student interest in visiting Japan were explored. 62.5% of students felt they were very or somewhat interested in visiting Japan before the experience, which increased to 95.9% after. Using the Wilcoxon signed-rank test, common for Likert scale responses (Roberson et al. 1995), the p-value for a two-tailed test was found to be .00338, so the result is significant at $p < .05$.

For this test, the Likert responses were given values of 5 for *Very Positive*, 4 for *Somewhat Positive*, 3 for *Can't Say Either Way*, 2 for *Somewhat Negative*, and 1 for *Very Negative*.

Note that the Likert scale questions did not all follow the exact wording of "Very Negative, Somewhat Negative, Can't Say, Somewhat Positive, and Very Positive." For example, question one asked if it was "Very Easy to Use, Somewhat Easy to Use, Can't Say Either Way, Somewhat Difficult to Use, and Very Difficult to Use." Question 7 used "Very Interesting, Somewhat Interesting, etc." Question 8 used "Very Immersive, Somewhat Immersive, etc." However, as all the questions followed the same meaning of positive to negative reactions based on the Likert scale, the wording found in Figure 3 was used.

For the open response questions, the following themes were found, as shown in Table 3.

Table 3. Open-ended questions

Question	Coded Themes
Was there anything you particularly liked about the virtual study abroad experience?	"Immersion", "Realism", "Daily Life"
Was there anything you disliked about this experience?	"Video Length", "Video Quality", "Video Content"
How could this experience be improved?	"Add Content", "QR Code Experience", "Freedom"

Appreciated points about the experience mainly included the content and immersive nature of the video.

One respondent commented:

I really liked the impression that it seems that we are in a specific place, having the vision that you would have if you were there physically.

Another comment:

I liked that it truly captures the everyday atmosphere of the place.

Dislikes about the experience mainly had to do with the video, particularly video quality and length.

Respondent comments included "*The videos were too short. I think 5 minutes or more would be more interesting," "I would have liked better video quality,"* and *"The resolution of the videos."*

For improving the experience, in the "Add Content" theme, respondents wished to have more videos, freedom to move, and informative narration. This overlapped with the "Dislikes" question.

One respondent explained:

Expanding upon my previous answer, for me it would be an improvement, if instead of the text there would be someone with an engaging voice explaining its content, after which we are left with the sounds of the city for a while before the video ends. Also, it would be nice if there were pop-out bubbles in specific places of interest during the video to add information in an engaging way.

Another explained:

If there were more scenarios, it would be more interesting, I think. I want to freely explore Tokyo.

The above responses were edited only for spelling and grammar. Out of the 25 respondents, the submission of one was removed due to missing answers on the survey and no having no input on the three open questions.

Finally, when using YouTube analytics, it was shown that the video counts were higher than the number of participants, and that the videos were being accessed by QR code scanning apps through their traffic source (for example, com.teaapps.barcodescanner, com.xaomi.scanner, and tw.mobileapp.qrcode.banner). For each video, the average view duration was within 10% of the video length, implying a high retention rate when viewing the content.

7. Conclusion and Discussion

7.1 Conclusion

To begin with responding to the first research question, it is clearly possible to create a reliable high-immersion learning system using 360° videos and QR-code transitions, even within an entirely-distance-learning paradigm. As explained in the "Results" section, transition times between the personal computer and smartphone were very low, and there were no major issues with question submission or viewing the videos. This may partially be attributed to the detailed instructions, including photographs of the process, that were provided to each student at the start of the experience. YouTube Analytics confirmed that the QR code scanners were being properly used, and this was corroborated by the open-ended questions, Question 2, Question 4, and Question 5.

To answer the second question, evaluating student interest, the effect on interest in studying abroad in Japan was found to be statistically significant at $p < .05$. In addition, the majority of students found the activity immersive and interesting and would recommend it to others, as shown through the responses of Questions 6 through 11.

These results can be useful for the development of future high-immersion systems in a distance learning context, including the use of Dual-Frame System Design. Finally, given the media swappability of Dual-Frame design, a separate project could replace the 360°content with VR180 content, allowing for a comparison lacking in current research.

7.2 Areas for Improvement

This research project was restricted to examining only a portion of a fully distance-learning virtual study abroad experience. It did not test integration with existing learning management systems or its usefulness as a module in relation to a larger course. In addition, learning outcomes were not measured, as this was meant to be a small "experience snapshot." Integrating pre- and post-testing, as well as student evaluations on completing assignments, would have also been more useful. However, these omissions may pave the way for future research.

7.3 Future Research

This project is only the first step to using system design methodology for creating large-scale learning experience in distance learning environments. This version has helped create the conception of Dual-Frame System Design while engaging in a process of iterative change through "design thinking", as shown in Figure 4 below.

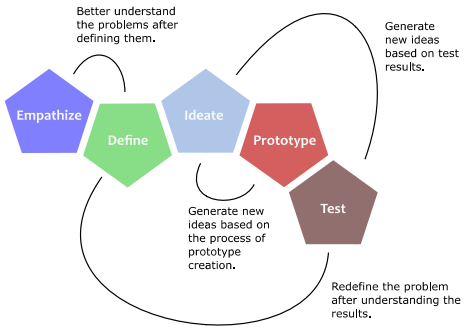

Figure 4. The design thinking process

The idea of "design thinking" was popularized by researchers at Stanford University (Tu, Liu, and Wu 2018). As seen in the lines connecting the different pentagonal shapes, it is possible for the process to loop back and repeat itself or to skip to different points. This project was created as an extension of four previous projects, each taking in elements of Dual Frame System Design, and new ideas have been generated in each iteration.

Following this, through integrating the results of this experience into the next prototype, an experience within a larger course is the next step. As seen in Figure 5 below, the next project will allow individual students to choose their own path through a virtual Tokyo, taking into account student requests for more content and the freedom to move. Using a customized web portal, students will complete different "experience snapshots" and be able to choose their own path, an important tenant of freedom that study abroad students physically present in the study abroad location can more easily partake in. Students would be able to experience snapshots in the order they wish and then receive a customized assessment based on their recorded progression throughout the spaces of Tokyo. These assessments may take the form of quizzes, tests, or even group discussions in which the instructor has access to the video-watching history of each student.

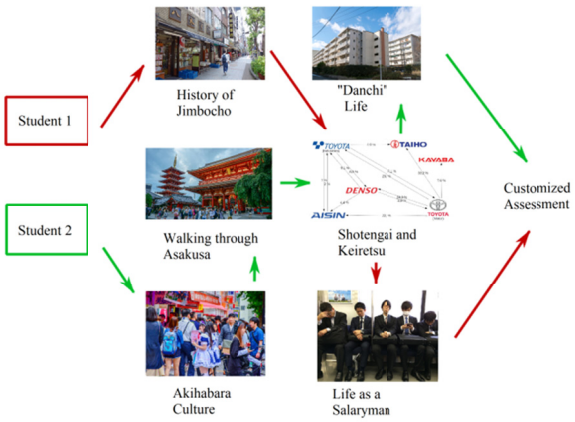

Figure 5. Expanded system with customized assessments

In summation, while the process of system engineering and design has been applied to high-immersion media technologies, there are few that take into account an already-created platform as a deeply integrated part of a larger system for virtual studying abroad. This iterative project will continue to seek to fill that gap through design thinking and Dual-Frame System Design.

Acknowledgements

The authors would like to thank both Keio University and Mejiro University for funding and supporting this research through basic research grants.

References

Border Enforcement Measures to Prevent the Spread of Novel Coronavirus (COVID-19). (2021). *Ministry of Foreign Affairs of Japan (MOFA)*. Retrieved from https://www.mofa.go.jp/ca/fna/page4e_001053.html

Calix, P., Torcivia, L. P. P., & Leon, O. (2012). *Virtual study abroad: student engagement & international interaction using meeting & mobile tools*. Retrieved April 12, 2021, from https://dspace.sunyconnect.suny.edu/handle/1951/68922

Carol, P. (2020). *The impact of COVID-19 on study abroad: Oct 2020 survey results*. Retrieved April 5, 2021, from https://institutions.educations.com/insights/the-impact-of-covid-19-on-study-abroad-oct-2020-survey-results

Chareen, S., & Hsu, Y.-C. (2020). Educational 360-degree videos in virtual reality: a scoping review of the emerging research. *TechTrends, 64*(3), 404-412. https://doi.org/10.1007/s11528-019-00474-3

John, U., Bodinger, de J., & Michael, A. D. G. (2020). *Study abroad and the quest for an anti-tourism experience*. Rowman & Littlefield.

Jorge, R. (2018). *The potential of 360-degree videos for teaching, learning and research*.

Karën, F., Adda, G., & Cohen, K. B. (2011). Amazon mechanical Turk: gold mine or coal mine?. *Computational Linguistics, 37*(2), 413-420. https://doi.org/10.1162/COLI_a_00057

Kristen, M., & Valencia, J. A. Á. (2016). Study abroad: tourism or education? a multimodal social semiotic analysis of institutional discourses of a promotional website. *Discourse & Communication, 10*(3), 235-256. https://doi.org/10.1177/1750481315623893

Lemonia, A., Economou, D., & Bouki, V. (2020). Design methodology for 360° immersive video applications: the case study of a cultural heritage virtual tour. *Personal and Ubiquitous Computing, 24*(6), 843-859. https://doi.org/10.1007/s00779-020-01373-8

Liu, Y. J., & Shirley, T. (2021). Without crossing a border: exploring the impact of shifting study abroad online on students' learning and intercultural competence development during the COVID-19 pandemic. *Online Learning, 25*(1), 182-194. https://doi.org/10.24059/olj.v25i1.2471

Marcus, B. (2012). Privileged migration: American undergraduates, study abroad, academic tourism. *Critical Arts, 26*(1), 82-102. https://doi.org/10.1080/02560046.2012.663163

O'Connor, E. A., & Worman, T. (2019). Designing for interactivity, while scaffolding student entry, within immersive virtual reality environments. *Journal of Educational Technology Systems, 47*(3), 292-317. https://doi.org/10.1177/0047239518817545

Roberson, P. K., Shema, S. J., Mundfrom, D. J., & Holmes, T. M. (1995). Analysis of paired likert data: how to evaluate change and preference questions. *Family Medicine, 27*(10), 671-675.

Rupp, M. A., Odette, K. L., Kozachuk, J., Michaelis, J. R., Smither, J. A., & McConnell D. S. (2019). Investigating learning outcomes and subjective experiences in 360-degree videos. *Computers & Education, 128*, 256-268. https://doi.org/10.1016/j.compedu.2018.09.015

Sabrina, T., Paviotti, G., & Cavicchi, A. (2020). Educational tourism and local development: the role of universities. *Sustainability, 12*(17), 6766. https://doi.org/10.3390/su12176766

Sebastian, F. M. (2018). Towards an Integration of 360-Degree Video in Higher Education. Workflow, Challenges and Scenarios. In D. Schiffner (Ed.), *Proceedings of DeLFI Workshops 2018 Co-Located with 16th e-Learning Conference of the German Computer Society* (pp. 1-12). Retrieved April 23, 2021, from http://ceur-ws.org/Vol-2250/WS_VRAR_paper3.pdf

Shannon, H. (2020). Virtual exchange as a study abroad alternative to foster language and culture exchange in TESOL teacher education. *TESL-EJ, 23*(4). Retrieved April 15, 2021, from https://eric.ed.gov/?id=EJ1242714

Statcounter GlobalStats. (2021). *Mobile operating system market share: United States of America*. StatCounter Global Stats. Retrieved April 21, 2021, from https://gs.statcounter.com/os-market-share/mobile/united-states-of-america

Steve, S. (2019). An overview of content analysis. *Practical Assessment, Research, and Evaluation, 7*(1). Retrieved from https://scholarworks.umass.edu/pare/vol7/iss1/17

Vanessa, W. (2016). On the ethics of crowd sourced research. *PS: Political Science & Politics, 49*(1), 77-81.

https://doi.org/10.1017/S104909651500116X

Virtual Programs - Washington State University. (2021). *Washington State University, office of study abroad*. Retrieved April 17, 2021, from https://ip.wsu.edu/study-abroad/virtual-programs/

Virtual Study Abroad- AKP. (2021). *The associated Kyoto program*. Retrieved April 17, 2021, from https://www.associatedkyotoprogram.org/category/blogs/nihongoka-blog/virtual-study-abroad/

Virtual Study Abroad. (2021). *Middle Tennessee state university - office of education abroad*. Retrieved April 13, 2021, from https://mtsu.studioabroad.com/index.cfm?FuseAction=Abroad.ViewLink&Parent_ID=0&Link_ID=84A55517-B677-068B-C840840FBDC66CF7