7 Making the virtual tangible: using visual thinking to enhance online transnational learning

Kelly M. Murdoch-Kitt[1] and Denielle J. Emans[2]

Abstract

Tangible visual thinking activities can enrich long-distance intercultural learning experiences by improving realism, respect, and equity. This occurs through the creation of boundary objects, which can be physical objects that generate shared understanding across diverse teams and disciplinary boundaries. In the case of this study, visual thinking activities produce boundary objects in the form of visual creations – such as sketches, photographs, collages, and data visualizations. Used strategically in conjunction with Collaborative Online International Learning (COIL) curricula in any academic discipline, these activities cultivate self-reflection, communication, mutual understanding, cultural learning, and cooperative work. The benefits of visual thinking enrich and enhance transnational learning, as illustrated and observed in the course of the authors' ongoing nine-year study of Virtual Exchanges (VEs) between learners situated in the Middle East and North America. The visual thinking activities in this study complement and work in parallel with COIL curricula or existing courses that instructors have already planned. They can also occur in conjunction with regular course activities leading up to and throughout a collaboration to enhance relationship-building and trust. Visual thinking activities offer ways for learners to understand and appreciate their collaborative partnerships beyond the screen. In the

1. University of Michigan, Ann Arbor, United States; kmmk@umich.edu; https://orcid.org/0000-0003-3410-6017

2. Roger Williams University, Bristol, Rhode Island, United States; demans@rwu.edu; https://orcid.org/0000-0003-3185-2997

context of long-distance intercultural experiences, the tangible and tactile nature of these activities reinforces the verisimilitude of the collaboration and its participants. After completing these preliminary activities, the study findings indicate an increase in the quality of projects that students produce together.

Keywords: visual thinking, digital equity, self-awareness, collaboration, tangible, meaningful relationships.

1.   Introduction and literature review

Visual thinking is the act of making one's thoughts or ideas visible. This study examines how participants use visual thinking to formulate a deeper understanding and appreciation of self and respective intercultural partners within COIL exchanges. Activities that support visual thinking can range from sketches and prototypes, to writings and models. As tangible manifestations of visual thinking, these basic categories include thought objects, progress objects, and dialogue objects that center on the kind of communication they each support (Murdoch-Kitt & Emans, 2020). These three object categories come from the sociological construct of boundary objects, which, according to Star and Griesemer, are created objects, images, or communications that serve to facilitate understanding of communication, identity, and self-reflection (Star & Griesemer, 1989). While these visual thinking objects can be seen as a form of visual communication, in this study they are less formal and personalized to team communications, whereas the field of visual communication is generally more concerned with communicating to wider audiences.

While VE prioritizes cultural learning and sharing, COIL prioritizes collaboration on project-based learning outcomes between participants from different cultural backgrounds and geographic locations. Long-distance intercultural learning has long been a topic of interest within various academic disciplines. While

Rubin and his team coined the term COIL in 2004 (Rubin, 2018), providing a shared lexicon to describe VE, there remains a need to embed visual thinking in international co-teaching and co-learning strategies. As evidenced by the focus on technological translation tools and logistics in the current VE literature, visual thinking as a pedagogical VE methodology remains an underutilized means of creating and exchanging information, and of relationship-building among COIL participants.

The literature discusses some projects that utilize an emic approach, which helps students gain an insider's perspective into a partner culture. Yet, literature overwhelmingly focuses on logistics (Pearl & Verruck, 2019) and the use of tools (Simon, 2019). With few exceptions (e.g. Schadewitz, 2009, which delves into some design 'patterns'), discussions around communication often emphasize technology use as paramount to establishing connections between participants (as in Wilmot, Rushton, & Hofmann, 2016). In order to fully support intercultural learning and collaboration beyond tools, logistics, and technology, instructors have a responsibility to introduce communication strategies and interpersonal competencies into their pedagogies. Though widely overlooked in the COIL literature, visual communication is an effective strategy for engaging participants in understanding each other's lived experiences.

Visual communication can serve as a rather universal language to deepen dialogues and connections beyond the tip of Hall's (1976) theoretical cultural iceberg. As evidenced in prior academic research, the need to develop effective communication competencies is heightened when teammates work together globally *and* remotely (Bennett, Eglash, & Krishnamoorthy, 2011). Evolving technology offers potential for richer exchanges, but brings its own barriers and is not necessarily ubiquitous. In pursuit of critical telecollaboration, VE classrooms also need to go beyond typical icebreaker activities or superficial connections, which sometimes fail to develop a critical understanding of the self or others (O'Dowd, 2016). These surface-level interactions, such as discussions of cuisines, can unwittingly reinforce cultural stereotypes by offering a shortsighted view of a particular country, culture, or people.

Because creating and sharing ideas through images can encourage comprehension of complex ideas (Nelson & Stolterman, 2014), promote negotiation (Singh, 2011), and enable dialogue (Tharp & Tharp, 2018), visual thinking has many positive effects on VE. *Boundary objects* support this process, enabling learners to exchange knowledge and co-create by navigating compromises and encouraging dialogue, trust-building, and understanding (Leonard-Barton, 1995; Star & Griesemer, 1989; Takeuchi & Nonaka, 1995). Boundary objects can be physical objects that generate shared understanding across diverse teams and disciplinary boundaries. Visual, product, and interactive design, as well as other creative disciplines, commonly use boundary objects as forms of visual thinking – to explain or express thoughts, elicit feedback, build upon ideas, and reach consensus (Marheineke, 2016).

Together, these positive attributes of visual thinking and communication help promote equity among intercultural collaborators as a result of individuals' in-depth perspective-taking by making, exchanging, and interpreting each other's visual thinking objects. According to the US-based National Digital Inclusion Alliance[3], while digital inclusion entails providing access to hardware, software, internet access, and other technical resources, one of its key aims is "to enable and encourage self-sufficiency, participation and collaboration". To that end, visual objects help individuals understand themselves and their partners more deeply by inviting more sophisticated and critical conversations. This involves creating space for each other, more attentive listening, and the ability to embrace differences as opposed to seeking commonalities. Over the course of this ten-year study, this has been evidenced in the complexity and perspectives present in teams' project outcomes and is overwhelmingly noted in students' individual written reflections of their experience.

This ongoing study builds on previous work in multisensory and tangible approaches to international education and co-learning. Creating and engaging with visual and physical objects has proven effective in a range of areas, such as language learning; for example, where beginner English learners utilize

---

3. https://www.digitalinclusion.org/definitions

'tactile, visual, and kinetic' means to thoughtfully connect images and image-making with language (Gorjian, Hayati, & Barazandeh, 2012). Meanwhile, a study that used drawing to engage and connect medical and fine art students in 'critical looking' shows how visual communication promotes interdisciplinary communication and learning (Lyon, Letschka, Ainsworth, & Haq, 2013). These examples show the efficacy of visual thinking in diverse contexts. Its tactile and physical components help students feel more connected to their work and teammates. However, these examples rely on in-person interactions. The authors extend the findings from these studies into the virtual learning realm and, specifically, the practice of COIL. An overview of positive outcomes discussed in this paper encourages educators to incorporate visual thinking strategies within COIL curricula.

2. Methodology

2.1. Constructive-developmental paradigm

This research utilized constructive-developmental theory (Baxter Magolda, 2001; Kegan, 1994) and grounded theory (Charmaz, 2014; Glaser, 1978) to analyze and compare the qualitative data collected over the course of the study. This form of data collection involved classroom observations, student questionnaires, student written reflections, and project outcomes. As part of this process, the constructive-developmental theory promotes the cultivation of students' self-understanding as a precursor to understanding others. This theory is critical to COIL, with boundary objects assisting in this developmental progression.

Applying these theories to an ongoing series of VE, the authors developed more than 30 visual thinking activities to support COIL. These activities were developed from 2011 to present between different cohorts of students based in North America and the Middle East. Using observations and qualitative online questionnaires to obtain feedback and to continually improve upon the activities, the authors have so far prototyped, tested, and refined these activities with over 300 students hailing from 23 different countries.

Findings indicate the visual thinking activities are effective in both COIL curricula and classrooms that are not part of VE. Some of the authors' tactile visual thinking activities include the Teamthink Constellation; Picture Story Shuffle; Cultural Icebergs; Comparative Impression Maps; Belief Brainstorm; Datastorming; and value collage (Murdoch-Kitt & Emans, 2020). This paper focuses specifically on the value collage activity (see Figure 1), which demonstrates the theories of the constructive-developmental paradigm and boundary objects.
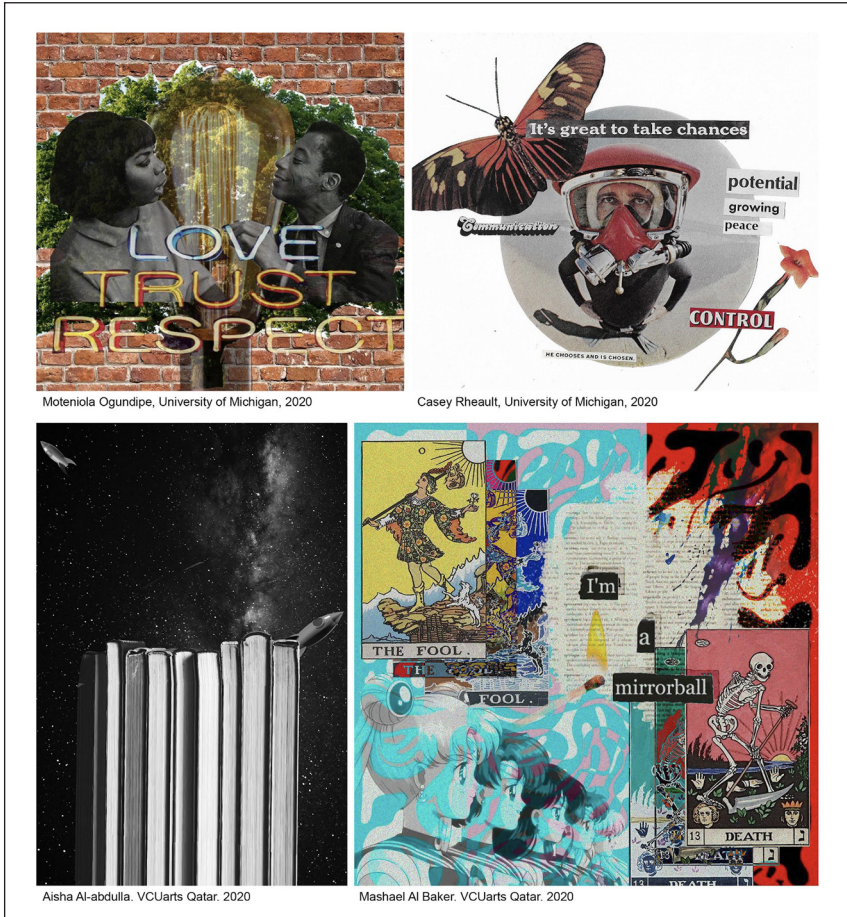
2.2.   Value collage

The value collage activity asks participants to consider where their own values come from and then write lists of their personal and cultural values. Next, they explore how to represent these values visually using various materials or media to make a *collage*, a tactile visual composition created from selecting, combining, and arranging cut-out images, colors, textures, and text. Because of the open-ended nature of the prompt and because it is informed by each individual's values, each completed value collage is unique. Instructors encourage students to create their collages by hand, however, some end up creating digital compositions, or combining physical materials into a digital composition.

In creating, sharing, and discussing collages – first with collocated classmates, then with international partners – through synchronous and asynchronous means, the activity enables individuals to better understand themselves and prepare for thoughtful conversations with COIL partners. For example, in response to the value collage activity, one US-based participant wrote,

> "I hadn't thought about how culture could influence your values and it really forced me to dig deeper into how my identity and culture correlates with these values I hold most important".

This self-reflective aspect of learning is critical to building trust and long-term relationships between participants, and visual thinking enhances self-reflection.

Figure 1. Example value collages[4]; this activity is effective in both COIL and non-exchange courses alike. As with these examples, the activity can be conducted using physical materials (e.g. magazine cut-outs), digital images, or a combination of both

Moteniola Ogundipe, University of Michigan, 2020

Casey Rheault, University of Michigan, 2020

Aisha Al-abdulla. VCUarts Qatar. 2020

Mashael Al Baker. VCUarts Qatar. 2020

---

4. We have not been able to follow up with the participating students to ensure all the images used in their collages are copyright-free. We nevertheless believe all of the work – as is typical with collage – falls within the fair use doctrine as 'transformative' work, which states: "transformative uses take the original copyrighted work and transform its appearance or nature to such a high degree that the use no longer qualifies as infringing". In this way, the collages bring together various images to speak about each person's personal value systems.

2.3.   Communication methods

Throughout the process, instructors guide students in discussions between collocated classmates as a precursor to sharing with long-distance intercultural partners. This internal discussion boosts confidence, promotes individual self-reflection, and provides practice dialogue. Having gained perspective on their own values, they are then better able to appreciate their classmates' and collaborators' values. Within this study, discussions of participants' value collages have taken a variety of forms. This is because each of the COIL cohorts have communicated with each other through a variety of synchronous and asynchronous methods, depending on the nature of particular collaboration and the constraints of the semester.

Sometimes, when courses have been scheduled at compatible times, COIL partners have a great deal of synchronous discussion (e.g. live videoconference meetings) and are able to share and discuss their value collages in a real-time conversation. In other cases, such as study cohorts with 11- to 12-hour time differences, asynchronous communications such as messaging applications and email exchanges have been the dominant mode of conversing between teammates. In this case, a discussion about individuals' value collages might take place over several days' time.

3.   Discussion

The authors characterize *meaningful relationships* by participants' ability to cooperate and work efficiently with each other based on increased social exchange (Homans, 1958) and reduced social uncertainty (Berger & Calabrese, 1975). Meaningful relationships are built upon trust, understanding, and the ability to listen to others' perspectives. Making and exchanging various visual objects – such as sketches, photographs, collages, drawings, and data visualizations – helps VE participants open up to new perspectives and take them into account (Murdoch-Kitt & Emans, 2020). When these activities are integrated into COIL projects, participants become equipped to foster and sustain meaningful

relationships. For example, survey data revealed that 60% of the authors' most recent COIL cohort would stay in touch with their global collaborators following the project completion. Additionally, 72% stated an increased interest in future intercultural opportunities.

When asked to respond in writing to this question, *What would you tell another student who is thinking about enrolling in this course?*, one participant noted:

> "If they are looking for an experience where they'll understand themselves and others better by the end of it then this is for them. If they want experience in collaboration or with meeting new people from different places and of different backgrounds then this course is definitely right up their alley".

Another participant stated:

> "This is a great opportunity to build collaboration, communication, research, and critical thinking skills".

Going beyond initial ice-breakers and surface-level communications, visual thinking activities and resulting boundary objects can support collaborators in project-based learning. During tactile visual activities like the value collage, the physical aspects of combining various elements together into a single image become visual signifiers of the various students participating in VE. Students reflect openly on values depicted in their own and their partners' collages, revisiting these throughout their collaboration. This shared experience is a worthwhile and engaging way to understand people, beyond simply connecting via social media or asynchronous small talk (Murdoch-Kitt & Emans, 2020).

As one COIL participant in the study wrote in a freewriting response following the value collage activity:

> "I don't think I've really ever considered where these values came from and how they are influenced by the context/culture in which I live.

As humans, we have a tendency to find comfort in familiarity, and discourse on the value discrepancies between people and cultures can be even more uncomfortable in many respects because our values dictate so much of who we are. The idea of channeling these conversations through a different medium to help lessen the personal baggage and invite inquiry is a really cool idea and makes me wonder how we could reframe other potentially difficult/uncomfortable topics to facilitate these important conversations".

Qualitative data collected from the authors' study reveal that visual thinking activities positively affect the majority of students' participation and engagement in COIL. The activities captivate the senses and push students to think creatively and critically about who they are as individuals, enhancing their experience with project-based learning. For instance, one participant noted in their weekly reflection, in response to the question 'who are we':

"I think the value collage made me think a lot about what values I hold in general and what things I actually uphold in my own life. I think there is a little bit of a disconnect there and it's important to acknowledge that and again take a closer analysis of what is most important to who I am individually. I think who 'we' are as a whole is hard to define and that makes me happy! Even looking at our beliefs activity from class today it was very interesting to see the wide range of thought processes and ideas that I hadn't even thought of".

When these activities are done by hand – using physical materials including paper, markers, string, or glue – they stimulate multiple senses and help learners appreciate the tangible reality of otherwise virtual collaborations. These findings are consistent with theories of multisensory and multichannel learning, which emphasize that utilizing different senses stimulates brain activity (Mayer, 2002; Willis, 2006). With this in mind, the ability to work with tangible materials in one's physical environment helps otherwise virtual relationships to feel less abstract to participants.

4.   Benefits and challenges

A persistent challenge within COIL exchanges is the need to move beyond simply 'connecting' with others, and instead, conceive of communicative, coordinated, and cooperative partnerships. True collaborations are built on trust and openness. Thus, students must learn and employ interpersonal skills like active listening, negotiation, and patience. Systematically initiating and taking responsibility for their individual and collective roles also builds harmonious and efficient relationships.

Because the visual activities in this study are based on constructive-developmental theory, they help participants overcome surface-level assumptions and interactions. Initial introspection provides a basis for sensitive inquiry and communication with VE partners. While earnest collaboration is challenging to accomplish during VE, relationships become stronger through the shared development of a project, which relies upon and simultaneously builds interpersonal communication skills and teammates' sense of empowerment (Hill, Brandeau, Truelove, & Lineback, 2014). Beyond communication alone, visual thinking activities can support students in developing relationships around topics related to global challenges, such as defending human rights or preserving natural resources. This approach must be deliberately introduced and nourished.

Visual thinking activities like the value collage are not confined to the creative disciplines. These activities can also complement and work in parallel with existing courses or COIL curricula. These points are reinforced by Vazquez (1981), who explains that "to use art in the language classroom does not mean to teach art, but to teach language through art" (p. 1).

Finally, based on the authors' analysis of their overall observation and interpretation of this ten-year COIL study, when compared to COIL, activities improve the quality of projects that the students create together (Murdoch-Kitt & Emans, 2020). Analyzing the qualitative data about participant experience over time has enabled the study to improve upon and refine the activities as an

outcome of this research. In this study, the authors observed stark differences in the working processes and outcomes of teams who employ these methods compared to those who do not use them (for example, as shown in Figure 2).

Figure 2. This representative set of participant responses about superficial similarities and differences between a team's two cities came from a cohort that did not employ any of the preliminary visual thinking activities. Below: as a result of using visual thinking early in their team-building process, two participant responses from a later cohort illustrate the heightened understanding of cultural complexity within team discussions and project topics

BEFORE VISUAL THINKING ACTIVITIES:
SUPERFICIAL SIMILARITIES AND DIFFERENCES

DIFFERENCES	SIMILARITIES
Dubai has hot summers and San Francisco has cool summers.	Dubai and San Francisco are two cities that attract tourists from all over the world.
Dubai has a lower rate of population and San Francisco has a bigger rate of population.	Dubai and San Francisco have important skyscrapers.
Dubai has few graffiti walls and San Francisco is a city that is very proud of the graffiti artwork.	Dubai and San Francisco both have beautiful beach sites.

AFTER VISUAL THINKING ACTIVITIES:
HEIGHTENED UNDERSTANDING OF COMPLEXITY

NUANCES	
[I shared a story with teammates about] a time in Iran when I went out with some of my cousins and we were caught by the moral police for not following the dress code. It really bothered me because they were only concerned with the girls' dress, not the boys'. Women in my country are not free to wear what they choose.	I think had we shown the banners only in Michigan or only in Doha our messaging would have been much different. The banner my partner designed spoke very much to her experience with gender discrimination in public spaces, something I haven't experienced much. When it comes to gender discrimination in the United States, I think themes like discrimination in the workplace or in certain fields of study is an experience that is more accessible to women.

The tangible and tactile nature of visual thinking activities strengthens the verisimilitude of virtual relationships and collaborations. In other words,

"tangible objects help teams build relationships, trust, and ideas" (Murdoch-Kitt & Emans, 2020, p. 225). The tangible aspects of creating boundary objects can enrich a COIL exchange by improving realism, which, in turn, improves respect and equity among participants. Research shows that equitable teams, in which members feel comfortable exchanging ideas, do better work (Leonard-Barton, 1995).

5.   Conclusion

VE instructors must take responsibility to craft a plan that continually nurtures relationship-building throughout a COIL exchange. Integrating multiple strategies – including visual thinking – is key to building and maintaining important relationships that develop during this expansive process. Although VE instructors may initially perceive these activities as outside the scope of their course, visual thinking activities can enhance existing pedagogical structures, strengthening their original intent. When incorporated strategically, their ability to enhance comprehension and engagement can further reduce stresses and extra work for instructors. This is because boundary objects generate conversation around and about the artifact, rather than directly asking participants to share their beliefs, thoughts, or ideas through written or oral means alone.

The object, therefore, serves as a facilitation tool to initiate conversation among teammates and eases pressure on the students to always think on their feet or feel scrutinized by their partners as a representative of their country or culture. Deep discussions evolve around the visual objects that effectively draw out stories, perspectives and experiences which would not otherwise emerge, perhaps particularly in the presence of a lingering instructor. Instead, the VE instructor's energy can shift to supporting the cohort as a whole by introducing visual thinking activities that guide the overall COIL journey, and shift the onus of critical conversations to the students, mediated by their visual objects. As an adaptable approach, creating and working with boundary objects also levels playing fields for participants who speak different languages or feel less confident in a common instructional language. With these benefits in mind, the authors

invite the IVEC community to integrate visual thinking activities to create more equitable, inclusive, and meaningful relationships among their VE cohorts.

References

Baxter Magolda, M. B. (2001). *Making their own way: narratives for transforming higher education to promote self-development*. Stylus.

Bennett, A., Eglash, R., & Krishnamoorthy, M. (2011). Virtual design studio: facilitating online learning and communication between U.S. and Kenyan participants. In K. St. Amant & F. Sapienza (Eds), *Culture, communication, and cyberspace: rethinking technical communication for international online environments* (pp. 183-206). Routledge.

Berger, C. R., & Calabrese, R. J. (1975). Some explorations in initial interaction and beyond: toward a developmental theory of interpersonal communication. *Human Communication Research*, *1*(2), 99-112. https://doi.org/10.1111/j.1468-2958.1975.tb00258.x

Charmaz, K. (2014). *Constructing grounded theory*. Sage Publications.

Glaser, B. (1978). *Theoretical sensitivity: advances in the methodology of grounded theory*. The Sociology Press.

Gorjian, B., Hayati, A., & Barazandeh, E. (2012). An evaluation of the effects of art on vocabulary learning through multi-sensory modalities. *Procedia Technology*, *1*, 345-350. https://doi.org/10.1016/j.protcy.2012.02.072

Hall, E. T. (1976). *Beyond culture*. Anchor Books.

Hill, L. A., Brandeau, G., Truelove, E., & Lineback, K. (2014). *Collective genius: the art and practice of leading innovation*. Harvard Business Review Press.

Homans, G. C. (1958). Social behavior as exchange. *American Journal of Sociology*, *63*(6), 597-606. https://doi.org/10.1086/222355

Kegan, R. (1994). *In over our heads: the mental demands of modern life*. Harvard University Press.

Leonard-Barton, D. (1995). *Wellsprings of knowledge: building and sustaining the sources of innovation*. Harvard Business School Press.

Lyon, P., Letschka, P., Ainsworth, T., & Haq, I. (2013). An exploratory study of the potential learning benefits for medical students in collaborative drawing: creativity, reflection and 'critical looking'. *BMC Medical Education*, *13*(1), 86. https://doi.org/10.1186/1472-6920-13-86

Marheineke, M. (2016). *Designing boundary objects for virtual collaboration*. Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-15386-1

Mayer, R. E. (2002). Multimedia Learning. In *Psychology of Learning and Motivation*, 41, 85-139. https://doi.org/10.1016/S0079-7421(02)80005-6

Murdoch-Kitt, K. M., & Emans, D. J. (2020). *Intercultural collaboration by design: drawing from differences, distances, and disciplines through visual thinking*. Routledge. https://doi.org/10.4324/9780429268823

Nelson, H. G., & Stolterman, E. (2014). *The design way: intentional change in an unpredictable world*. The MIT Press.

O'Dowd, R. (2016). Emerging trends and new directions in telecollaborative learning. *Calico journal, 33*(3), 291-310.

Pearl, M., & Verruck, F. (2019). Internationalization at home and virtual team collaboration meet global challenges: a practical approach to international business. *2019 International Virtual Exchange Conference (IVEC) Proceedings* (pp. 46-50). http://iveconference.org/wp-content/uploads/2019/12/IVEC-2019-Conference-Proceedings.pdf

Rubin, J. (2018). The collaborative online international learning network: online intercultural exchange in the state university of New York network of Universities. In R. O'Dowd & T. Lewis (Eds), *Online intercultural exchange: policy, pedagogy, practice* (pp. 263-272). Routledge. https://doi.org/10.4324/9781315678931

Schadewitz, N. (2009). Design patterns for cross-cultural collaboration. *International Journal of Design, 3*(3).

Simon, N. (2019). Choosing the best technology for your COIL project. *2019 International Virtual Exchange Conference (IVEC) Proceedings* (pp. 83-89). http://iveconference.org/wp-content/uploads/2019/12/IVEC-2019-Conference-Proceedings.pdf

Singh, A. (2011). Visual artefacts as boundary objects in participatory research paradigm. *Journal of Visual Art Practice*, *10*(1), 35-50. https://doi.org/10.1386/jvap.10.1.35_1

Star, S. L., & Griesemer, J. R. (1989). Institutional ecology, 'translations' and boundary objects: amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science*, *19*(3), 387-420. https://doi.org/10.1177/030631289019003001

Takeuchi, H., & Nonaka, I. (1995). *The knowledge-creating company: how Japanese companies create the dynamics of innovation*. Oxford University Press.

Tharp, B. M., & Tharp, S. M. (2018). *Discursive design: critical, speculative, and alternative things*. The MIT Press. https://doi.org/10.7551/mitpress/11192.001.0001

Vazquez, D. (1981). Teaching a second language through art. *Writing Across the Curriculum, 1*. https://teachersinstitute.yale.edu/curriculum/guides/1981/4/81.04.12.x.html

Willis, J. (2006). *Research-based strategies to ignite student learning: insights from a neurologist and classroom teacher*. Association for Supervision and Curriculum Development.

Wilmot, N. V., Rushton, D., & Hofmann, A. S. Z. (2016). Reaching across continents: engaging students through virtual collaborations. *Higher Education Pedagogies*, *1*(1), 121-139. https://doi.org/10.1080/23752696.2016.1216325

Virtual exchange: towards digital equity in internationalisation
Edited by Müge Satar

Disclaimer: Research-publishing.net does not take any responsibility for the content of the pages written by the authors of this book. The authors have recognised that the work described was not published before, or that it was not under consideration for publication elsewhere. While the information in this book is believed to be true and accurate on the date of its going to press, neither the editorial team nor the publisher can accept any legal responsibility for any errors or omissions. The publisher makes no warranty, expressed or implied, with respect to the material contained herein. While Research-publishing.net is committed to publishing works of integrity, the words are the authors' alone.

Trademark notice: product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

Copyrighted material: every effort has been made by the editorial team to trace copyright holders and to obtain their permission for the use of copyrighted material in this book. In the event of errors or omissions, please notify the publisher of any corrections that will need to be incorporated in future editions of this book.