

ICT-Supported Design Thinking Workshop Program: A Case Study of Encouraging Social Lean-In for High School Students in Japan

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Abstract: Since 2015, an ICT-supported workshop program based on the constructionism approach has been implemented at Fujimikaoga High School for Girls (FHS) in Japan. Keio University Graduate School of Media Design students from diverse cultural backgrounds facilitates the nonformal learning experience. The program employs a design thinking process (DTP) and ICT tools to enhance active collaborative learning and intercultural interactions. Over 800 students have participated, demonstrating gains in critical thinking, investigation, feedback articulation, and iteration of their own views. This paper details the program's concept, process, qualitative findings, key elements of success, and challenges during implementation.

1 INTRODUCTION

1.1 Contextual Progression

The notion of globalization is often discussed with respect to its commercial, cultural, and societal aspects (Ritzer and Dean, 2019). The progression in technological infrastructure amplified the overall smartphone adoption rate in Japan (Tateno et al., 2019). This affluence in accessibility has facilitated more opportunities for interpersonal communication and exposure to diverse cultures. Specifically, the social features on platforms enable these connections, allowing youngsters today to participate actively (Lehdonvirta and Räsänen, 2011).

While youngsters engage digitally, they may inevitably encounter discussions about worldwide matters and challenges, ones in Japan included (Lehdonvirta and Räsänen, 2011). Online and offline interactions necessitate cultural sensitivity, competence, and respectful communication (Parkinson, 2009; Cushner, 2015; Nastasi, 2017).

To develop these crucial skills, the Programme of International Student Assessment (PISA) recommends promoting global competence through the cultivation of critical thinking and intercultural appreciation in discussing, analyzing, and taking action toward global subjects (OECD, 2018). Such skills are crucial for constructing a harmonious multicultural community in the long run (OECD, 2018; Tichnor-Wagner and Manise, 2019). Various initiatives world-

wide aimed at promoting global competence among high school students exist (Tsang et al., 2020), although, in Asia, they typically take the form of short-term competitions rather than long-term program integration in support of the school curriculum.

1.2 Use of ICT: Pre and During COVID-19

In 2022, a study found that prior to the COVID-19 pandemic, Information and Communication Technologies (ICT) use in secondary school classrooms in Japan varied across the country (Iwabuchi et al., 2022). The hesitation in using ICT tools in Japan's classrooms was also reflected in the findings from a 2013 study, as well as the country's low ranking in the OECD's report, which indicates a reliance on traditional methods of instruction (OECD, 2020; Kusano et al., 2013). During this period, ICT was largely perceived as a stand-alone subject with limited integration into the overall education process.

During COVID-19, educators in Japan had to exploit assorted digital services obtainable to continue teaching (Kang, 2021), resulting in increased ICT tool adoption among both educators and learners (Kang, 2021). However, ICT primarily served as a means of communication during this period in Japan, replacing physical presence (Kang, 2021). E-mail and Zoom were frequently used alternatives for communication between teachers and students, but the formal educa-

tion approach remained unchanged (Barry and Kanematsu, 2020; Kuromiya et al., 2022). Interestingly, studies suggest that teachers and parents in Japan still favor physical learning environments rather than integrating digital tools into their practice (Akabayashi et al., 2023; Ikeda, 2022).

1.3 Motivation

The progress of technology and ease of information access has enabled learning to evolve beyond traditional physical settings. These context conditions led to the creation of a proposed program that aims to explore the viability of a structured nonformal tutorial environment to foster peer learning while studying the influence of ICT tools on students’ relationships, motivation to learn, and knowledge acquisition.

1.4 Structure of Discussion

To provide clear visibility of the process for the program, the following discussion will be divided into three main parts: 1) Section 2 primarily discusses the overall foundation of the program. 2) Section 3 concentrates on the deliberate use of the Design Thinking Process for implementation. 3) Section 4 discusses using ICT tools to enable peer learning and intercultural, multicultural, and cross-team interactions.

2 PROGRAM FOUNDATION

2.1 Aims and Structure

Formal learning is demarcated as obligatory with the aim of attaining accreditation, vastly composed by the lecturer under an educational establishment within the scheme (Eshach, 2007; Cedefop, 2014). Specifically, Japan’s secondary education addressing students’ needs for global competence is primarily motivated by schooling in a formal education approach (Davidson and Liu, 2020). Under this method, topics were often taught in textbook-directed methods and concluded as the lecture was completed, as the content was delivered and expectantly obtained by the students.

Conversely, nonformal learning is typically run by a chaperon, systematically prearranged in accordance with learning objectives, and participants attend voluntarily, deprived of assessments, nor attainment of accreditation (Hamadache, 1991). Studies suggest that nonformal learning practices enable students to gain problem-solving skills, build self-confidence through reflecting on experiences, and

proactively seek knowledge (Dib, 1988). The nonformal learning in this program is defined by the OECD as learning through a program that does not involve evaluation or certification (OECD, 2005).

Arguably, learning can arise in various settings through diverse methodologies when new information is presented and connected to existing knowledge schemes (Saunders and Wong, 2020). The proposed program aims to provide supplementary scaffolding for student-centered learning experiences in a non-formal setting, promoting active reflection, creativity, and meaning-making through experiences. As illustrated in Figure 1, the proposed structure does not aim to modify the current formal approach in Japan’s secondary education, but rather to enable students to develop global competence skills through offline experiences and broaden their contact with diverse cultures through ICT tools.

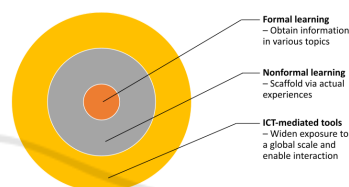


Figure 1: Proposed Structure of the Program.

2.2 Nonformal Learning

Constructionism is based on the idea that individuals learn best when actively constructing understanding and meaning, rather than passively receiving information (Harel and Papert, 1991). Rather than committal to memorization, Figure 2 illustrates the supporting theories used in the proposed program.

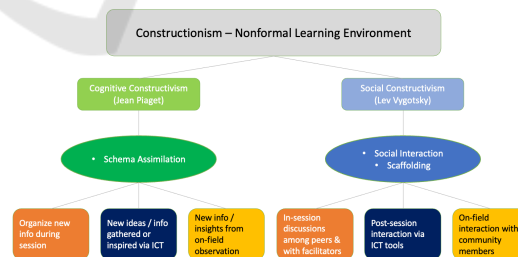


Figure 2: Supporting Theories for the Proposed Program.

The program is partly constructed based on Lev Vygotsky’s concept of constructing knowledge through socialization (Vygotsky and Cole, 2018; Pass, 2004). Facilitators, local community members, high school teachers, and student peers all play a role in the communication and learning process. Through social interaction, students create their own interpretations of the material and integrate them with existing schemas (Gallagher and Reid, 2002).

Incorporating a social constructivist learning theory in the proposed program has numerous benefits, including the ability for students to identify areas of interest, foster creativity, and collaborate with peers to appreciate diverse perspectives (Vygotsky and Cole, 2018). This approach also inspires active reflection and discovery, enhancing the creation of knowledge (Alam, 2022; Ali, 2019). Moreover, the social constructivist method provides workshop facilitators with a degree of autonomy, allowing them to tailor the sessions to the needs and level of understanding of different participants (Vygotsky and Cole, 2018).

Jean Piaget’s learning theory of constructivism supports the second half of the grounding philosophy for the proposed program (Pass, 2004). Reflecting on one’s own practices is a critical aspect of adapting and integrating new information (Pass, 2004). This reflection procedure encourages exploration and active learning (Gallagher and Reid, 2002).

2.3 Creating the Environment

The proposed program intends to foster students’ social lean-in and promote global competence development by creating a learning environment that integrates social context with exposure to global issues. This approach aligns with the idea that global competence is often enhanced within a social context through proactive engagement with real-world global issues (OECD, 2018).

To motivate social lean-in, the program has been designed to shift students from passive knowledge receivers to active learners and enhance their global competence through nonformal learning opportunities. It utilizes the Design Thinking Process (DTP) (Friis Dam and Yu Siang, 2020) to facilitate students’ awareness of a specific topic of interest, appreciation of diverse perspectives, and proactive problem-solving (Rao et al., 2022) As 21st-century students are naturally inclined to be technology-savvy, digital resources have become an intuitive form of learning outside of school (Saykili, 2019). Incorporating ICT tools in the program, therefore, provides an efficient way to transmit, store, create, share, and exchange information and ideas (Saykili, 2019).

3 IMPLEMENT VIA DTP

The study focuses on exploring the potential of utilizing the nonformal learning environment and dynamic interaction between ICT tools and DTP framework for promoting the acquisition of global competence and social lean-in among students.

Specifically, as illustrated in Figure 3, the program is grounded on constructionism values and aims to provide a nonformal learning setting that utilizes ICT to support global competence development. Design thinking practices are employed as a guide to enable students to actively perceive, discover, and analyze their local communities. The ICT tools’ innate characteristics brought a many-to-many communication platform that further supports the construction of peer learning (Pfister, 2011). Collaborative learning, which is an operative means to benefit the learning progression and increase the learning involvement for learners (Topping, 2005), is possible under the peer learning theory. Through this setting, students can establish connections with local community members and actively interact with the facilitator community.

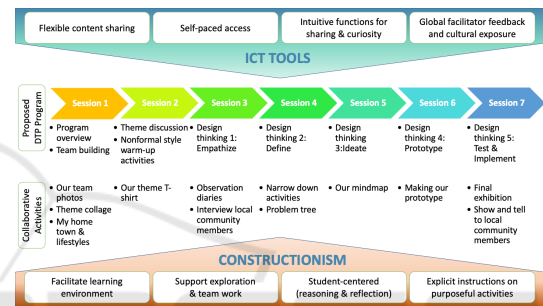


Figure 3: Relationships among the Proposed Program, Constructionism, and ICT Tools.

In addition, Self-Determination Theory supports using a continuum and interactive structure to fulfill the inner needs for competence, connection, and autonomy, as well as social interpersonal communication, all of which can enhance knowledge construction and motivation to learn (Flannery, 2017; Parr and Townsend, 2002). The proposed program takes this into account by providing room for individual decision-making and ownership while utilizing ICT tools for cooperative learning and peer assessment (Jacobs and Ivone, 2020; Pinheiro and Simões, 2012). These aspects further enhance student engagement and broaden their perspectives as they share their discoveries.

3.1 Collaboration with Fujimigaoka High School (FHS)

Since 2015, the proposed program has been annually implemented outside of regular class hours at FHS, an all-girls secondary education institution in Japan that aims to “nurture young ladies with a global mindset” (FHS, 2015). The proposed program, which has an average of 100 tenth-grade participants each year, is incorporated into the compulsory course “Basic Sus-

tainability”, as part of FHS’s designation as a “Super Global High School” (FHS, 2015) by the Japanese Ministry of Education, Culture, Sports, Science, and Technology.

Facilitated by the Global Education project team at Keio University Graduate School of Media Design, the program features an average of 1 to 1.7 facilitator-to-group ratio, allowing for more thorough discussions and improved relational connections between students and facilitators. The project team comprises postgraduate students from at least 15 countries across Asia, Europe, North America, South America, and the Middle East, offering high school students the opportunity to interact with facilitators from diverse cultural backgrounds.

3.2 Frequency of Implementation

The proposed ICT-supported workshop program was conducted at FHS in Japan, typically once a month from June to January of the following year. The intervals between workshops allowed students to gain practical experience through hands-on learning in the field.

3.3 Specifics of the Proposed Program

The workshop comprises eight sessions that use DTP as a framework for facilitation. The first two sessions aim to orient students to the program and project theme while fostering group bonding. The remaining six sessions guide students to explore, examine, ideate, and create solutions for a community of their choice, based on project themes such as global economy, sustainable development, climate action, and gender equality. The following discussion will focus on the third session and beyond, where DTP is utilized.

3.3.1 Design with Culture in Mind

FHS students, who have not previously participated in non-formal learning, may initially expect detailed, step-by-step instructions from the facilitators. To challenge this mindset and facilitate the transition to non-formal learning, the program’s third and fourth session focuses on DTP’s “empathize and define” stage.

3.3.2 DTP Phase 1: Empathize and Define

The “empathize and define” phase comprises two workshop sessions that aim to raise students’ awareness of their community through practical experiences such as keeping an observation diary, conduct-

ing interviews, and reflecting on community issues and situations. Figure 3 illustrates 4 main activities designed for team members to interact with each other and international facilitators, providing opportunities to apply their learning even beyond the workshop sessions.

In 2016, the proposed program built upon the formal classroom learning of the global economy by providing students with practical experiences in field research and observation, data collection, and process analysis related to locally-made goods for the global market. This hands-on approach encouraged active exploration and critical thinking, moving students away from traditional passive learning methods. By utilizing the discovery learning concept, the program attempts to develop self-sufficient learners who determine the linkage among diverse evidence, perceptions, and theories rather than relying on straightforward teaching (Clark, 2018).

3.3.3 DTP Phase 2: Ideate and Feedback

This phase, depicted in Figure 3, consists of two workshop sessions with main activities that aim to unify information obtained from previous sessions, establish arguments, articulate individual sentiments, and stimulate deliberations toward common goals.

The implementation of this phase has shown that culture is a crucial factor influencing student participation. The local culture of valuing conformity, social expectations of obedience, and females being agreeable can act as barriers to learning. Therefore, the proposal was modified to address these cultural characteristics, challenging students’ comfort zone by requiring them to articulate criticism with reasoning and express individual views. Often, tutors tend to simply encourage students to speak up, but the proposed program goes further by creating a safe environment for sharing and conversing. Observations indicate facilitators’ determination to generate such an environment is a significant first step.

The mindmap technique was used during the sessions to ideate solutions and understand the interconnection of stakeholders and its multifaceted nature in a topic. Facilitators mediate and encourage productive exchanges among peers and constructive reflection. Post-session, students refine their ideation based on peer feedback, which would gain practice in problem-solving, decision-making, and communication, providing experiences that are not typically found in traditional formal schooling.

Such problem-based and case-based learning permit students to practice their knowledge in real-life circumstances, encouraging advanced cognition capacity (PCTL, 2021; CITL, 2021). This exercise

in striving under challenging situations facilitates a growth mindset (Dweck, 2016), and community interaction enables students to expand their understanding of self-identity and personal values.

3.3.4 DTP Phase 3: Prototype and Testing

Aligned with global competence thinking, the final phase of the program encourages students to take action and showcase their creations through a year-end exhibition. Preparing and exhibiting the work allows students to take ownership. Building upon the experience in phase 2, the final exhibition challenges students to interact among team members and consider and construct the meaning of their proposed solutions. Here the area of learning comes from considering the impact of proposed solutions for the target community.

During this phase, facilitators focus on ensuring the freedom of exploration in prototyping and learning through trial and error whilst maintaining motivation. The reflection on experiences enables students to gain awareness of the total experience. Based on the feedback from students, it is noticeable that this final process also enables students to gain a sense of control and confidence as well as bonding among the members. According to McClelland's theory of needs (Osemeke and Adegboyega, 2017), this opportunity to demonstrate competence satisfies the need for achievement and becomes one of the motivators which further ignites students' learning behavior.

4 ICT'S CONTRIBUTION

ICT tools are selected for their ability to transmit, store, share, and exchange information, thoughts, and communication, supporting the collaborative learning process (Pinto and Leite, 2020). Additionally, using ICT allows students to learn at their own pace. The discussion below is structured around the three primary contributions of ICT tools. The specific functions, values, and observations for the use of ICT in the proposed program are summarized in Table 1.

4.1 Co-Creation Within Team

Observations from the implemented sessions show that ICT tools such as Google Slides, Jamboard, Padlet, Miro, and Zoom supported group work and co-creation processes within each team. These tools were chosen to shift students' attention from large group peer pressure and conformity culture, providing each team with a secluded platform that helps them

stay focused on small group discussions while having enough flexibility to share information among members. Online ICT tools provide options for learning pace and communication in preferred formats.

Feedback received from students indicates that they appreciated the interactions among team members, particularly for data analysis and logic flow organization to create their project proposal. Students also noticed the flexibility of ICT platforms, and their ease of use supported them in proactively exploring other functions during the co-creation process, providing them with a sense of autonomy. Observations of student behavior during sessions show that they were more willing to take the initiative to communicate without probing from facilitators.

4.2 Large-Scale Discussion

Given the large number of participants each year, challenges related to visibility on the progress of individual groups and large-scale participant discussion were anticipated. To address these challenges, tools such as Mentimeter, Padlet, and Miro were employed. Data confirmed that these tools enabled students to have wider visibility into the work of their peers upon initial completion of work within each team, which further stimulates their interest in other groups' progress and discussion among and within their team members. Increased cross-team interactions were also observed, as well as the ability to discuss, appreciate, comment, and share the work of other teams within their own group. From the perspective of Self-Determination Theory (Flannery, 2017), the nonformal learning setting and ICT tools offer fertile ground for autonomy. The exhibition at the end of the program offers an opportunity to demonstrate students' competence, and peer social interactions throughout the program contribute towards the relatedness. By fulfilling the need for autonomy, competence, and relatedness, the proposed program helps foster students' intrinsic motivation to learn.

4.3 Intercultural Interactions

In addition to cross-team interactions, the mediation of ICT tools was particularly pronounced when travel was limited due to COVID-19. Facilitators were situated around the globe in their home counties while participants were in Japan. Zoom enabled communication to be established in various formats regardless of geographical boundaries. For example, in DTP phase one, Zoom's live audio-visual images allowed both facilitators and students to share their local community environment and lifestyle. During these inter-

Table 1: Functions and Value of ICT Tools Used in the Proposed Program.

Tools	Text Transmission	Image Transmission	Audio-visual Transmission	Data Storage	Interpersonal Communication	Visibility of other Groups' Work	Mass Communication
Value Contribution to the Program	Offered communication channel	Offered multisensory stimulation	Offered multisensory stimulation	Ensured continuous 24/7/365 access for self-paced learning	Encouraged within-team and cross-team discussions & Connected students with facilitators worldwide	Provided opportunities for peer learning	Allowed individuals to be heard and seen by all attendees
Observation Evidences	Students actively participated in discussions on Zoom and Padlet	Students took photos/screenshots of slides and used mood boards for projects	Students showed active comprehension by taking notes, nodding heads, and asking relevant questions	Students accessed and checked resources uploaded on Padlet after sessions	Students collaborated on projects using Canva, Google Slides, and Jamboard	Students commented and interacted with each other's work on Padlet and Miro	Students expressed individual opinions using MentiMeter during online sessions
Zoom	√	X	√	X	√	X	√
Canva	X	X	X	√	X	X	X
Padlet	√	√	√	√	√	√	√
Google Slides	√	√	√	√	√	√	√
Miro	√	√	√	√	√	√	√
MentiMeter	√	√	√	√	√	√	√
Jamboard	√	√	√	√	√	√	√

actions, students can non-formally become aware of the cultural differences as facilitators visually show and tell their physical settings and introduce local lifestyles. Meanwhile, tools such as Mentimeter gave students a unique experience as they voice out individual thoughts anonymously, which was a unique experience in a collectivist and conformist cultural context.

Insights from these experiences were organized and documented using Jamboard, Padlets, and Miro, which facilitated internal deliberation as students progressed to the second phase of the DTP process. Here, facilitators oversaw the development of the investigation, engaged students in text conversations to reflect on experiences, and challenged their presumptions, thus developing their cultural metacognition (Chua et al., 2012). This process allowed students to combine newfound insights with pre-existing thinking and creatively address community issues.

Students gain support on the content of work, encounter interpersonal and intercultural connections, and problem-solving skills. With these experiences, students learned the diversity in perspectives and how culture shapes one's value system and beliefs, further influencing behavior. This new interaction, feedback, and support experience, from a social learning process perspective, acts as a motivator for learners to continue to take proactive actions and overcome the fear of failure and attempt to step out of their current comfort zone of formal learning style.

5 DISCUSSION

5.1 Insights from Student Feedback

Table 2 presents qualitative responses from student surveys that provide valuable insights into students' learning experiences and workshop design. These responses indicate that participants have developed self-awareness and critical thinking abilities, become more invested in community issues, and demonstrated

motivation to propose and take action towards addressing these issues, showcasing social lean-in. Furthermore, the process of learning to "lean in" has been found to cultivate a growth mindset. The positive conversation during the program further motivated students, who were provided with an open and safe environment to express their views, provide peer responses, and share knowledge. Facilitators could also exchange views with students outside planned times and restricted physical sites.

Qualitative feedback also indicated first-hand involvement in this program promotes understanding of diverse perspectives where students recognize the importance of mental flexibility and respecting dissimilar views when approaching and examining situations. In addition, the program provided a foundation for a flipped classroom experience with the support of ICT tools, offering access to educational resources outside of workshop sessions and facilitating individualized support during the workshop sessions. As a result, students engaged more in activities and discussions during session hours and proactively explored learning materials outside of the workshop.

5.2 Key Elements of Success

The proposed program's implementation has revealed several key elements of success. First is the collaboration and support from the high school where the program was held. As change is a rather challenging topic culturally (Saito, 2018), having an open-minded institution agree to this partnership was essential for the program's successful implementation. The school provided access and acted as a strong liaison with smooth communication and commitment throughout the years of study.

Additionally, facilitators' dedication, extra time in pre-session training, open discussion, and preparation contributed significantly to the program's success. The open and honest sharing of experiences, both successes and challenges, further bonds the facilitators and allows best practices to be quickly learned and

Table 2: Students' Learnings.

	Themes	Examples
Individual Level	Increased awareness of self within the community	"The most important thing I learned today was to think about social issues as my own." "I learned that it is important to find social issues starting from myself."
	Developed ability to critically evaluate information, articulate and refine own ideas, and form well-reasoned opinions	"There were many times when I could not express my opinions, but I did my best to participate actively. I was able to share my opinions with everyone." "By asking people questions, you can learn things you wouldn't have thought of on your own."
	Greater understanding and recognition of the causes of certain community issues	"The most important thing I learned today was to think deeply about causes." "The problems that are happening today are caused by many different things."
	Motivation to take action toward community issues	"I would like to have the opportunity to freely express my thoughts and thoughts about our current situation and the environment through illustrations." "I learned that it is important to continue to take on challenges."
	Cultivation of a growth mindset through the process of learning to "lean-in"	"I found that expressing daily problems in writing and pictures helps me to think about solutions at the same time."
Interpersonal Level	Gained broader perspectives	"The most important thing I learned today was to expand my inspiration by listening to different people's opinions." "Different people have different opinions on the same issue, so it is necessary to take into account the other person's ideas."
	Willingness to engage with and learn from diverse perspectives	

adapted to unique facilitator-student circumstances. The qualitative feedback suggests that well-prepared and adequately trained facilitators can adapt to diverse learning needs, improving student learning outcomes.

Furthermore, a broad enough topic that is relevant to students' formal learning and their local context also contributes to the success of implementation. Having a wider topic allows students to explore in a nonformal learning environment, and context relevancy further motivates students to lean in.

However, challenges were encountered during the implementation, including but not limited to aspects such as varying levels of student engagement, limitations in terms of time and resources, which had an impact on the consistency and sustainability of the workshop, and the struggle in time to allow students to learn at their own pace.

Future work includes making the workshop more relevant to current learning methods, using digital tools, and connecting with local community members and stakeholders. Quantitative studies across different locations and regions will help gain a deeper understanding of the workshop's impact.

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