Participatory Design in Different Contexts: Understanding the role of the facilitator

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Abstract

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Participatory Design is a design method that includes the end users in technology design. While there are studies that examine the implementation of PD methods in both Library and Information Science and Human Computer Interaction research, existing studies lack an examination of how participant groups are created and maintained. This study contributes to understanding 1) how the skills of participatory design are first taught and learned while developing relationships for co-design 2) how participatory design projects are maintained and 3) how participatory design projects are enhanced by working with different cultures. By understanding how PD is taught and learned among different stakeholders, how projects are maintained and how we expand by creating a culturally inclusive environment, we will be opening more spaces where people can be a part of co-designing future technology that meets their needs.

In order to answer the research questions, I examine three case studies of 1) a class that taught participatory design in libraries 2) how we transitioned to the online space to sustain the partnership and 3) how researchers expanded the project by working with children at the welfare center in Korea. In each case my focus shifts to how PD is

learned and partnership is developed, how it is maintained and how we expand. This research expands our knowledge of how we teach our students to work with the community and ways we develop community partnership, how researchers and practitioners can continue to support projects for the community growth and well-being, and how researchers can be more culturally aware in working with diverse users. I aim to address three main themes in the dissertation: public spaces, onlines spaces and cultural awareness. By understanding the role of the facilitator, we can improve how we work with end-users and our overall practices with regards to inclusivity and diversity in technology design.

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DEDICATION

To my parents, Kun Seop Lee & Miyoun Koh

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Chapter 1 Introduction

For this research, I was motivated by the importance of democratizing technology where it is accessible to more people by using methods in participatory design. To democratize technology is the opposite of excluding certain demographic groups of use. I argue that we need to create technology that does nor discourage people but supports people for development. Participatory design is a democratic and collaborative way of design where designers or researchers involve the end-users in the process of design. When multiple stakeholders gather to co-design we are able to design technology that is more inclusive and open to a diverse population. However, in order for multiple stakeholders to have that place to gather, there are factors to consider in first developing a group, sustaining and expanding the group.

1.1 Motivation

Not all people are able to take advantage of new technology. While we have smarter, faster technology whose purpose was to advance the human's life, many people still struggle to learn and use technology. The first computers were first built for experts in the field to use. However, in today's world it is not only the experts but even children young in age are using technology. Yet, in many instances technologies that do not consider the use of a wider population and certain groups of people are excluded when trying to use those new technologies. These changes indicate the need to create more democratic spaces where the community can be heard in designing technology that meet their needs.

A promising field is in Human Computer Interaction where scholars have long examined how humans and computers interact and aims to answer questions in making technology more efficient for the user. Within Human Computer Interaction, there is a method of Participatory Design where people design with end-users. PD originated in the 1960s when these workers faced threats of being replaced by new technologies [84]. PD scholars have long strived to understand new methods and techniques to communicate with users, while taking into consideration the different demographic groups (elders [4], animals [87], neurodiverse children [42,107]) and environments where PD is conducted (schools [29],[126], refugee camps [1], libraries [167], and community centers [93]). My work is situated in working with children as design partners [61, 94]. Many early papers regarding PD with children share insights on what children have to offer for the design process, such as how the information they provide informs the design of future technologies (e.g. IDCL library [74], Nicks.com 'Do not touch button', Nature Collection [36] and Creepy technology [97]). In recent years, scholars have begun to further investigate how, as a method, PD can better involve the different end-users in order to foster diversity and empowerment [10, 37].

While participatory design is a growing methodology, we have less information on how newcomers learn about the method and the process of developing new partnerships. The value of participatory design is when the project is sustained as opposed to being a one-off project as relationship building is crucial. By understanding in what ways we can expand groups by being culturally aware, we are able to include more voices in the process of design. Therefore, I examine ways we create, sustain, and lastly expand our participatory design teams. While, prior

literature has an understanding of two group such as the the researcher and the end-user [32] or the group dynamics within the group [148], there are also other stakeholder groups and external factors (the location, the caregiver ect.) that can influence the participation of the design. However, participatory design is considered a more fluid method that changes based on context that makes it difficult to conceptualize the process.

For my dissertation, I examined three case studies to fill in the gap of understanding the different context and examining the role of the facilitator to still co-design. The skills of becoming a practitioner and researcher in participatory design requires a knowledge in both theory and practice while also being keen to community needs. Therefore, I first examined a case study in first **creating** a co-design group where the students in the University of Washington first learned about participatory design while partnering with Seattle Public Library in a course titled "Participatory Design and Libraries". I interviewed the experience of the students, families, and librarians involved in the co-design group. I looked at 3 years of data to understand the challenges and opportunities of the partnership and how the students were first learning about participatory design. **Sustaining** partnership is also crucial as one core element in participatory design is 'relationship building' which takes time to develop. For my second case, I examined a case study of an intergenerational co-design team in sustaining the partnership by transitioning to the online space. Lastly, as my goal in participatory design is to **expand** for more diversity and inclusion, I examined a case study of the process of co-designing with the children at a welfare center in Korea. My goal in research was to overall examine the different context of participatory

design teams and provide guidelines on the role of the facilitator conducting PD to be responsive to the community needs based on empirical findings.

1.2. Thesis Statements

My thesis claims are summarized in the following statements:

> *It is crucial to understand the ways we can create more co-design spaces where different stakeholders come together to design future technology. Co-design spaces should be inclusive, diverse and provide a space where people feel comfortable to elaborate on each other's ideas. By adhering to these guidelines, participatory design spaces can enhance democratizing technology, where technology can be more accessible to more people.*

1.3. Research Questions and Approaches

To verify the thesis statements, I examined the following research questions (RQs) through a case study approach:

> **RQ1:** How can we **develop** partnerships for participatory design within the context of partnering with public libraries?
>
> **RQ2:** How can we **maintain** partnerships for participatory design by transitioning to the online synchronous space?
>
> **RQ3:** How can we **expand** participatory design partnerships by co-designing with children in an East Asian context while being culturally aware?

Below is a summary of the definitions I used in my research questions

- **Developing** a team is having or structuring a space where different stakeholders come together to design. Druin examined the roles of the children when they design with adults [32] . Yip et al. (2017) examined the roles of the adults when they design with children [170]. Both Druin and Yip have examined two groups of adults and children and how they work as a team. However, as the number of researchers who conduct PD has grown, there are more stakeholders within the process such as students who are learning about PD, public workers, designers and engineers who are also in the design process. The importance of developing is creating more spaces where different groups are able to collaborate and share their design ideas in meaningful ways.

- **Maintaining** partnership is being able to adapt to the changing external and internal forces that change over the period of time to continue to co-design. The importance of maintaining is providing a space where skilled practitioners can continue to design despite change.

- **Expanding** focuses on not being static but expanding in multiple levels of the people we work with but also the way we conceptualize co-design itself. As many of the participatory design teams are situated in Western countries, I examine a case study in what ways co-design occurs in an East Asian country where there are different norms and values which can influence the way people participate. The importance of expanding is to create spaces for more diversity and inclusion.

To answer **RQ1**, I examined a case study of a community-based learning class of students conducting participatory design in the libraries which was a total of 3 years of data. My goal was to identify challenges and opportunities for developing community partnerships. In addressing **RQ2,** I proposed a theoretical framework called Improv. (Improvisation) on how we can sustain partnership by being attentive to changes that are out of our control by using theories in improvisation. In addressing **RQ3**, I did an exploratory study that utilizes the prior Improv. theory and added the perspective of cultural awareness.

Overview of Each Case Study Research

1.3.1. Case study 1- Learning about Participatory Design and Developing Partnership

The first study was about understanding the partnership between students/researchers in a university co-designing with families/librarians in a public library. By examining 3 years of data in a class titled *'Participatory Design and Libraries' w*hich engages the students in both theory and practice, I studied how students in a class were first learning about participatory design and the community's experience of co-designing with students and researchers. This class was an Academically Based Community Service (ABCS) class which is a subset of service learning [5]. In an ABCS class the problems centers the community needs while engaging in research as opposed to the students being the center of interest [57]. Therefore, the ethos of an ABCS class aligns with participatory design goals where there is an interest in meeting the needs of the end-users. The group of stakeholders (graduate students, researcher, children, and public librarians) gathered in the library to co-design the use of future digital technology for youth programming in the library. The findings of this case study helped me identify the challenges and opportunities between stakeholders when conducting participatory design and the different mindsets people need to have in partnering. I discuss the gap between theory and practice and state how stakeholders wear multiple hats when co-designing but gravitate to their main roles

which can lead to friction. To answer my research question of how we can create partnership while learning, I specifically proposed how the ABCS class was utilized in a way where the students were learning the method of participatory design while being attentive to the needs in the public library community. In conclusion, I proposed the need for an extensive amount of communication that needs to occur to close the gap between theory and practice of participatory design. This study answered RQ1 of the dissertation by examining the role of the facilitator of bringing together the groups of children, librarians and graduate students to codesign in relation to developing design partnerships with communities.

1.3.2. Case Study 2- Maintaining Partnership in the Online Environment

The second study was about understanding how we can sustain partnership by transitioning to the online space where we are free from geographical limitation. To examine the design space, my colleagues and I analyzed 10-week of video data (a total of 900 minutes) and 10 interviews of children in an intergenerational co-design group which transitioned to the online space during a global pandemic (COVID-19). We study how to conduct participatory design online in a synchronous space. However, when we move to an online space, we notice there are more emerging factors that are out of the control of the facilitator. While an experienced practitioner or researcher can improvise in these situations, for newcomers it is difficult to improvise. Therefore, my team introduced a theoretical framework called 'Improv' where we provide the considerations that need to take place when conducting participatory design in a synchronous online environment. In answering my research question of how to sustain partnership, I argue how we need to improvise in the changing environment. I used theories in improvisation and human computer interaction to inform the roles facilitators need to take in being attentive to change to sustain the partnership.

1.3.3. Case Study 3- Expanding Partnership by Co-Designing with Children in Korea

Oftentimes the participatory design sessions are conducted based on Western philosophy where there is a flatter relationship among different stakeholders. Prior literature states how in the East Asian countries there is a more hierarchical relationship. Moreover, the educational system also differs which could change the way the participant is engaged in a session. Therefore, by leveraging the second study of moving to the online space, I examine a case study where students (from the University of Washington who had prior experience with PD) designed with children in a welfare center in South Korea. In this study, I focus on how the researchers and myself were being culturally adaptive to the difference. I examined six week of video data of (approximately 400 minutes) of the co-design sessions, interviews of the experience of parents and children and finally a total of 42 analytic memos from the researchers in the study. I expanded the theories in co-designing with children in the online space by utilizing theories of cultural sensitivity in public health.

1.3.4. A Summary of Research Questions and Approaches

Table 1 summarizes my research questions and the studies I conducted to answer them. I also added the theoretical frameworks that I used to analyze the data.

Table 1 Summary of the research questions and studies

#	Research Question	How I Addressed It	The Theoretical Framework I used	The Chapter
1	How do we develop partnership while learning about participatory design?	A case study examining the experience of graduate students learning methods in participatory design. I interviewed the experience of community partners (public librarians, children, and parents) who partnered with	Academically Based Community Service [5]. Theory and Practice gap [54].	Chapter 4

		the graduate students.		
2	How do we maintain partnership in participatory design?	A case study examining the considerations that need to take place when co-designing in a synchronous online environment.	Theories in improvisation and Human Centered Interaction (HCI) [78]	Chapter 5
3	How do we expand partnership in participatory design?	A case study of examining how we can be culturally responsive when co-designing with children	Theories in co-designing online (Impro. model[100]) and Cultural Sensitivity in public health [127]	Chapter 6

1.4. Contributions

In this dissertation, I present three types of contributions—theoretical, empirical, and methodological. Specifically, my research resulted in the following outputs:

1. Design guidelines for developing partnership for co-design based on empirical findings (video analysis and interviews) and theory. These design guidelines on developing partnership include: (1) leveraging the academically based community service model where students engage in research while co-designing alongside with community partners, (2) creating multiple channels for extensive communication to reduce the gap between theory and practice in participatory design, (3) about identifying experts in the community. (Discussed in Chapter 4)

2. A theoretical framework for mapping out the considerations when co-designing with children in the synchronous online design space by introducing themes in (1) project logistics, on what to consider when preparing for a session (2) people and setting, on what to consider that is unique to online connectivity and (3) people and online

interaction, on considering how people are feeling in the online space. (Discussed in Chapter 5)

3. Design guidelines for creating techniques to communicate with children in a synchronous online environment that can be responsive to unforeseen factors by using the theories in improvisation. (Discussed in Chapter 5)

4. Design, implementation, and evaluation of co-design sessions by being culturally aware by using the model of cultural sensitivity. I showed how we re-evaluate the co-design sessions by examining the opportunities, challenges and compromises we had to make to be culturally aware. (Discussed in Chapter 6)

1.5 Dissertation Structure

The dissertation is divided into a total of eight chapters.

In Chapter 2, Literature Review, I provided the overarching literature that guides my dissertation. I start with the scholarly work and current trends in Human Centered and Interaction (HCI) research. Next, I provided a theoretical background in Participatory Design research that provides the context of each case study. Finally, I provided a more in-depth method of Cooperative Inquiry [31] which states about the relationship we aim to build with children in technology design that focuses on design partners.

In Chapter 3, Methodology, I gave an overview of the methodological and epistemological aspects of this research. The goal of this chapter is to give context in a relatively higher-level way before giving details of each method in the individual case studies. For instance, for each

case study, the methods of data collection and the type of participatory design (cooperative inquiry) I use remains the same for all three studies.

From Chapter 4 to Chapter 6, I introduced the three case studies that aimed to answer the research questions I proposed. After each case study, I added a Positionality Statement. My position as a researcher can influence the interpretations and conclusions of a study, therefore for each case study, I acknowledge my subjectivities. By doing so I was allowing myself to reflect on my prior experience at the timing I collected and analyzed the data that can influence my perceptions toward the data.

In Chapter 4, I answered the research question of how we learn through participatory design, by examining a case study of conducting participatory design in the library with Master of Library and Information Science (MLIS) students. My theoretical lens that guided this study was the Academically Based Community Service (ABCS) framework that is a type of service learning. Through this research, I aimed to examine how we can teach PD methods to new students and the challenges and opportunities when working alongside community members. This manuscript will soon be submitted as a journal article.

In Chapter 5, I answered the research question of how participatory design projects are sustained by examining a case study of an intergenerational co-design group transitioning to the online space from working in-person. The following manuscript was published in CHI 2020.

In Chapter 6, I answered the research question on how researchers can become culturally aware by examining a 6-week case study of University of Washington students in the United States design with children in the welfare center in Korea. I used theories of cultural sensitivity in public health that guided my analysis of the research. I envision this paper making contributions to future researchers who will utilize the online space to design with children across international contexts.

In Chapter 7. I discussed the summary of my findings for all three studies and the impact and importance.

In Chapter 8, I shared my overall conclusion and contribution of the three studies.

Chapter 2 Literature Review

2.1 Human Computer Interaction

All three of the case studies I examined were situated in the field of Human-Computer Interaction which explores the ways people interact with computers. In HCI, scholars aim to answer the question of how we can design, build, implement, and evaluate systems to maximize usability. Nowadays almost everybody is a computer user including young children. Therefore, it differs from early years where computers were only used by experts. In HCI there are a total of four components which are the user, task, tool, and context [53]. In the early years, studies in HCI were mainly found in the literature of computer science focusing on computer mainframes [53] However, from the emergence of personal computers in the 1970s, more fields such as in anthropology, psychology, cognitive science, and information science have all been involved in the studies of HCI. The term "user-friendliness" was also introduced in the 1970s. However, as we have more technology other than the computer such as mobile devices, virtual reality devices, augmented reality devices and any smart systems it has become more complicated how we examine the interactions and understand how they embed in the human's context. A commonly used method in HCI is experimental observations where the researcher examines the behavior of users of performing tasks using new tools [135]. Based on the findings of the task of how people perform, the researcher modifies the design to develop more interactive systems.

The role of the practitioner and researcher in HCI is stated to represent the user and has been the identity of the field of HCI. There have been multiple terminologies used in what we call in representing the users such as through user-centered design, and usability studies. The role is to

deliver the data of the user to the design. Yet, the way of how we are gaining user data is complex. Multiple studies have shown the difficulties of working with the users but also the complexity of the process that often results having no actual result toward the end.

2.2 Participatory Design[1]

A method in HCI of obtaining user data is participatory design (PD) which originated in Scandinavia during the 1960s. The core concept of this approach is to include the end user, who will use the technology and design it with designers. Floyd et al. (1989) attributes the socio-cultural background of Scandinavia countries in their explanation as to why this approach originated from this specific region [40]. Democratization is deeply committed and engrained in Scandinavian history. Norway and Sweden did not have a feudal system, which exemplified their goals of establishing an egalitarian society. Therefore, during the 1960s and 1970s when Scandinavian factory workers were threatened by new technology in the working environment, researchers worked with union members to find ways to include them in the design process [35]. During the mid-1980s, inspired by Scandinavian workers, the US also started to implement PD projects [35].

Both Ehn (1987) and Floyd (1989) discuss two values that guide PD: democracy and humanization [36,37]. These two values can be distinguished from other approaches of system design. Within democracy, Ehn (1987) discusses the importance of considering the conditions for

[1] This section of the literature review is previously published work. To cite material from this section, please cite this original work as well as the dissertation:

Lee, K. J., Lee, J. H., & Yip, J. C. (2021). Pre-service Librarians' Perspective on the Role of Participatory Design in Libraries with Youth. In *Diversity, Divergence, Dialogue: 16th International Conference, iConference 2021, Beijing, China, March 17–31, 2021, Proceedings, Part I 16* (pp. 562-574). Springer International Publishing.

proper legitimate user participation, which implies the creation of the design itself [36]. Similarly, Floyd (1989) states, “the system should either reflect the interests of the system's owners, or as fairly as possible the interests of all those affected” [40].

For humanization, Floyd (1989) notes, “the system is primarily designed to compensate for human weaknesses, or to support human strength” [40]. Similarly, Ehn (1987) states, “the importance of making the participants’ ‘tacit knowledge’ come into play in the design process” [36]. Ehn (1987) and Floyd (1989) both move beyond the approach of being techno-centered [36,40].

The guiding principle and the spirit of PD are still relevant today, especially where we see a growing number of new technologies. However, PD is often not inclusive to different demographic groups. As the public library is a democratic space, and librarians have long championed inclusion and access, we found opportunities of understanding how PD can be used in the public library space [73,90]. In the first case study, I examined the case of the pre-service librarians who worked closely with children to democratically create youth service programs for digital learning.

2.3 Cooperative Inquiry

For all three case studies, I used the framework of Cooperative Inquiry which strives for being equal design partners. Cooperative Inquiry is distinct from other methods as the children are involved in the design process at all stages [33]. A PD researcher who claims to do CI has an

underlying belief that children are capable of being equal design partners [33,170]. It differs from Informant design in that the researcher invites children in the design process at only specific points in which their input is considered most valuable [134]. It also differs from Read's [126] viewpoint of how the extent of participation by children is instead fluid based on different contexts rather than being static. In CI, the continuity of the involvement is the essential difference [31,52]. Some researchers argue while the partnership is valued, they question the extent of whether true equality can exist; therefore, it has a method called 'Bonded Design" which is in the middle of Informant and CI [97].

The relationship between the child and the researcher in Cooperative Inquiry is that they are design partners where children are considered equal stakeholders in the design of new technologies [33]. The value commitments made from PD researchers claiming to do CI have been visible on the use of different techniques, which creates an environment of such partnership to occur [31,33,170]. In recent years we now have a framework of unpacking what constitutes equal partnership, which the layers are: facilitation, design-by-doing, relationship building, and idea elaboration [170].

The CI method has roots from the 1970s Scandinavian co-operative design work where the researchers had concerns of new technologies impacting trade unions[84]. In favor of the trade union, the researchers attempted to work alongside local trade unions in understanding the actual and potential consequences due to the introduction of technology. The researchers helped the trade union in having increased control over their work and, in result, helped in bargaining power

[84]. The researchers in CI, like the researcher in the Scandinavian PD, also work alongside the end-user (in this case, children) who has the most direct influence from technology to capture the complexity and 'messiness' of one's world [33]. In addition, CI has a relationship with the researcher which reaches a point for 'idea elaboration.' It is when ideas are built upon each other, whereas in informant design, it is more of a dialogue with the child [52,97]. It is crucial to note the difference between building upon ideas to simply asking the child's view. The framework of being balanced to an unbalanced relationship shows the difference. Having a balanced relationship with the children in being design partners is not merely listening to the children but being able to also work with the children [170].

Chapter 3 Methodology

3.1 Case Study

In order to answer my three research questions of participatory design team develop, maintain, and expand, I used an exploratory case study which focuses on a single or limited number of cases. I felt that an exploratory case study fits my research better than an explanatory case study as my goal was not to explain a causal relationship. In addition, I was using case study methods as in answering my research question, the ‘context’ plays a crucial role in the people, time, and resources available. In other words, a case study research method provides me with a holistic view of the study as opposed to other methods. It also gave me an in-depth description of social phenomena. The purpose of the research was rather to better understand an emerging phenomenon and to generate new ideas. In defining a case I used the definition of Merriam’s qualitative research where the case is a program. In my case, the case study was about a

participatory design team named ‘KidsTeam’. I was exploring how the team KidsTeam was being formed, maintained and expanded in different cases.

However, for data analysis I found it helpful to use Stake’s strategic ways of analyzing the data of aggregating and categorizing data and making direct interpretation [164]. The reasoning for this may be due to the unit of analysis of how I was viewing the groups within each co-design group. In coding the data of video transcripts and interviews, I found many similarities between three groups of people. They were the children group, the parent group and the researcher group. Stake also states about the importance of each researcher reflecting from the experience to find the forms that work in answering the research questions [140]. I noticed that as I participated in each session, I was also reflecting back for each session. I also reflected on how and what I was perceiving. I aimed to make sense of what I perceived by triangulating the different sources of data such as the interview data and the reflection notes or analytic memo the researchers in each study contributed too. Stake also discusses validation by using different types of sources [164].

In subsection 3.3, I detailed the common used methods of data collection to triangulate the data. For all three case studies, I was the primary instrument of data collection and analysis of this dissertation. Therefore, for each study I added a positionality statement on my position and prior experiences that may have influenced the way I interpreted the data. I used the process of ‘reflexivity’ that Cresweel and Merriam [164] states of being aware of my own assumption that may impact the study for the reader to understand each case study’s result within the context that I am holding the study. For all three case studies, I was a participant but also the main facilitator in where I designed the sessions, but later analyzed the data with the research group. While many of the researchers that were graduate students or undergraduate were also participant observers, I

aimed to have at least one person who was not a participant of the study but to help guard any biases of the study. I have also checked in with my advisor about their feedback on the findings and to share my argument of what claims I was making and how it would fit in the larger communication and theories in Human Computer Interaction (HCI) and participatory design.

3.2 Context of KidsTeam

KidsTeams is an intergenerational codesign group which designs new technology for children with children. I have been a part of KidsTeam since 2016. In KidsTeam UW, which is a group that meets in the lab in the University of Washington, children aged seven to eleven come to campus to design twice a week with the adult researchers and designers. In KidsTeam UW, the technology that is being designed changed weekly based on the partnership that was developed. There was a wide range of partnership from student and faculty projects to local partners like the Seattle Public Library and many industries like Amazon and Microsoft. For each design session, the day started with snack time where the adults and children had snacks together and chatted about how everyone was doing. After ‘snack time’ there was ‘the question of the day’ where the adult facilitator would ask a question that was either related to the topic of the day or a question for relationship building to get to know each other better. Afterward, there was ‘design time’ that would last around 30 to 45 minutes. Finally, the session ended with discussion time that lasted for 15 minutes. The KidsTeam program is based on a framework Cooperative Inquiry [32]. In Cooperative Inquiry children and adults are design partners that design new technology or new technology programs for children with children [32]. In Cooperative Inquiry as the framework

strives for long term relationships to be design partners many of the children partner with adults for more than an year [32].

In KidsTeam UW, where I was a researcher, it can be said that there is a structure for children who have numerous practices of design from children who stayed as design partners for up to 5 years to at least an year. In KidsTeam UW, the children meet twice a week on campus and work on different design projects. Yet, not all teams are able to adapt to that structure of a long-term design group due to limitations in resources of people, time and money. Therefore, Bonded Design is another method where children and adults co-design on a specific objective over a limited number of sessions [97]. For the three case studies, I examined three teams 1) The library KidsTeam named KidsTeam SPL 2) The UW KidsTeam and finally 3) KidsTeam Korea at the welfare center. While KidsTeam UW adapts the framework of Cooperative Inquiry, the KidsTeam SPL and KidsTeam Korea group align with more of the framework of Bonded Design where we have limited time as a group [97]. For the KidsTeam SPL it was a 10-week session where children met once a week. The reason for the 10-week session was because the adult facilitators were students in the master's of the Library and Information Science course. Therefore, the design team lasted for a quarter as part of the class.

In the case of KidsTeam Korea, while I have strived for around 10 sessions, the welfare center was very new with long-term programs as most of the sessions were mostly drop-in sessions. Therefore, the welfare center was open for a total of 4 sessions that would occur once a week for a month. But as I stated the importance of relationship building, I was able to conduct a total of six sessions adding in two additional sessions in the beginning and end for relationship building. I had a total of seven researchers for the KidsTeam Korea project. All students were from

University of Washington and had experience working in a KidsTeam either in SPL or UW. Six students were mentored by Jason Yip who was the lead facilitator in KidsTeam UW. One student was mentored by Wendy Roldan who is the student of Jason Yip. Therefore, all students were all equipped with co-designing with children. Among the seven researchers, six researchers spoke Korean and had backgrounds of both living in Korea and in the United States. One researcher, Katie Wang was from Taiwan who gave feedback on the claims we were making on data analysis, and I had multiple discussions on whether the cultural behavior we saw in Korea was similar or different to the Taiwanese culture.

3.3 Data Collection and Analysis

For all three case studies I collected the following evidence:

Analytic memos: For all three case studies, I wrote analytic memos before and after the session. My memos included my conversation with librarians and welfare center administrators. For reflection, after the session, I recorded what happened, what I noticed, and any additional thoughts I had. In addition, the student researchers also contributed in writing an analytic memo after the session. The number of analytic memos or how we were analyzing the analytic memo is detailed in each study.

Artifacts of a session: Each co-design session generated a type of artifact. For instance, for the in-person co-design session in the library (Chapter 4), I took pictures of the white board that generated *Likes, Dislikes, and Design Idea* which is a design technique where children and adults partner together to evaluate technology or a curriculum [153]. I also took pictures of artifacts that

were generated from *Bags of Stuff* which is a design technique where children use arts of craft materials in a bag to do low prototyping [31]. For KidsTeam UW (Chapter 5) and KidsTeam Korea (Chapter 6) all sessions were conducted in the online space. Therefore, the artifacts from the sessions were in the form of a PowerPoint which were all saved.

Video recording of the session and debrief: All sessions were video recorded. For the in-person session (Chapter 4) we had one camera that recorded the whole group activity. When the groups were divided into small groups, I moved the camera every 5 to 10 minutes. For the online sessions (Chapter 5, 6) as we were using the Zoom platform all the sessions were recorded and there was at least one person recording the small groups so we were able to capture the entire moment of the design session. For all three studies, I also recorded the adults debriefing of the session. All recordings were transcribed by the researchers in each study.

Semi-Structured Interviews: For all three case studies, the participants were interviewed after the entire session ended. I asked questions about their experience of being part of KidsTeam. In case study 1 (Chapter 4), I interviewed the librarian, the students, and the families. In case study 2 (Chapter 5), I was only able to interview the children. For the KidsTeam UW group, in addition to asking about the experience of co-designing, I asked questions on how the children were experiencing the online space as opposed to in-person sessions. Except for one child, all children attended the in-person sessions but transitioned to the online space due to the pandemic. Finally, for case study 3 (Chapter 6) which is the KidsTeam Korea study, I asked questions about not only their experience of KidsTeam but added questions about educational and online activities.

For the KidsTeam Korea group, I was able to interview the parents in the study as well. The parents I was able to interview were all mothers.

Data Analysis: The methods I used for data analysis are specified in more detail within each case study chapter (4-6) as I did a mix of either starting from open-coding or did deductive coding from prior theories. For each case study, I used different theoretical frameworks to guide the analysis process. I shared the codebook within each case study method section.

Chapter 4 (Study 1) Conducting participatory design in public libraries

This chapter provides a study of conducting participatory design in public libraries with pre-service librarians. I encountered this work as I was a research assistant of a larger project from the IMLS grant[2] from 2018 to 2021. I plan to submit this article in a journal titled *Caring for the Community Conducting Academically Based Community Service in LIS*.

Keywords

Academically Based Community Service, LIS education, librarianship, professional development, practice, service learning, participatory design, community inquiry

Abstract

The field of Library and Information Science (LIS) has historically struggled to connect theory and practice in its graduate education, specifically when it comes to building and understanding partnerships with diverse stakeholders in public library communities. One possible technique for bridging the gap of stakeholder experiences is academically based community service (ABCS) courses. ABCS courses attempt to directly focus on research-practitioner partnerships to solve real-world problems by involving the community to democratically co-design the curriculum. In this paper, we present a reflective case study of an ABCS course on integrating participatory design methods to co-design new digital learning activities for youth in an urban public library.

[2] IMLS grant Log Number: LG-96-18-0041 Supporting Intergenerational Participatory Design Groups for librarians and youth for Design Thinking Around Digital Learning. Lead PI: Jason Yip, Co PI: Jin Ha Lee

By conducting 10 co-design sessions and 26 semi-structured interviews, we examined a partnership between a university and a library, and how this ABCS course impacted different stakeholder participation. Our findings highlight how ABCS courses require intensive communication and care between all stakeholders within a library setting. This work contributes to a growing body of work that calls for more courses in LIS education with greater civic and democratic engagement between graduate students, university partners, and library stakeholders.

Introduction

For today's information professionals in public libraries, there is a need to obtain skills such as the ability to serve diverse people, to collaborate, and to adapt to changing situations such as implementing the latest technology in the library ([91]. Often, obtaining such skills mean engaging in practice through community engagement which is going beyond learning theory. To provide opportunities to practice such skills in LIS, a model of service learning has been developed [3,120,171]. In service learning, universities partner with community groups and agencies [4,120], and students receive academic credit for service and volunteer work [111]. However, in different research studies, while the students provide service work to the community and intend to be mutually beneficial for the community and the learner, prior literature has shown that it has not always been the case [15,171]. In [9], Bishop et al highlighted that service learning has tended to focus on the student experience, and not on the community experience. This tendency to highlight only students' achievement might not correspond to the ideal of service learning, because students cannot reflect on how they actually contributed to the community through service-learning programs due to the lack of opportunities to understand

community members. A question we might ask about service-learning opportunities in the classroom is: What do community members think about the engagement? In our study, we attempt to understand the experiences of the community. By focusing on understanding the experience of the community we can evaluate school programs not only through the criteria of research but also their practice process which can make stronger programs that benefit both the community and students.

We developed a service-learning library course inspired by the ideas of *Academically Based Community Service* (ABCS) courses [10,56,77]. While service learning is more pedagogically driven (e.g., how do students learn from service to the community), ABCS encompasses service learning but strives to do research on community needs. In other words, ABCS courses attempt to directly focus on research-practitioner partnerships to solve real-world (direct) problems with the involvement of the community. ABCS courses have an active agenda of democracy and social change by learning with the community to improve the quality of life. The ABCS courses are democratically designed and implemented in partnership with community organizations. In figure 1, we share a diagram that shows the difference.

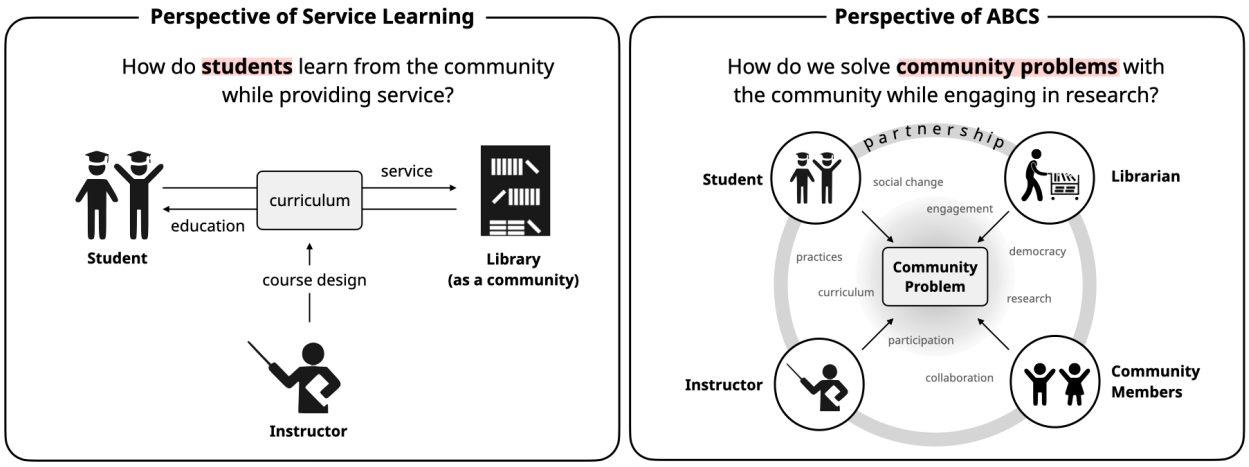

Figure 1 Differences between service learning and ABCS

We believe there is a value in incorporating the ABCS model in LIS education as both support the idea of democracy and attempt to fill the limitation of service learning by centering the community while engaging in research. However, in many existing ABCS courses, there is an emphasis that the university as an institution of higher education has the responsibility to actively structure the courses to meet community needs [6]. If the ABCS framework is adopted in the librarianship, the role of the librarians is critical as they engage with methods of working with the community to solve problems even after the course. We aim to understand the challenges and tensions in the integration of ABCS specific to libraries and how we can envision the role of librarians in this partnership towards LIS education.

While the academic community understands that there is value for students enrolled in service-learning courses, we have limited understanding of how the community perceives such service. Prior research [59,132] suggests there are tensions and challenges for instructors to offer such courses and for community members to be involved. Hicks et al. (2015) state why certain tensions may occur. University professors are required to engage in scholarly work that is often

measured through impact of publications and grant dollars, while students are required to meet assignments and credits to obtain their degree. On the other hand, the community partner does not work on the school schedule and has different goals and needs.

> *faculty members pursue scholarly work measured in, for example, grant dollars, publications...community members do not operate on academic calendars or organize their work by semester-long projects or assignments, and they have many professional responsibilities. With faculty busily trying to "fill the buckets" of teaching, scholarship, and service to meet promotion and tenure pressures, and with students scrambling to finish degrees on time… there is little time to form meaningful relationships across boundaries between campus and community and amongst the various people involved in these relationships. [59:107]*

Yet often the tensions are not specified in the literature and rather the opportunities are highlighted. Thus, by identifying the challenges and tensions in our partnership, we contribute findings for others to create LIS courses that not only recognize the needs of the students but the needs-based, asset-based, and community grounded approach of multiple stakeholders including researchers/instructors, librarians, and library patrons from the local community.

We delve into investigating the dynamics of different stakeholders (in our case, graduate students, the public librarian, child participants, and their families) in a service-learning course to identify issues and challenges of working as a group.

We examine three research questions:

1. What are the opportunities and tensions of implementing an Academically Based Community Service course in library science for the different stakeholders?
2. What are the design implications for curriculum development in the LIS field with an Academically Based Community Service course?
3. What are the implications an Academically Based Community Service courses can have on the theory-practice gap in LIS education?

Through our case study investigation, we learn that there are communication and cultural gaps between the partners and the gaps are reduced by the time spent for active conversation and meetings. This paper makes two contributions to the LIS community: empirical and theoretical. Empirically, we provide design implications on setting up and implementing a research-community partnership for LIS education programs based on reflections from community members. Theoretically, we provide new perspectives on the theory-practice gap in LIS and the role that ABCS courses can take in shaping this challenge. We conclude with roles and mindset current librarians and pre-service librarians can have when partnering with universities.

2.1 The Gap between Theory and Practice in LIS

We provide an understanding of why the theory-practice gap exists (2.1.1 Historical Context) and then we discuss how the changing roles of librarians (2.1.2 New roles of librarians) intensifies the need in reducing such gaps.

2.1.1. Historical Context of Theory and Practice in LIS

Michael Gorman (American Librarian Association, past president) once remarked that library school faculty focus too much on research and not enough on the real world needs of the profession of librarianship [3]. Gorman's comments are not surprising; the gap between theory and practice is well-known in Library and Information Sciences (LIS) education [50,63,131]. Crowley (2004) echoed Gorman's assertion, stating that the ongoing tension between library practitioners and educators are based on a difference in theories and perspectives of learning [26]. Library practitioners prefer a model grounded in apprenticeship while educators and LIS researchers tend to be more theoretically oriented [142].

Hadow and Klobas [54] manifest the gap by defining multiple LIS theory-practice gaps, such as the *knowledge gap*, *culture gap*, *communication gap*, *relevancy gap*, and *immediacy gap*. Hadow and Klobas define the *knowledge gap* as the communication breakdown between theory and practice, therefore not being able to inform each other. The reason for the lack of effective communication lies in the *culture gap*, that is, the isolation between the common values, beliefs, and practices of practitioners and theorists. When the two groups are siloed off from each other's knowledge and cultural values, *communication gaps* begin to form. Practitioners and theorists also dispute the relevance of different problems in their communities (*relevancy gap*). These two

groups are thus further separated by an *immediacy gap*, in which practitioners need quicker pragmatic solutions to their local problems than what theorists can provide.

The reasons for such a gap trace back to the education of how librarianship began with the apprenticeship model with skilled practitioners outside of the academy [28]. However, as the field became professionalized and universities took over LIS education, academic theory became the primary model for educating future librarians [24]. The ongoing tension among theory and practice in LIS leaves students facing unexpected challenges after graduate school due to the lack of connection to the community they will need to be serving. Our study explores in what ways the different stakeholders can aim to reduce the gap through the ABCS course.

2.1.2. New Role of Librarians

There is a constant shift in libraries in positioning itself as information common and learning spaces which move beyond simply providing materials to patrons. Such change has made researchers think about ways of understanding what new roles librarians can take in creating such space in the contemporary knowledge society [96]. A key competency for information professionals is developing relationships and partnerships in the community [119]. In recent years in library and information science terms such as "design thinking", "librarians as designers" and "participatory librarianship" have been used to discuss the role of librarians [22,167]. These terms imply creative ways for change in the system often inviting multiple perspectives in the process for better design. The new roles of being designers differ from being instructors and experts of knowledge. Koh and Abbas[91] discuss how facilitating learning and collaboration are top competencies to adapting the evolving space of the library. A facilitation

approach for librarians differs from previous models of how librarians served their community by being the experts delivering knowledge to patrons.

Moving from the expert model to a facilitator model is exemplified in recent studies of how such tensions look like of shifting roles from an expert to a facilitator. Yip et al. [167] argue that when librarians co-facilitate with youth, librarians must provide structure and freedom while allowing the child to think and create with technology. It is important that the next generation of librarians learn how to move beyond instructing patrons (such as youth), to learning from and designing with patrons. This is due to create a more democratic learning space with the youth. Yet the role of fostering and understanding how to design with the community is underrepresented in MLIS education [21]. Overall there is an urge for LIS programs to develop more programs that provide opportunities for students to work alongside with the community to design. In our study we attempt to prepare future librarians for new roles (e.g. facilitator or designer) while simultaneously foregrounding community member's experiences in LIS courses as well to maximize the experiences for the community as well.

2.2 Service Learning and Academically Based Community Service

Multiple research projects speak to understanding the effectiveness of service learning because these experiences allow students to not only reflect on the theory learned but also to engage with local community members [13,44,62]. However, prior work highlights the difficulties of maintaining an ongoing meaningful relationship between students and the communities that they are serving. For instance, Kazmer (2007) states that while service learning

(community-embedded learning) provides the students for an educational assessment to occur, the experience and gains of the community partner in many cases are not clear [83]. In this case, the focus of service-learning is more on the learning outcomes of the students, not the community. In order to fill in the limitations of service learning, we adopted a narrower concept of service learning which is Academically Based Community Service.

The term Academically Based Community Services was first coined by Harkavy and Benson at the University of Pennsylvania [6]. The school which used actively utilized service-learning courses started to have a strong interest in restructuring courses for a civic revival which is reconnecting community members with local decision-making [6]. With ABCS, faculty called for the creation or redesign of academic courses and seminars that would make the communities issues and problems the focus of student learning and problem solving; these projects would be democratically designed and implemented in partnership with the people (*i.e.* community organizations).

ABCS is similar to traditional service learning with respect to these criteria: they are credit bearing courses, they involve reflection, and they include service activities that are collaboratively identified between the community and the instructor of the class [6]. What differentiates ABCS to service learning is that it strategically focuses on the local manifestation of a universal problem with a focus on research [6]. The scholars who propose ABCS acknowledge that service learning allows students to witness real-world situations in communities and the value of service learning stating that it enables witness on what is

occurring. However, scholars point out that the systematic instructional efforts to help students understand the complex factors that perpetuate the status quo are all too often missing in service learning [5,6,56].

While in the LIS literature rarely discusses the term ABCS, in LIS, Community Inquiry (CI) has similar values from ABCS where there is interest in putting the community as the center as opposed to passive receivers. In community inquiry the roles are merged where all stakeholders take on being a learner and a teacher. Bishop and Bruce [8] point out that a successful community inquiry is not when the role is the same, but 1) when there is an accommodation of plurality, 2) there is a productive use of difference, and 3) when we accept crisis (in the context of friction between two groups) as an often necessary aspect of true learning and social transformation. Our study shares similar principles with Community Inquiry and ABCS that there is a need in inviting multiple lenses in solving social problems. ABCS can be seen as a subset of Community Inquiry of specifically focusing on instructional methods in school settings.

We found Community Inquiry (CI) to be a broad framework which incorporates a wider range of projects even where the university is absent. As our goal of this paper is situated in a higher education setting, we adapt a narrower term the ABCS as a lens specified in creating academic courses.

3. METHOD

We conducted a case study [112] of an ABCS course in LIS titled "Participatory Design in Libraries". The class was offered as a special topic course in the Master of Library and Information Science program at a large research university in the United States. The course focused on teaching and implementing participatory design (PD) methods in a library setting over the course of 10 weeks. The bounds of this case are from 2018 to 2019 of the Fall Quarter from September to December.

3.1 Context and Structure of the ABCS class

Among the services the library provides, youth digital learning is a rapidly changing environment where the demand is high but it is also difficult for librarians to learn about the emerging technology beforehand. Emerging technologies and evolving needs of youth has shifted the role of the librarian from an all-knowing librarian (instructor) to a designer where the librarian must work with youth to create digital learning activities [102]. Therefore, the motivation for this class was to support libraries in creating digital learning activities for youth programming. The learning goal of the course was to train pre-service librarians to engage in design thinking [20,72] through participatory design methods and solve a design problem for the public library.

We argue this class was an ABCS course rather than a service learning course because of its structure. First of all, the syllabus was designed in partnership with the librarian at the library with the interest of trying to find solutions to the problems which the library was struggling with (i.e. designing new ways to integrate new technology in the library). Second, the students were

not only providing service to the community but they also had to analyze the data collected from the sessions and were asked to come up with design recommendations for the library. In this way, the students were not just witnessing what was happening in the library by providing service but were asked to investigate by engaging in research and make changes by partnering with the community. Third, the bigger question the library and the university were confronting were around issues of equity in education and the role of the library which is a universal problem. Lastly, in shaping the course, instructors and the librarian did not have a set of pre-planned activities from the beginning to the end. The second half of the course was designed and led by students with the feedback from the children they were working with.

Class structure: The class met twice a week with one session in a classroom and another session onsite at the library (pre-COVID19). Based on connected learning goals in libraries through digital media [70], the PD sessions aimed to create a deeper understanding of how to integrate digital learning technologies at the library. At the end of the class, the students were assigned to write reports in pairs for design recommendations reflecting on what they learned from the class and their PD practice.

3.2 Participants

Graduate Students: A total of 18 graduate students were enrolled in the class. Two students were in the Masters in Information Management (MSIM) program and 16 students were in the Masters of Library Science (MLIS) program.

Community Partners: A total of 15 children (7 boys, 8 girls) participated in the co-design group. The age of the children ranged from 7 to 11 years old (M= 8.6; SD =1.2). There was one youth service librarian from the local branch recruiting the children and communicating with families and two librarians from the main branch who selected the technology and communicated with the instructor of the class. Since it was a 10-week session, the number of children attending each session changed drastically, with only 6 children attending in-person (pre-COVID 19) sometimes.

3.3 Interviews

After the course ended, we interviewed 14 graduate students from the 18 enrolled in class. We used a semi-structured interview protocol to give flexibility to the participants to reflect on their own experience of the class. We asked questions about reasons for coming to the program to expectations of the class of doing participatory design in the library and reflections/takeaways after enrolling in the class. The interviews lasted an average of 34 minutes (SD=13.8) and were held at meeting rooms at the university or through phone calls. Participants did not receive compensation.

We interviewed the one librarian who was involved in all 10 design sessions. The interview with the librarian lasted for 1 hour and 35 minutes. Interview questions began with the role of the librarian to the prior expectations of the class to the actual experience and reflections of the process of working with the graduate students and the library patrons. The librarian did not receive compensation for the interview. The librarian stated that this community was not familiar

with research, therefore the researcher stated in simple terms that the interviews were to understand how we could improve the program.

We also interviewed 6 children with their parents. As there were siblings, a total of 5 parents were interviewed. The child was interviewed first and afterward the parent was interviewed in a meeting room at the library. For all the children it was their first time being interviewed. Therefore, the researcher did a mock interview first and afterward conducted an interview. In the mock interview, the researcher asked what the child's favorite color and food was. During the process the children got to view how the recording worked and were able to interview the researcher as well. The author showed the child pictures from their design sessions to help the children better recall the experiences. We provided a $20 gift card of their choice as a token of our appreciation for their participation in the study. The average minutes of the children's interview was 7.93 minutes (SD=1.73). The average minutes of the parent interview was 10.50 minutes (SD=4.07). All the interviews were conducted in English with the exception of one interview being conducted in Spanish.

3.4 Video Data

We video and audio recorded 10 sessions.The video camera captured a wide view for the first part of the design session and the facilitator in the room rotated the camera every 10 minutes to capture specific group interactions and conversations. All 10 sessions were transcribed by two researchers and time-stamped. Based on the transcribed videos three researchers selected notable moments of interactions between at least two groups of people either the group of the children

and librarians or the children and the pre-service librarians in the course [156]. Our selection criteria of the videos were 1) selecting moments of interactions that could be unique to the library space and 2) when there was an active conversation or action among the different groups.

3.5 Analysis

We started with the inductive process of open coding the interview data. Three of the authors opencoded [92,143] all 26 interview transcripts (14 graduate students, 5 parents, 6 children, 1 librarian). Each coder was in charge of open coding at least four interview transcripts of the 14 graduate student interviews and the coders read all the parents, child, and librarian interviews. We used a qualitative analysis software named *Quirkos* which provided a visual way to manage and analyze the transcripts. We developed a codebook through discussions by grouping themes generated from each of the stakeholders. In Table 1 we share the themes generated. Next, based on the codebook that was created through the interview data, we further iterated the codes by triangulation of the video data. We then followed a deductive approach to make connections to the nature of an ABCS course that diverged from the traditional service learning model that is stated in prior literature [6,57]. In order to understand the different dynamics occurring within each group we also used Yip et al. [167] participatory librarianship and Hicks et al. [59]) notes on tensions that arise to make sense of the different roles of children, librarians and researchers (Table 2). All authors of the paper actively engaged in making iterations of the themes for higher level themes to discuss the relationship between an ABCS course and librarianship.

Table 2 The themes that emerged from the interviews

Graduate Students Interview	
Perceptions of the class	Quotes on what the class means to the graduate students. ex) learning to be a youth librarian, learning about civic engagement.
Relationship Building	Quotes on getting to know the children and understanding group dynamics.
Challenges and limitations of working with an outside community.	Quotes on the challenges of shifting roles (design partners, researcher) and on project goals
Surprise	Quotes on learning about children and how they see the world.
Future Confidence	Quotes on how the students state about the confidence of directly working with an outside community.
Child	
Working with the adults	Quotes on the ratio of adults to children and the different dynamics. ex) I liked that there were a lot of adults.
The Concept of Choice	Quotes on children stating that Evergreen (PD team) allowed them a space for choice.
Other	New ideas (Design is New idea), Tangible artifacts the kids enjoyed
Parents	
Child being independent	Quotes parents leaving their child at the library for independence and walking away, recognizing the library as a safe place.
Learning about different technology and beyond	Quotes on the interest of exploring the new technology in the library
Being free and the location is a big deal	Quotes on the free aspect of the library program
Meeting the community	Quotes on noticing neighbors and interest in the university involvement
Librarian	
Giving up control	Quotes on the grey area of not knowing what would happen, tensions among the different stakeholders
Road map of solutions	Quote on being unclear about the end goal, How to integrate it in a library already
Slow works better	Quotes on planting the seed for parents and kids, Second time worked better than the first.
The role of recruiting	Quotes on multiple draws in participating, different methods used in communicating with the parents.

The educational aspect	Quotes acknowledging that everyone is learning through the sessions

Table 3 Yip's et al. (2019) and Hicks et al (2015) roles expanded for the ABCS course

	Common roles	As designers and researchers
Children	Participating in library services for learning	Developing design relationships Co-facilitating sessions Co-designing and researching together as a group. Mixing ideas together.
Student	Submitting assignments, meeting school requirements	
Parents	Supporting children to obtain service from library programming	
Librarians	Providing service to the community, connecting with families and communicating with researchers.	
Researcher	Collecting and analyzing data for research	

4. FINDINGS

We highlight three major themes toward understanding the opportunities and challenges involved when offering an ABCS course by centering the experiences of all stakeholders involved in the course. The three major themes are: the opportunities and tensions of -working on a wicked problem, -working with patrons through collaboration and -the time span of working with a community. For each finding, we compare and contrast insights from the ABCS course with existing knowledge about service learning.

4.1 Working on a wicked problem

The difference between service learning and ABCS: Similar to a service learning course, students in the ABCS class were learning through action and reflection. However, compared to a service learning course, where instructors work with community partners and outline a clear problem space for students, the students in the ABCS class were working on an unknown problem. As mentioned in the prior work section the main difference between our course and a service learning course, is that ours was structured for graduate students, children, and librarians to collaboratively work on a wicked problem (a problem you cannot articulate fully).We left it open ended for all three stakeholders to solve the problem. The nature of the unknown problems was that until the students and the community partner confronted such a problem, **the problem itself was difficult to articulate.** A wicked problem is a "problem that cannot be definitively described" [129]. A wicked problem is also a problem that has no single correct solution and as such requires creative problem solving approaches like design methods. Therefore, the class was structured to make alternations of the class curriculum. In other words, based on how the unknown (wicked) problem unraveled, there was an emerging curriculum that students, instructors, and community partners could all contribute to.

In our case, while there was a goal in the library of equitable digital learning opportunities to occur, how and in what ways the community and the university would tackle that goal was yet defined. As the team worked together on a wicked problem there was space for the team to be surprised with new ideas as there was not a fixed definiant problem to solve. Yet, the limited instructions of the problem space caused anxiety for the librarians and students because they did not know what to expect in sessions or know what the direction of the project would be. Below

we elaborate our findings by sharing the snapshot of the session and class with interviews and reflections from the stakeholders.

Figure 2: Small group design time.

Vignette of how a wicked problem is posed and taken up: On September 20, 2018, 4 graduate students, 7 children, 1 librarian, and the course instructor met at the library for the second co-design session. The focus of this session was to understand how to create library programming using digital technologies for storytelling. After everyone gathered in the community space of the library, all the people had snacks together during circle time (where students and children gather in a room forming a circle) to answer the question of the day. Next, the course instructor wrote on the board "How can we build future technologies that help us tell stories?" The instructor of the class wrote this question to provide a starting point for discussions. The course instructor then created 5 small groups with a mix of children, graduate students, and librarians to explore this broad question together using objects like paper, pipe cleaners, and post-its. Below we provide a snippet of the conversation that occured within one of the small groups as they unpacked this wicked question.

In one of the small groups there was 1 graduate student (Tina), a librarian (Marvin) and three children with ages 6, 7, and 11. The group spent the first portion of the design time trying to dissect the question. For example, Nona (child) asked "what does that question mean" and wondered if they were trying to tell a story with the craft materials. Later in their discussion, Tina (a graduate student) proposed to the group "*So where does the technology part of the question come in*?". The group of children and adults then talked about what "technology" even is. For example, Norah stated that technology is a "*digital device*." However, Blen (age = 11) challenged this –technology doesn't have to be digital. In response, Tina asked Blen if she knew any examples of technology that were not digital. To this question, Blen responded "books" as an example of a technology that was not digital. Finally, the librarian built on this discussion to say "glasses, shoes, and other objects" could also be technologies. Ultimately, based on the question posed by the course instructor at the beginning of the session, this particular small group arrived at the conclusion that all technologies do not have to be digital. Their final idea was different robots that read stories to different age groups. For instance, the baby robot read stories and sang songs. In another group, the group created a fish tank full of different creatures and showed an interaction of children fishing and a story being read accordingly. For instance, if a child fished for an octopus a scary story would come out. After all five of the small groups shared their ideas, we noticed how each discussion went in a different direction. At the end of the session, the instructor summarized the different ideas that emerged from the co-design session and the graduate students wrote an analytic memo and watched the recorded session for research purposes.

Analysis of how the wicked problem evolved: From this vignette, we see how the broad question posed by the educator allowed for an explorative discussion among children, librarians, and students to ask 'what is a technology?' We also see how the problem space of "telling stories using technology" was taken up in different ways by each group's ideas evolving as community members and students shared their different interpretations of the question and their unique ideas of how to solve this problem.

A wicked question can go in different directions based on how the group interprets it as seen in the vignette above. The course instructor did not say, "make sure you have a technology that is digital and a technology that is not-digital". They also did not say "make sure it is an idea that can be public". In this vignette, we highlight how the course instructor did not provide clear guidelines or constraints of what the idea had to be, rather it was in the hands of the graduate students and the children to determine within their small group how they interpreted the problem posed. Based on each small group's personal interpretations of the question posed, every group came up with different ideas.

Opportunities when we pose wicked problems: We argue that when educators start sessions with a wicked question that can be interpreted in multiple ways by multiple people, it opens up a space for discussion beyond one right answer to see many possible answers. To highlight this, we note that in our analysis of the interview transcripts many of the graduate students talked about how surprised they were by the children's ideas that they had never considered. In their

interviews, the students shared that they were very surprised by the fact that the community had very good and interesting ideas. Furthermore, the graduate students shared that they were amazed by how each child and librarian viewed the world - a different perspective than their own. We argue that our participatory design approach was the vehicle of the ABCS course to provide space for all stakeholders to be part of the curriculum development as the ideas were shaping the direction and conversation of the course.

From this finding, we propose that when ABCS courses teach with wicked problems, it can help library students dispel the notion that communities do not have ideas. Using wicked problems helps foreground how creative and intelligent community members like children can be. When librarians invite child and parent voices into the programming that is offered in the library, it may serve as a potential pathway to increased participation in the library. For example, Shane (graduate students) said in their final written reflection "In my own experience, I have seen many examples of "programming," which is created based on librarians' own interests, and not rooted in any real community need or desire (think knitting clubs and chess nights, which see just one or two participants). The open space for working with a wicked problem in an ABCS course also allowed a space to experiment with new ideas. For instance, in an interview Ally (graduate student) stated, "*For adults we were like, how can we do that? Kids are more flexible... if it doesn't work, they try new things."* From this quote, we show evidence of how the graduate students were learning from the children as opposed to viewing the children as recipients of service. Through these findings, we hypothesize that one way to increase participation in library programming is to invite community voices through wicked problems like in the vignette we just

shared where ideas evolved when everyone had a chance to discuss their interpretation of the problem. In addition, we argue that the ABCS course that was offered from the university both gave the graduate students and the community members (librarians and children) to connect in the first place.

Tensions when we pose a wicked problem: The evolution of a wicked problem is dependent on how people participate in the discussion. What caused anxiety for some stakeholders (librarian or graduate students) was when there were not that many people there and the librarian needed to figure out how to help the group because they wanted to offer a good experience for everyone. It would have been a different experience if there were too many children or not enough children because the small group dynamics were critical to how ideas move from broad questions to specific ideas. While the graduate students were obligated to be part of the design session, the children were all voluntarily present which meant child participation varied.

The below quote is a reflection by Mallory (graduate student) stating about being flexible about the unknowns: *I think ... requires a lot of flexibility and a lot of unknowns and a lot of kinds of... I think people view it as risky. Like, I think like you invest in this thing and you have no idea what the outcome is going to be and you don't know what direction it's going to go*

It was not just the graduate students who felt anxious about the open-ended sessions and the open-ended direction of the end goal. The librarian also had some concerns about working with the university that was open to changes. While the librarian had built a relationship with the

instructor of the class, due to the limited time and the structure, the librarian did not closely know the graduate students. Although all graduate students were members of the university, they were not local community members of the library. For example, during the fourth week of the program the librarian felt nervous about letting students lead The following quote shows the stake to the librarian.

It was the first time I'd done a program like this, and I didn't know, and I wasn't completely in charge or completely at the steering wheel... How's it going to be initiated? ... there was a lot of anxiety I had that first day… The relationships with these kids mattered. I said anxious, but also, I will even say a little apprehensive, because I feel responsible for the kids and the families that come. I feel like it's my responsibility to make sure that their time with their kids is safe ... experience at the library.

This quote shows how the librarian felt responsible for the community members which led to the anxiety of potentially "failing" the community members. When librarians oversee all of the programming they have control of planning their session ahead of time and knowing what would happen. When librarians partner with graduate students and the plans are fluidly developed with community members, there is less control of the plans from the librarian's side. From this quote we learned that even though the program was meant to be run together (students, instructor and the librarian) there were higher stakes (responsibility) the librarian felt toward making sure the families have a good time. This was due to the existing relationship the librarian had with

families which was different from the temporal relationship the university students formed with the families.

4.2 Inviting multiple voices for Inclusion

The difference between service learning and ABCS: The nature of an ABCS course model is that when working with a problem the class is structured to invite multiple people in the community in finding the solutions to a wicked problem. The reason students in the university were not simply finding the solutions for the community was because in an ABCS course model the emphasis is on the utility of the solution. Here, we discuss the opportunities that surfaced as community members became researchers and the tensions that arose in moving the project forward when there was disengagement.

Vignette: In week 5, the graduate students planned a session where they explored the open-ended questions of 'What is the role of the library in helping children?'. In answering the question, the children, the graduate students, and the librarian were invited to take on the role of being researchers to investigate their own library. In figure 3, the children are walking around taking notes on what they like, dislike about their libraries. After they have investigated the space the children went into small groups to ask questions to their librarians such as what librarians do, what librarians should do, what characteristics librarians have, and what characteristic librarians should have. When Malvin (the librarian) started asking the kids what they thought, Felise (child) immediately said: "librarians should stop giving us due dates and fines". She explained that she is often unable to finish reading a book by the due date. Alysee

(graduate student) gave him a pen and sticky notes so that he could write his ideas that would be later posted on the wall. While browsing another group starts to talk about foreign languages. The girls said they have friends who speak foreign languages, and they thought librarians should know different languages. Blen (child) was more talkative about this theme because she is studying Amharic.

Analysis: In this session, the children (who are the patrons of the library) were asked to be researchers with the graduate students. The graduate students provided the tools and structure by passing out the sticky notes and creating a space where the children could have an open conversation with the librarians. While exploring the library children were asking different questions regarding the library service. In this process, all stakeholders were both in the roles of becoming a researcher of the space but also brainstorming ways to redesign the space.

Figure 3 Children investigating their own library.

Opportunities of inviting more voices: The children appreciated the fact that they were actively being heard by the adults and that they could hear adults' ideas. A common theme mentioned throughout the children's interview was about the ways in which the interactions they had with the adults were 'different' compared to school and how they enjoyed having 'choice' and an area

to ‘express’ their thoughts. The design session utilized methods and techniques from participatory design where the instructor provided different ways for children to engage in the conversation. The librarian also reflected on the sessions stating the following about community engagement:

“It wasn’t everyday that this happened, but the kids started to, you know you could see that kids could practice sharing ideas, building on each other’s ideas, disagreeing about an idea. To me, I don’t feel it’s a technology program. I tried to get that kind of experience where kids can practice sharing ideas, improving ideas, disagreeing. I think to me, that’s one of the best outcomes.”

This quote shows how the librarian viewed this program of the children working side-by-side with adults in finding solutions to different problems, as a beneficial activity which empowered the children to share ideas. As opposed to being passive receivers of the library, through participation in this ABCS course the children were asked to be fellow researchers to investigate their own library and brainstorm solutions.

Tensions in inclusion of multiple voices: While there was value in providing a space to engage with the community as there were many stakeholders involved in the process, sometimes the ideas were not building up toward a specific direction; rather they were going in multiple directions. In the video data, we often heard graduate students ask the children “Should we combine the ideas together?”. But there was no reply and the children all continued to work on

their own design. Figure 4 shows an example of each member of the group working on their own idea. In the interviews, the graduate students expressed confusion about who and when the final decision should be made to move forward with one idea. The following quote shows Emily (graduate student) stating about the need for connections and building up the ideas:

"There were some moments I feel like some of our sessions weren't as connected to our ultimate goal and if we did it over again, I wouldn't have them or I would structure them very, very differently. Like they were still very fun and they ended up being very good in terms of relationship building and bonding which is so important but... the way they were organized I definitely don't think gave us any directly useful ... information."

This quote demonstrates how some of the sessions were 'fun' and an enjoyable activity for both children and adults, however it remains questionable to the students how much of the session was informational from a design point of view in moving forward with coming up with solutions to different problems. This may be due to the fact that everyone was making sure not a single person was dominating the session but valuing all voices equally. Therefore, there were difficulties of who had the final say of the design ideas. While the ABCS course was meant to invite the children in shaping the future of libraries by working as design partners, when we interviewed the children and the parents, not all had an understanding of their roles in the program. For instance, the majority of the parents stated the selling point for this program was the technology component.

Figure 4 The time span of working with a community

The difference between service learning and ABCS: The nature of an ABCS course model meant inviting community members to share their thoughts on how to solve real world problems. One common theme we identified was the time spent in building a relationship where the community felt comfortable enough to share their ideas. In our ABCS course, we aimed to invite multiple perspectives in the process of designing solutions; whereas in a service learning course traditionally inviting all voices is not a requirement. We learned that the process of building trust and working as a group requires intentionality and time. The opportunity that arose in offering this course was that children could build relationships with graduate students. The tension we experienced was around time because eventually the graduate students had an ending point of the course. The librarian however, had a continuous relationship with the community even with the end of the program. This meant that the different relationships the students in the class built with the children would influence the relationships the librarian had with the children.

Vignette: In week 4, graduate students Bre and Ally were in a group with Shanti (age 11) and Fatima (age 11) to work on the design challenge of creating story cubes where children can use to tell stories. For their presentation the group introduced the 'death cube'. For each side of the cube there was a dynamite, fire, water, dragon etc. and depending on whatever side the child landed on Shanti would explain, "She [the princess] dies from the fire". Moving the box around Shanti showed the side of water and indicated that if the child rolled the dice and got to the side of water "She [would] die from the water". Bre said there was a theme. After the presentation ended children and adults had multiple questions. Greg (graduate student) asked, "So your character never gets to the treasure box?". Bre responded, "Yes, but they wanted to add conflicts". Another child Max (age 7) raised his hand and asked, "Why did your group add so much about death". Bre replied, "For me, what makes stories interesting is the struggles characters overcome". Ally added, "I just wanted to have stories that are sad. I have just seen too many stories with happy endings where the girl finds love, becomes princess and lives happily ever after."

Analysis: Shanti and Fatima both aged 11 at that time were the older children in the group compared to other children. The vignette illustrates a moment where the two adults were going with the flow of an idea on the death box. While the subject matter could be controversial, the vignette shows an instance of how the graduate student Bre was adding to the children's idea and noting how the children were not just being rebellious. She expressed an understanding of the thought process of creating conflicts in stories. Further on, we can understand the underlying thought of why the group worked on the death box as Fatima commented they are too used to

happy ending stories for children and wanted some sad stories too. From analyzing previous video sessions, we noticed that the four members of the group often gathered to have small talks before the session started. While there were moments where Shanti and Fatima were bored with the activity or worked alone, we noticed that Shanti and Fatima talked more when they were working with Bre and Ally as they found similar interests such as shows they watched and books they all read.

Figure 5 Children and adults in small groups working together and interacting again during snack time.

Opportunity: Students expressed that the success of a session was dependent on the relationships that they built with children and librarians throughout the quarter. When asked about what should be changed or improved about the course, the majority of students advocated for more sessions at the library to strengthen connection with the children as well as each other. Jenny (graduate student) commented on the importance of building trust from the beginning, stating that "*the kids that knew me and felt comfortable talking to me about things, their feedback they were giving me was just like more transparent.*" By understanding the children better, the graduate students were able to utilize everyone's skills effectively. Cindy (graduate student)

recognized that some children "*just wanted to talk*" and some "*needed drawing out.*" Understanding this distinction allowed the groups to work more efficiently together as a team. The librarian also commented on the importance of the relationship component stating: *I don't think kids come for the technology. I think they come because they like having relationships with adults where they feel like they get to talk about what they want to talk about.* The following quote shows not only the importance of 'relationship building' but it also shows the different motivations for participation.

The class also fostered a way for the community members to know each other better who would have otherwise not have interacted with each other. For instance, in the parent interview quotes many parents mentioned how they got to know their neighbors better. "*I think him* (the patron's son) *being here , we've definitely recognized a lot more of our neighbors. So, the kids that he goes to school with, when we see them at the Farmer's Market and stuff, it's like, 'Oh hey, we know you' So that's one thing, making connections in the community."* (Parent's quote).

Tensions: Even though the class created a space for a community to interact at the library there was a clear end date to the class component. Therefore, unless students wanted to continue to volunteer to design with the children longer, the project had to end with the end date of the school year. Librarians also complied with the larger systematic policies and working hours. We saw in the analytic memos that there were instances where the librarian had to deal with situations of conflict and tension with the new roles emerging from the ABCS class.

For instance, after the end of the quarter the librarian emailed the teaching assistant whether one of the graduate students was going to come back to give a child a gift the graduate student

promised to a child in the program. During the ABCS course, we learned that a graduate student promised one of the children that they would give the child a gift they possessed (colored paper). Afterward, the child often went to the librarian asking when their colored paper would arrive. However, the student in the program was not able to deliver the colored paper and the librarian had to buy the colored paper instead of the student (from an analytic memo from one of the authors). Despite the fact that the instructor of the course had policies of banning the graduate student from giving gifts to individual children, this instance caused the local librarian to deal with the byproduct of the graduate students.

In another case, we noted an instance about setting boundaries of what was and not allowed in the library. For instance, in the class, one of the technologies that was explored was using 3D printers in the library. From the sessions, the graduate students and children worked on 3D printing projects and some children wanted to print their objects after the hours of the class which the graduate students thought would not be a problem or issue. However, the head library banned printing objects after hours as allowing the children in the program to use the 3D printers meant that librarians would need to help them print the objects and there were no clear guidelines of how much we should allow the children to print and there were complexities of only allowing the children in the program to print. In this process, there was tension between the head librarian and the graduate students. The graduate students did not understand why children in the program could not print after hours as they did not understand the complexities of public library policies and librarian's working hours. In this instance, unless graduate students were present at the library, it required more of the librarians working hours to print the objects. Likewise, we have seen instances where we needed to be aware how changes or promises made to the patrons from

the graduate students would influence the workload of the librarian. We were not able to locate specific vignettes from the video data. However, such tensions were prevalent in our interview and analytic memos.

5. DISCUSSION

Based on our findings, we share three design implications for conducting an ABCS course: 1) Identifying the Expert, 2) Moving Beyond Service Learning, 3) Making Explicit How Roles Shift. Each of our implications points to important questions we must ask as academics and public librarians seek to unite theoretical foundations with real-world problems that communities care about. Through this paper, we aim to help other practitioners and instructors structure similar programs designed to engage the public.

5.1 Who is the expert

In our class, the design group was working with a wicked problem regarding youth services in the library and the inclusion of new technologies. Therefore, the librarian recruited children in the community who wanted to be a part of the design sessions and wanted to share their design ideas with the graduate students and the local librarian. Prior literature suggests [22,90,102,167] that one of the changing roles of the librarians is moving away from the expert model to becoming a facilitator. In our paper, we document what it meant to facilitate a design session by partnering with a university through an academically based community service course. We believe that the connection the librarian made of identifying the community members to join the sessions was crucial in creating a space for the patrons to engage in an academically based

community service course. The children were able to join the group of university students because families had existing trust toward the librarian. If the graduate students had to recruit the children it would take longer to build relationships and identify community members to be involved.

As we saw in the video and interview data, the librarian had already built a prior relationship with the community that this librarian knew who could possibly be part of the session. We believe that one active role the librarian can play in the future is knowing the community in depth and identifying experts in the community to partner with the university for the ABCS course. Our graduate students noted they would like to design with other groups of people like folks from the LGBTQ community, elderly people, and members from the accessibility community. In order for more ABCS classes to occur of the university resources being used with and for the community, we believe the librarians need to identify these experts in the community. We also show from our findings how the method of participatory design [32,84,118] was utilized throughout the course of being design partners.

Importantly, we highlight that university members need to make sure that they have built trust with the librarian and that the instructor of the class has fully prepared the students to work with the community. For instance, in this class all students had to review protocols of working with minors. In addition, the instructor of the class and the graduate students had an understanding that their actions would affect other library programs and the librarian who was in charge of programming. Despite the fact that the instructor prepared the students to work with the library

community, in our findings we have shared instances where conflict still arose even with good motivations (wanting to share a gift to a child). Therefore, we believe that it is important for the instructor to have clear and constant communication with the local librarian and the graduate students.

In LIS community inquiry researchers emphasize the importance of putting the community member as the center and in order for CI to be successful there is a need for plurality (Bishop and Bruce 2006). From our findings we argue that the method we utilized participatory design can be the vehicle of CI to occur. The class structure of students engaging in participatory design sessions with the community allowed for the plurality of viewpoints to be shared and discussed. We add upon the work of CI of understanding how such concepts of centering the community can be taught to pre-service librarians in the master's of library and information science courses. In the ABCS course which we view as a concept narrower than CI, we were actively teaching students on exploring different methods and techniques in communicating with the users which is not much discussed in CI literature.

5.2 Moving beyond service learning

Our findings showed how the class structure of asking all stakeholders to become both practitioners and researchers impacted the sense making process around the design problem and the solution. In prior service learning literature [5,6,9,56], there was an emphasis on practicing the democratic Deweyan theory as opposed to the aristocratic Platonic theory. Deweyan theory aims to focus on the immediate problems that the community faces while understanding the

complexity of the solutions. Aristocratic platonic theory, on the other hand, is distant from the context but strives for absolute truth [6]. Our findings showed how when the children and the librarian were asked to become researchers investigating their library, they perceived the library as a space where they had ownership and felt they had the opportunity to ask questions to their librarians. However, learning how to become a researcher as opposed to a receiver of knowledge took time and required continuously practicing ways of sharing ideas. For instructors who plan to engage in academically based community courses, it could be useful to structure enough time within sessions where the community members can build relationships with the students and learn about the culture of how researchers present ideas, how ideas are clustered, and how final decisions are made. For the students, it was also important to reflect on the current theories taught in class. All students in the interview stated the importance of both theory and practice and how one contributes to the other. In our class, the dual nature of the curriculum (half theory learning and reflection in the classroom, half active engagement in design challenges with youth) provided the right amount of comfort and discomfort. The classroom portion of the curriculum created ample room for reflection while the design portions challenged students to become comfortable with failure and to become more versatile in their application of different engagement methods. We believe that with the right amount of comfort, students are willing to take more risks and try different tactics. We show how important learning can arise from the combination of theory and practice.

We have learned that in cases where a session might be considered a “failure”, the stakes are higher for the librarian who is directly and consistently working with the community (while in

class failure is considered a learning point). Among the adults (the instructors, the graduate students in the class, the librarian), the librarian had the greatest responsibility of making sure the children were having a good time. Therefore, in planning such sessions, while there can be many opportunities for students to be creative in the problem space, creativity should not come at the cost of creating a fun and safe experience at the library. While all parents and the librarians mentioned in the interviews that they appreciated the instructor and the students for being considerate for the program, there needed to be a structure for the instructor to make sure the librarian had information about the students who would directly interact with their community members. For example, the instructor in this course did a background check for all students and verbally went over ethnic training before situating the students to work with the children. We need to be mindful that while the children have the opportunity to work with the different adults (graduate students), as they are still minors, constant monitoring needs to take place from the instructor about the adults to ensure the partnership we have with the library.

(NOTE: This marks the end of the original publication)

Positionality Statement

My role in the KidsTeam projects and with the participants varied over the last years. I began working as a researcher in the KidsTeam UW project where I was apprenticed by Jason Yip, my advisor of how to interact with children from 2016. In the summer of 2016, I was the intern for the Seattle Public Library main branch. I was mentored by Juan Rubio, the digital media and learning intern. For this internship, I worked on projects of integrating Finch Robots, AR technology for youth learning in the library. Therefore, I was exposed to being a practitioner in the library where I conducted workshops for other librarians, but I was also a researcher

understanding participatory design. In 2017, I became a teaching/research assistant in the class titled “Participatory Design and Libraries” where I continued to work with both Jason and Juan on doing KidsTeam SPL (Seattle Public Library) in the library. My prior experience with participatory design and experience of working in the library all influenced my research and findings. For instance, in interviewing the students for the study of how the team was developing for participatory design, many students were discussing the equal partnership model which is a framework Jason Yip uses in KidsTeam UW. My prior relationship with Juan Rubio also influenced the way I was facilitating the co-design processes with children and the librarians. However, my closeness with the research team allowed me to have a deeper understanding of the different roles the library (Seattle Public Library) and the school (University of Washington) was playing to collaborate.

Chapter 5 (Study 2) Conducting synchronous participatory design online

This chapter provides a study [3]of conducting synchronous participatory design online with children during COVID-19.

Abstract

Co-designing with children in an online environment is increasingly important due to external factors, such as the COVID-19 pandemic, and the diversification and inclusion of youth participants. Many prior studies about co-design with youth focus on co-located or asynchronous online sessions. However, conducting synchronous online co-design sessions adds layers of complexity and uncertainty to collaboration. This paper introduces a model explicating factors to consider when co-designing with children synchronously in an online space. We examined ten consecutive intergenerational participatory design sessions online where children (ages 7-11) and adults designed new technologies. Along with highlighting unexpected moments and interactions, we use theories of improvisation to guide our understanding of dynamic situations that are out of the control of researchers. This work contributes to improving theoretical

[3] This study is a previously published work. To cite material from this Chapter, please cite this original work as well as the dissertation:

Lee, K. J., Roldan, W., Zhu, T. Q., Kaur Saluja, H., Na, S., Chin, B., ... & Yip, J. (2021, May). The Show Must Go On: A Conceptual Model of Conducting Synchronous Participatory Design With Children Online. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (pp. 1-16).

understanding of improvisation as a method of inquiry for co-designing with youth, and offers practical suggestions for suitable online co-design techniques and implementation.

CCS Concepts: Human-centered computing, Human computer interaction (HCI), HCI theory, concepts and models

KEYWORDS: Participatory design, Improvisation, Children, Design methods

ACM Reference Format:

Introduction

In HCI, children are important participants in co-designing future technologies for other children. Only today's children can reflect on the current time of what it is like to be a child, and propose which technologies they want to use. Most studies for co-design with children have been developed for co-located in-person sessions [105,109,137,156,169]. Yet there are many situations when one must co-design online synchronously, not just as an alternative. In extreme cases, online could be the only mode of interaction that is possible for some groups of children. For instance, children participants could have health issues, transportation limitations, and time constraints of adult caregivers, which could limit their participation in co-located sessions [2]. Participating in co-located participatory design (PD) sessions can be seen as a privilege for families who have flexible schedules and easier transportation options. Some scholars have recognized this limitation and attempted to create PD workshops in neighborhood community centers, which are often more accessible places for some local participants [125,165]. However,

for some families, having to be in a fixed place at a specific time for a workshop can present other challenges, as it can overlap with work hours or it can be hard to access if they live in remote and rural areas [27,150]. Therefore, in this work, we aim to explore co-designing synchronously online which affords us to accommodate more families and situations when online interaction is the only option.

For many people in the world, the COVID-19 pandemic in Spring 2020 was one of these constraining situations. Our team typically co-designs with children (ages 7 - 11) in-person, and we were forced to conduct synchronous participatory design sessions online. Going online synchronously introduced many complexities and ambiguity, particularly when co-designing with children. Many of the methods and techniques we used to interact with children were initially designed for co-located sessions. Therefore, we had to quickly modify existing techniques, and learn how to design, communicate, and collaborate on different online platforms and tools. While prior literature investigates distributed co-design [27,47,49,106,151], many studies discuss asynchronous (occurring at different time) [27,106,151] and hybrid models (mix of synchronous and asynchronous session)[47,150] to accommodate time differences. There are limitations of co-designing in an asynchronous model as young children have to be assisted in the absence of the facilitator and the child has to understand how to use and co-design with the platform (e.g. Facebook, Minecraft) [48,106,151].

Synchronous video chat, on the other hand, supports in-the-moment interactions with the help of facilitators. Studies have shown the value of presence and relationship building that arise from synchronous video chats within a group of teenagers and family members [14,116]. However,

synchronous online sessions can also be disrupted by numerous external and internal factors because sessions occur in real-time. Because fewer co-design sessions on synchronous platforms have been studied, we have found little knowledge in HCI research to help understand how to navigate this complex space to co-design with children design partners. Given that the COVID-19 pandemic may isolate children longer, there is an imperative need to support the child-computer interaction community through new knowledge of how to effectively co-design through synchronous online means.

In this paper, we identify and discuss the new considerations we need to take when moving to a synchronous online space. We examined ten consecutive intergenerational participatory online design sessions of an intergenerational co—design team (called *KidsTeam UW*), where children (ages 7 - 11) and adults co-designed new technologies together through video chat. Our design team participated in online co-design sessions using *Cooperative Inquiry*, a PD method focused on children and adults as equal and equitable design partners [31,32,51,170]. We conducted and video recorded a total of ten PD sessions with ten children during the months of April to July 2020. We interviewed all ten children to learn about their experiences in the session. We triangulated across our data to analyze co-design session videos, interviews, and artifacts to address three research questions:

> **RQ1:** What are project logistics considerations when co-designing in a synchronous online space?

RQ2: What are online factors considerations when co-designing in a synchronous online space?

RQ3: What kinds of participant interactions do we need to consider when co-designing in a synchronous online space?

Through our investigation, we learned we could not create a 'how to' model of doing PD synchronously online with children, because there are many unexpected moments and interruptions that are out of the control of the facilitators. Therefore, we turned to literature on ***improvisation*** [76,78,113] for inspiration to make sense of our data as disruptions occurred, and people frequently needed to modify session plans. Improvisational theories also focus on the collaborative and emerging nature of the environment and assist in understanding what roles a facilitator can play in emerging situations, as well as how they can incorporate ideas from participants [11,45]. Talented artists, comedians, and skilled architects often embrace disorder to make the most of any situation [113]. In our work, we had to be agile and swift when running our co-design sessions online, where unexpected situations arose frequently. With more uncertainties, we had to be willing to diverge from planned techniques in the session and leverage ad-hoc approaches to continue to engage with children to co-design.

Drawing on improvisation theories, we developed a conceptual model and explicating factors to consider when co-designing with children synchronously in an online space. Our model consists of three themes of consideration for improvisation during online co-design sessions: ***Project Logistics, People and Setting,*** and ***People's Co-design Interactions***. We contribute a model that offers researchers a lens to scaffold and reflect on synchronous PD sessions and supports them in

identifying factors to improve for their future design sessions. Overall, we make three contributions to the HCI community:

Empirically, we uncover the implicit and nuanced complexities of engaging in synchronous online co-design sessions with children and adults. Theoretically, we extend Kang et al.'s [78] HCI improvisation features to consider improvisation as a way to balance the tensions in the known and unknown factors for synchronous online co-design. We provide design recommendations and ethical implications for engaging in online co-design through improvisation.

2 Related Work

2.1 Children as Design Partners

Participatory design (PD) focuses on the democratic means to engage end-users in the collaborative work processes to increase the utility of designs [84]. PD projects have roots in the spirit of democratizing the workforce, which trace back to the 1970's when researchers included trade union members in designing new technologies [117]. Inclusion of users in the design process does not only develop viable designs [139] but also supports the empowerment of users in shaping the direction of innovating technologies [110]. While there are multiple methods of involving the end-user to varying degrees in the design process [97], we specifically focus on working with children as co-design partners using the method of Cooperative Inquiry [31,32].

Druin [31,32] developed Cooperative Inquiry to allow idea elaboration between both adults and children by equally valuing the voices of children and adults alike. In this PD method, children are considered designer partners who hold expertise in being a child. In order to be design partners, it takes time and effort to build and sustain relationships. Therefore, researchers work with a small number of children, as opposed to a large group, primarily work with children ages 7 -11 as they can articulate their ideas. Yip et al. [75] adds how the partnership between children and adults is not static, but rather a combination of dynamic interactions over time. Many scholars have worked on creating new techniques to generate a more balanced relationship between adults and children [29,46,51,115,149,157].

To engage in PD, designers can use *design techniques* to communicate and co-design with children. Walsh et al. [153] created a framework to help researchers select, create, and modify design techniques based on the understanding that each context differs. When selecting a technique, facilitators must consider their project goals, the context of their participants, and the limitations and advantages of the technique. When considering the project goals, techniques can be chosen based on the design stage that the project is in: from early stages of the design process (asking children how they perceive a topic), to later stages (asking to evaluate a higher-fidelity prototype). Techniques can differ by how much expertise a child has in designing with adults, and the kinds of accommodations a child may need to use the technique. Other aspects to consider when selecting a design technique include the cost of using the technique (i.e., materials), the portability of the technique to other contexts (i.e., field vs. controlled lab setting), and the amount of required physical interactions of the participants.

Although extensive work in children and PD exists, most of these studies only focus on designing together in co-located physical spaces. Some of these spaces are university labs [67], schools [29,126], libraries [75], community centers [125,165] and refugee camps [1,79,161] Only a handful of studies have examined children's co-design in non-physical locations through distributed co-design [49,150].

2.2 The Space of Distributed Co-design and Play

For distributed PD, researchers highlight three key distinctions: *synchronous* (occurring at the same time), *asynchronous* (occurring at different times), or *hybrid* (a mix of synchronous and asynchronous) [130,137] For asynchronous sessions, scholars have explored PD with adults on social media sites (e.g., Facebook) [106] or on researchers' own online platforms [49]. For instance, Walsh et al. created DisCo [49] a co-design tool for asynchronous distributed co-design. DisCo is a desktop-based tool that allows children from multiple locations to draw, make audio clips, and layer ideas on top of other children's ideas. In a hybrid model, researchers have investigated how children co-design in a three-dimensional gaming space (Kidscraft, a modification of Minecraft) [47,48]. Despite the importance of the sense of presence and relationship building in co-designing with children, many current studies focus on the asynchronous mode. The asynchronous design sessions, however, lack the ability to support in-the-moment idea sharing. Additionally, asynchronous design sessions require multiple reminders for participation, as young children often struggle to participate [48]. In particular,

distributed co-design (whether synchronous or asynchronous) requires an extra level of facilitation that is taken for granted in co-located contexts [49].

Multiple scholars have stated how synchronized platforms, in the form of video chats, can provide a sense of presence and connectedness [16]. For instance, Yarosh et al. [162] created ShareTable, a system that provides video chat and shared tabletop space for children to engage with their parents from faraway. Inkpen's numerous work in play and video conferencing functions have demonstrated that there are opportunities and challenges for using multiple cameras and hands-free devices for telepresence, such as playing with multiple mice setups [68,69]. However, both Yarosh, Inkpen, and others have only created conceptual ideas and prototypes, which are not yet mainstream consumer devices. Few, if any, studies have looked at the role of video chat and online synchronous co-design for an entire intergenerational team. This calls forward the need for an investigation into the construction and facilitation of meaningful synchronous remote co-design sessions with children as design partners.

Our study focused on synchronous sessions, which required more in-the-moment decisions. For researchers who have studied distributed co-design, the motivation was to overcome different time zones. In our case, the children were all co-located in the same time zone and we focused more on emphasizing relationship building in synchronous sessions, which supported participants' sense of presence. However, because numerous unknown and unpredictable factors exist in synchronous online co-design (e.g., technology infrastructure disruptions, people's lack of engagement), we needed a theoretical model that allowed us to be flexible, but still provided

guidance and structure. Therefore, we turned to improvisation in HCI as a theoretical concept to help guide our investigation.

2.3 Theoretical Framing

We explore how improvisation in the arts could help us in understanding the unexpectedness of working with children in an online space. There are multiple ways to interpret improvisation based on its context. In music, improvisation is 'playing extemporaneously' or without written music [123]. In health education, improvisation are judgement calls, which are made in-the-moment in crisis situations [58]. To improvise is also to draw upon one's own knowledge and focus on the very moment to make the best of the given situation [113]. As improvisation emerges when we are forced to deviate from pre-determined plans, the underlying implication is that there was a 'right' plan to be followed. Therefore, improvisation is often associated with being inferior as it is seen as a substitute of a pre-established rule. In other words, improvisation is a back-up plan when the original plan is impossible [103]. However, it is important to note that while it is true that improvisation emerges as a response to unanticipated situations, it also can emerge voluntarily[76]. Artists, musicians and designers have valued improvisation for creative practices. While improvisation emerges from a response to a breakdown or glitches, it also emerges to accommodate creative practices. For example, artists and musicians sometimes purposely deviate from their original plans for creative purposes, such as jazz musicians adding a 'blue note' to discover new musical phrases [55].

Scholars also defined different levels of improvisation [93]. In the first level, modest adjustments are made to the pre-existing structure. For example, a jazz musician starts to diverge after playing their standard familiar notes to people. At the second level, the music starts with hardly any similarities to the pre-planned structure. However, there are moments it imitates the pre-planned structure. In the most extreme level, the improviser discards the whole activity and starts to compose new patterns. When the activity is discarded, the time used is not considered wasted but a time to discover new ideas based on previous knowledge by interacting with the old activity. Some artists deliberately make detours and accidental interactions to reveal creative ideas from the changed circumstances [133]. We see an opportunity to introduce a model of improvisation for working with users in PD methods, given that co-designing with children is full of noise and disorder. Moving to the online space adds even more complexity, as there are technical glitches and breakdowns that can occur.

For our analysis, we rely on Kang et al.'s [78] five key features in HCI improvisation. The five features illustrate different manifestations of how improvisation emerges in practices.

- *Reflexivity* states that improvisation is not purely random, but that there is constant trial and error for constructing creativity.
- *Transgression* states that improvisation is not always a passive learning mode as practitioners actively encourage unforeseen factors in order to promote discovery.
- *Tension* states that when a practitioner strives for both freedom and structure, improvisation emerges.

- *Listening* is essential in order to be aware of the changing factors of a situation. Listening in design closely parallels listening in improvisation.
- *Interdependence* discusses how improvisation is co-constructed with other relationships and environments.

3. Method

3.1 Context and Changes

Our investigation is part of a larger project of an intergenerational co-design group where adults and children design new technology for children, with children. Before COVID-19, KidsTeam UW team members met twice-a-week afterschool for 90 minutes. During the in-person 90-minute sessions, children and adults gathered to first share snacks provided by the researcher (snack time), afterward the researcher prompted the children to begin thinking within a design oriented mindset by asking the question of the day (circle time), the team had a design session for around 45 minutes (design time) and the session ended with group discussion and reflection. The team has worked on multiple design projects with other faculty members, students, industry partners, and librarians.

In March 2020, due to the COVID-19, our university was closed to the public and families had to stay quarantined. From March to April 2020, we spent one month reconfiguring KidsTeam UW to transition the group to only synchronous online. The lead principal investigator opened up the possibility of still being connected through a video chat platform. Families of the children

allowed this option, which gave us the opportunity to explore how to co-design with children during this difficult time.

A number of changes needed to be made to make synchronous online co-design more viable. First, based on the attention span of young children, the session time was reduced from 90 minutes to 75 minutes. We also changed from meeting twice-a-week to once-a-week to ease children into the new process. Although the new session format had no initial snack time, we followed the rest of the previous session format with reduced time. For example, we included questions of the day to prep and prime the participants to engage (10 minutes), design sessions to engage together (25 – 35 minutes), and discussion time to summarize and reflect on the session (15 minutes).

3.2 Participants

The team consisted of adults from the university (researchers and undergraduate students) and child participants ages 7 – 11 (n = 10). With the exception of one new child, who had not participated in any of the previous in-person co-design sessions, the nine children were all existing members of the co-design team. Their previous participation in KidsTeam UW ranged from six months to four years (Table 1). The one new child (Suga) was recruited because she showed interest in the past but her caregiver could not drive her to in-person sessions. While adult participants were situated across four different time zones (Korean Standard, Pacific

Standard, Central Standard and Eastern Standard), all the children were in the same time zone (Pacific Standard).

Table 4 Participant's demographics (pseudonyms)

Child Pseudonym	Age	Gender	Ethnicity	Years in KidsTeam UW
Alan	11	Boy	Hispanic	4
Ethan	8	Boy	Hispanic	2
Hope	10	Girl	Asian/White	2
Jack	8	Boy	Asian/White	2
Marcus	10	Boy	White	2
Mia	8	Girl	Asian/White	2
Ryan	11	Boy	Asian/White	4
Sarah	7	Girl	Asian/White	3
Suga	10	Girl	Asian/White	0
Tae	10	Boy	Asian/White	3

3.3 Design Sessions

We held a total of ten design sessions from April to June 2020 on Zoom (a video/audio chat streaming platform). We recorded audio and video of the design sessions using Zoom's in-cloud recording feature. We collected all data following the procedure approved by the University of Washington's Institutional Review Board. In Table 2, we present the different activities that occurred during each session and the technologies used. For each session, we also saved the generated artifacts and the first author wrote field notes both before and after the session for planning, reflection, and analysis.

Table 5 Design Sessions

Sessions	Design Questions / Project Goals	Design Stage	Design Technique and Digital Tools
1	What is the future of KidsTeam UW online? Our goal was to understand how children wanted to communicate online.	Early ideas	Bags of Stuff technique: Children used their own arts and crafts materials found at home. The camera in Zoom was used to share their design.
2	What do children think about the SunSmart technology ideas (Session 1)? Our goal was to understand children's initial feedback on prototypes for sun protection. SunSmart is an application to teach children about sun protection.	Mid Prototype	Line Judging technique: We shared the mid-prototype through a storyboard, which had some initial sketches that would be included in the mobile application. Children shared their preference of the prototypes by voting by color. PowerPoint and the Screen capture tool was used to capture their vote. Zoom was used for discussion.
3	How can we design for refugee children? Our goal was to understand how refugee children can also co-design using SMS texting, radio, and loudspeakers.	Early ideas	Bags of Stuff technique: The researchers sent children the same arts and craft materials (colored paper, popsicle sticks, and pipe cleaners). The camera in Zoom was used to share their design.
4	What can librarians do to help kids online? Our goal was to understand what online library sessions would look like.	Early ideas	Comicboarding technique: Children filled in blank slides in PowerPoint of what a fun library session would look like. For children who drew on a physical piece of paper, the adults took a screen shot. Zoom was used for discussion.
5	What do children think about the SunSmart technology ideas? (Session 2)	Mid Prototype	Big Paper technique: Children designed on their piece of paper using pencil to improve prototypes. The adults shared the prototype ideas in PowerPoint. Zoom was used for discussion.
6	What do children think about online safety? Our goal was to understand what children regarded as online safety issues and solutions.	Early ideas	Comicboarding technique: Children filled in a blank slide about what made them upset when they were online and possible solutions. We used PowerPoint to design. Zoom was used for discussion.
7	How would positive 'Would You Rather' (WYR) questions influence children's' responses? Our goal was to understand children's priorities and values in decision making. Would You Rather is a game for understanding people's preferences [47].	Early	Line Judging technique: Children voted on WYR questions. PowerPoint and the Screen capture tool were used to share the questions and to capture their choices. Zoom was used for discussion.
8	What would children want to do if they can control computers with physical objects? Our goal was to understand children's use of an AR device that detects physical objects and movement.	Late evaluation	Wizard of Oz technique: Adults gave a simulation of a new technology based on children's interaction. PowerPoint was used to write and sketch ideas. Zoom was used for discussion.
9	How would children create Would You Rather questions regarding Slither.io? Slitheri.io is an online game the children liked playing.	Early ideas	Line Judging: Children played each other's WYR game by voting with their hands up and low. PowerPoint was used to share questions and Zoom was used for discussion.
10	How would children still have fun with their friends during quarantine? Our goal was to understand what 'distant play' would look like for children.	Early ideas	Comicboarding: Children filled in a blank slide of how they can have fun with their friends while they are apart. PowerPoint was used to add in ideas and Zoom was used for discussion.

3.4 Interviews

To understand how children experienced the online synchronous co-design sessions, we conducted semi-structured interviews with all ten children in July 2020. We began by asking

questions about what their environment looked like when they came online and what other activities (e.g., school) they had online during COVID-19. Second, we asked questions regarding their experiences engaging with the different co-design techniques we used in the online space. Third, we asked about the different tools in Zoom, such as chat and breakout rooms. Finally, we asked how they compared the online sessions with the in-person sessions (with the exception of the child who only participated in online sessions). The interviews lasted for approximately 25 minutes and were transcribed for analysis.

3.5 Data Analysis

We first used an inductive and grounded method to understand the emerging themes of moving to an online space [16,17]. Five co-authors observed and annotated the 10 session videos. Primary and secondary observers/reviewers open-coded the data after annotating the videos. We used Miro Board, an online collaborative whiteboard platform, to share parts/quotes from videos. Based on the quotes that were found in the videos, the researchers analyzed overall patterns and started to develop themes. Afterwards, we deductively compared our themes to the FACIT PD model [153], which takes into consideration the co-design participants' needs and experiences, the design goals of a session, and the characteristics of design techniques. We then followed a deductive approach by mapping the FACIT PD model and applying Bronfenbrenner's ecological theory of human development and socialization [14] for a holistic view of the data. While coding the data and attempting to create a framework inclusive of different considerations, we prioritized extracting the theme that would be 1) unique themes specific to the synchronous online space. We chose these themes because there is already an extensive body of work that

supports in-person interactions; and 2) that other PD researchers could find these broad themes helpful for conducting their own sessions. During the analysis, the researchers noticed that there were many factors out of the researchers' control in the online space. This prompted the group to turn to theories of improvisation in order to make sense of these uncertain situations. Finally, to analyze the clustered themes of our data we used Kang et al.'s [78] five features of improvisation. Kang et al. outline the practices that emerge when engaging in improvisation, which include reflexivity, tension, listening, transgression, and interdependence. We triangulated our findings with themes that also emerged from the children's interviews.

4. Findings

We first introduce the conceptual model of improvisation in synchronous online co-design (Figure 1). In Sections 4.2 – 4.4, we describe each theme from the conceptual model, their subthemes, and provide example vignettes with analysis. As we describe our data, we indicate facilitators with superscript F (NameF), children with superscript C (NameC) and adults, who are not facilitators, with superscript A (NameA).

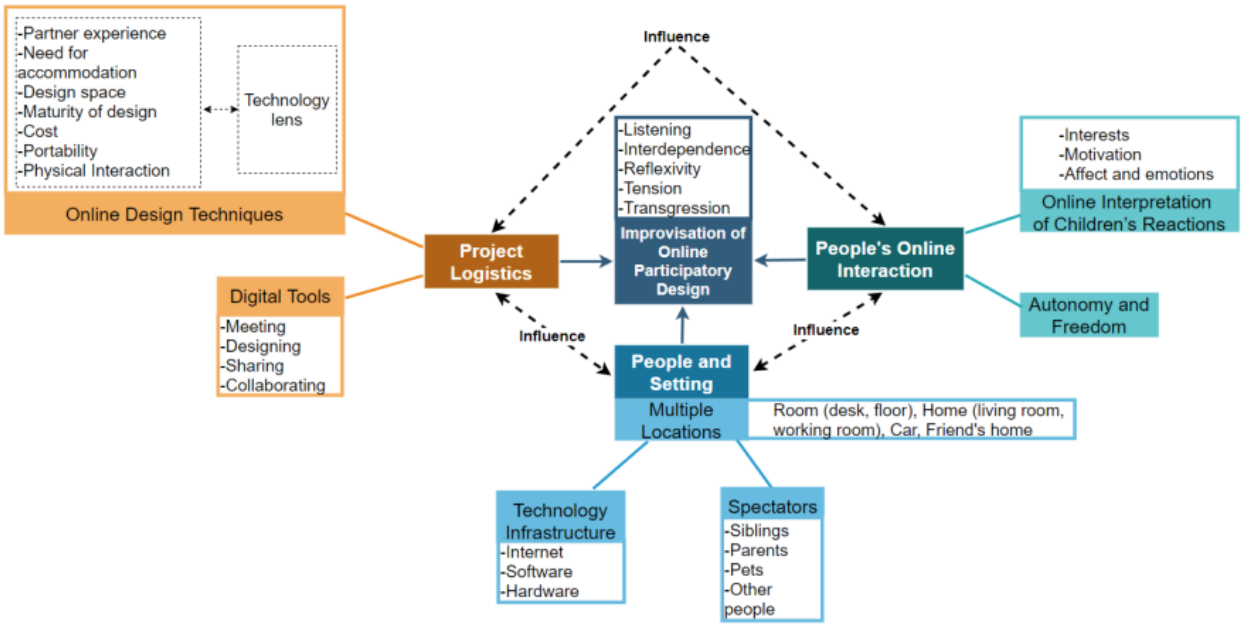

Figure 6 A conceptual model of conducting synchronous online participatory design with children.

4.1 Introducing the Conceptual Model

Based on an in-depth analysis of the ten recorded synchronous online co-design sessions, children's interviews, and artifacts, we developed a conceptual model (Figure 1) for consideration when conducting PD with children online. After conducting multiple rounds of inductive and deductive processes, we created our conceptual model. Our model is informed by Walsh et al.'s framework on how to design PD techniques [153] and Bronfenbrenner's ecological systems theory [14] for a holistic view of the data. Our conceptual model consists of three themes: 1) Project Logistics; 2) People and Settings; and 3) People's Co-design Interactions. Project Logistics are the properties of the co-design session that influence which design techniques and digital tools are used for synchronous online sessions. The theme of Project

Logistics is based on portions of the FACIT model [153], which concern the important features of a co-design technique (deductive). People and Settings refers to the external factors that exist in the multiple locations of the participants (e.g., technology infrastructure, location changes, spectators). This theme stemmed from the unique characteristics of a synchronous online space where outside factors, such as technology and infrastructure, influenced the online design sessions (inductive). People's Co-design Interactions emphasize the specific engagements that occur when adults and children meet synchronously online. This theme stemmed from our observations from co-design sessions. Interestingly, this theme also connects to Makhaeva et al.'s work on the important balance between freedom and structure for creativity in design [107].

All three themes in our conceptual model influence each other with different limitations and unexpected surprises throughout the sessions. For example, an unexpected Internet outage in a facilitator's location (People and Settings) can influence how a design technique may need to change (Project Logistics), and how the adults and children react to disruptions of the online co-design (People's Co-Design Interaction). The core concept is the *Online Improvisation* engagement of participants that needs to occur in order to mitigate tensions, either as micro moment-to-moment or macroscale shifts. These improvisations tie back to Kang et al.'s [78] five improvisations in HCI: listening, transgression, tension, interdependence, and reflexivity. We use video vignettes to illustrate moments from the PD sessions, as well as quotes from children's interview transcripts, to highlight their reflections on the sessions. We employed the comparative case study method [25], which allowed us to closely examine the expected and unexpected moments that occurred in online co-design sessions with adults and children over time. We organize our findings section by first describing the emergent sub-themes. Afterwards, we

provide examples from videos, artifacts, and interview data to illustrate the range of participants' synchronous online co-design experiences, and then outline connections to improvisation theory.

Our model does not present a 'how to' approach for doing PD with children online because every PD session, including its environment, participants, and context, is unique. Rather, our model provides researchers information about different factors and corresponding scenarios to use for reference before entering the session. Prior work states how people are able to improvise better when they have a known structure in mind. Applying frameworks from theories of improvisation, we were able to reflect on the various uncontrollable situations during our sessions in depth and embrace these moments as opposed to avoiding them.

4.2 Project Logistics

Every co-located design session with children has its own logistics to be managed, such as booking a location, finding time to meet with participants, and handling transportation. Additionally, planning co-design sessions with children requires determining what techniques can be used for communication between children and adults [153]. When considering the logistics of an online synchronous session, we compared issues from physical locations to those from online spaces. *Project Logistics* focuses on the characteristics of a session that pertain to how the session might be planned and implemented. For our conceptual model, we outline two subthemes of Project Logistics: 1) the Techniques needed to run a synchronous online co-design session; and 2) the Digital Tools that make online synchronous co-design possible.

4.2.1 Creating or Modifying Techniques for Online Synchronous Co-design. Techniques for co-design have mainly been studied in physical co-located sessions. When we consider Walsh et al.'s dimensions [153] for choosing, creating, and modifying techniques for co-design, there is no direct distinction between demarcating techniques for physical spaces or online spaces. Our conceptual model notes that when implementing synchronous online for co-design with children, previous co-located techniques can be modified for online interactions using Walsh et al.'s [153] dimensions as a guide (Table 3). As techniques for online synchronous co-design are intractably tied to meeting and collaborating online, we note that the rest of the seven dimensions of Walsh et al. 's framework [153] all must be considered through a technology lens.

Table 6 Walsh et al.'s [60] Dimensions for Online Co-design

Dimensions	Description	Technology lens
Partner experience	How much co-design experience is needed to participate?	How much experience do children have with the digital tools for online?
Need for accommodation	What is the age and cognitive ability of the participant? Does the participant need accommodation to design?	Does the participant need help with the online technology?
Design space	How specifically is the problem defined?	Can the problem definition be translated to an online space?
Maturity of design	How far along is the current design in the design process?	Is the idea and/or prototype ready to be explored online?
Cost	What is the financial price of materials for required techniques?	What is the cost of the technology for co-designing online (e.g., time, money)
Portability	What is the physical mobility of the artifact generated from the technique?	Can the technology properly record, view, document the technique online?
Physical interaction	What is the degree of participant movement? (low: children sit and draw, high: children move between rooms)	How much does the participant need to interact with the digital tools?

4.2.2 Digital Tools for Meeting and Designing. The shift from physical to synchronous online co-design requires consideration of the technological tools for remote access: including software, hardware, and physical materials. Tools enable participants to communicate with each other. In physical co-located sessions, tools such as whiteboards, arts and crafts materials, and tables can be shared among participants while situated in a common space. Our data suggests that for

synchronous online sessions, different digital tools are needed to support the following online interactions:

- Meeting: How do the participants gather together to communicate in online space?
- Design: How do the participants create new artifacts together in online space?
- Sharing: How do the participants present their ideas and artifacts together in online space?
- Collaboration: How do the participants work together in online space?

A single digital tool does not always address all four factors; therefore, a combination of tools might be needed to support a session. We consider the software and hardware used to execute a technique as a tool, including: access to shared documents, virtual backgrounds, breakout rooms, and the mute button which were new tools to our PD sessions.

4.2.3 Two Examples of Technique Modifications. In this section, we detail how we modified two existing co-design techniques for an online space: **Comicboarding**, which is used during ideation and scenario design; and **Line Judging**, which is used to evaluate multiple ideas. During in-person PD sessions, children could interact physically with design partners and had access to shared materials. In this new synchronous online context, accommodations to the techniques were necessary, given the limitations of being completely reliant on the technology to engage in the session.

Description of Comicboarding. Comicboarding [115] is a technique used to scaffold children's brainstorming process. When used in co-located settings, facilitators give children a piece of paper with three scenario panels: the first panel contains the context of the design problem and the last panel has the ending to the design problem. In the middle panel, children describe their ideas for how to arrive at a solution while a volunteer artist (i.e., an adult) sketches their ideas and designs out.

Modifications of Comicboarding Online. Our new meeting space, hosted on the video chat software Zoom, meant we had to modify Comicboarding by transferring the comic strip to a digital platform that still allowed for collaboration. For our design and sharing space, we aimed for a simpler solution and used a familiar digital tool, Microsoft PowerPoint. We created slide decks so that designers could easily import pictures and share them with others on their design team. We utilized Zoom's Breakout Rooms feature for collaborative small group discussions. We created copies of a PowerPoint slide for each group of adults and children, as well as illustrated the design problem at the beginning of the slide deck and the story's conclusion at the end of the slide deck. We left blank slides in the middle of the PowerPoint, and asked the children how they would fill the design story inside. Like Comicboarding in-person, the children directed the adults to draw the images around the slide, asking them to find visuals online (e.g., Google Images), and writing in the textboxes themselves. The level of accommodation online was higher than in-person sessions because we had to consider how children voiced their ideas together and support volunteers in illustrating the children's concepts. The physical interaction was low, as the children were still in front of their computer while directing the adults. The cost of executing the

technique was high, in that each small group needed an adult facilitator to take time to draw out their ideas.

Example Comicboarding Online Vignette. During Session 4, we used our modified Comicboarding technique to get children's ideas on how librarians can help other children remotely. EthanC asked KimF to find images of Yoda (a character from Star Wars). After the adults found the images online, AlanC and TaeC discussed which one was the best. They all agreed upon a "Baby Yoda " that was drinking soup. TaeC then stated that *"In the library you can't eat, maybe we can eat with the librarian online"*. In another group, SugaC decided to draw directly on a white paper, and then held her picture up to the camera. TiffanyA took a picture (Figure 2) and imported the photo into the slide deck. At the end of this session, a researcher noted that one limitation to the technique was that "only the vocal kids [were] able to participate."

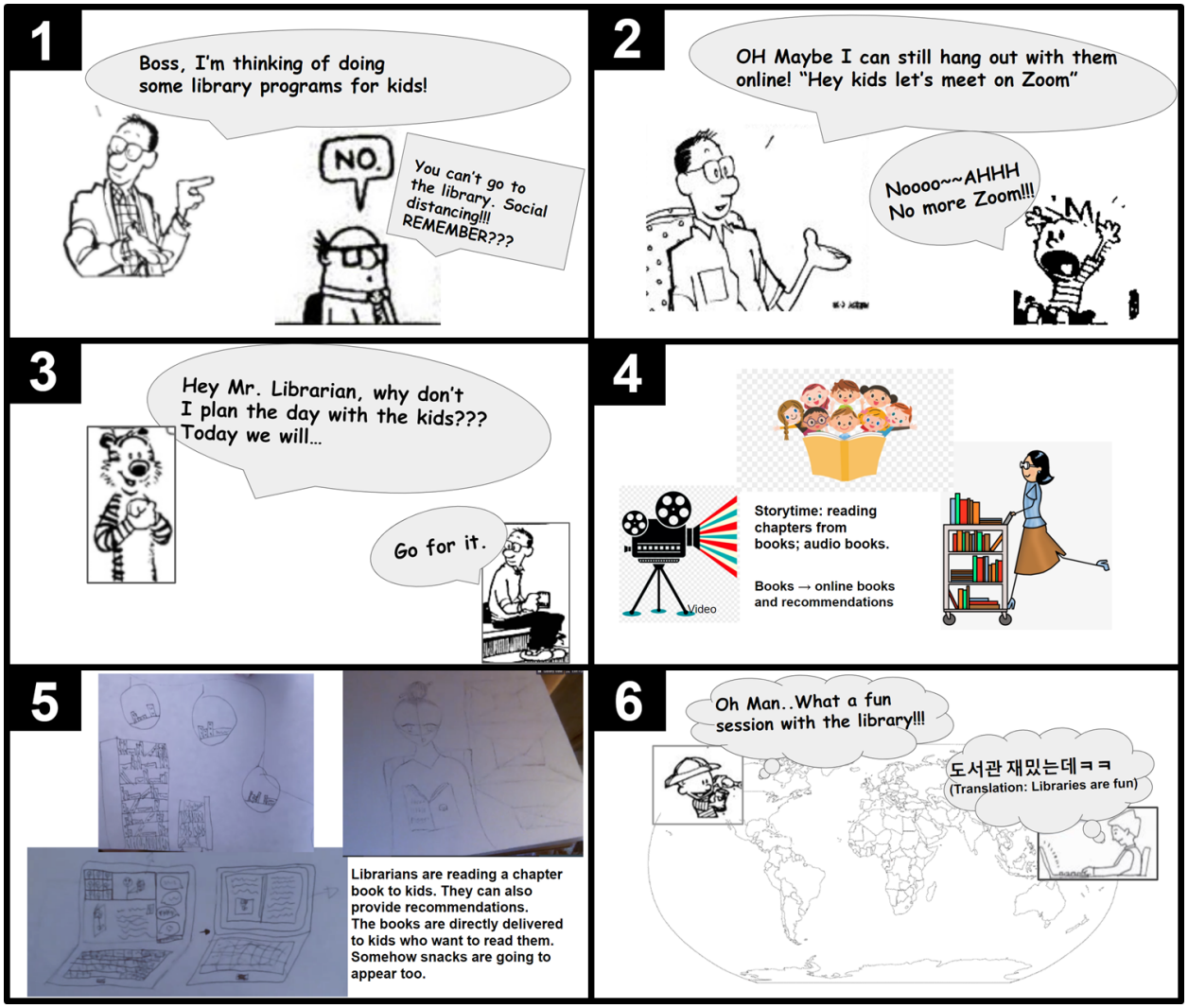

Figure 7 An example of Comicboarding technique in a shared PowerPoint. Slides 4 and 5 were the empty slides for the children to fill in.

Connections to Improvisation for Comicboarding. In improvisation**, 'listening'** highlights the importance of being aware of how people interact with the environment and with each other [78]. In this example, we were interacting differently than how we would interact in-person: the adult facilitator only heard children's voices, rather than seeing social cues in-person (like what EthanC was drawing or what AlanC's movement was). The adults and children could only see

one comic board frame at a time. For example, in the online space, children could only see one slide at a time while adults may have multiple screens to view many slides at once. When trying to design what should be on the next slide, sometimes both children and adults forget what was in the previous slide. We noticed it was especially difficult for children to focus on sharing their ideas when they could only see one part of the comic board. We needed to provide frequent reminders to the children about what was on the previous slide. One affordance in modifying this technique for an online space was that the children did not spend too much time drawing images, and utilized the Internet to search for a range of images instead.

Description of Line Judging. Line Judging [153] is a technique used to support children in evaluating multiple designs in an engaging way. In-person, facilitators draw a line on the floor or wall and the children start by standing in the middle of the line. Facilitators share each design idea, and the children indicate their preference of the idea by positioning themselves along the line (positive on one side, negative on the other, unsure in the middle). Once everyone is in their position a facilitator takes a photograph. Afterwards, facilitators ask the children why they are standing in that particular place. This technique allows children to vote on a spectrum using their bodies.

Modification of Line Judging Online. In the online space, the children could no longer move around the room to indicate their preferences. We needed to find an engaging way for them to express their vote preferences on a spectrum. We first considered which digital tools children would most likely to have access to, and how we could capture everyone's vote for a larger discussion. While we were aware of the built-in Zoom features for voting, such as the thumbs up

reaction, we had to make necessary adjustments because: 1) some children were using phones, which made it difficult for them to navigate desktop features; and 2) some families did not have the latest Zoom software updates. We chose to vote with bright colors because video chat afforded visualization of voting preferences, and we knew color was something children could differentiate between. We asked children to find three objects in their home: one red, one yellow, and one green. To capture everyone's vote for a larger discussion, we decided to use the screen capture tool so that the adults could see everyone's vote on a single screen in a slide deck, which, in turn, supported sharing. The facilitator then shared the screenshot with everyone to view the results and discuss.

Example Line Judging Online Vignette: During Session 2, we used our modified Line Judging technique to get children's evaluations of different sun protection technologies. To vote, adults used objects from their desk (*e.g.* markers). However, we observed that the children took a more creative approach. RyanC , for instance, voted with a new stuffed animal every time. Children said they liked seeing what their friends had at home (Figure 3).

Figure 8 Screenshot of the result of voting by color and hand

For Session 7, we modified the Line Judging technique once more to have children vote with their hands in vertical positions (Figure 3). After showing a design idea a facilitator said, *"If you like the first idea, put your hands above your nose, If you like the second idea better, put your hand below your nose."* During the session MarcusC said, *"My hands are getting tired. Can I put my hands down?"*. Unfortunately, the two facilitators did not respond to his comment because they were busy (one was giving instructions and the other was taking the screenshot). We did not realize this until we analyzed the video data. In his interview, JackC made a similar comment to MarcusC, *"It would be too close to the screen and it really hurts your arm. Or, if you just hold up a color, when you just want to do that for everything, it can kind of make your arm sore."* Despite some of the physical discomfort, our technique allowed for the inclusion of all the children's voices because they were able to express their opinions without relying on verbal processes.

Connections to Improvisation for Line Judging. In improvisation, '**reflexivity'** describes how artists, through multiple and iterative attempts, need to try different directions, make sense of multiple interactions, and continuously reconstruct their meaning in new contexts to arrive at a satisfactory point in their process [78]. A common misconception is that creativity comes from randomness. In reality, artists must go through trial and error before arriving at their final composition. In our process, after we tried to modify the Line Judging technique by using colors, then by using hands, we were iteratively trying different approaches. Through an improvisation lens, we did not engage in the session in a linear model of learning, such as how to use one specific technology at a time. Rather, we took a trial and error approach that enabled reflexivity throughout the process.

4.3 People and Their Settings

In this theme, we highlight factors within participants' settings that directly affected their interactions during the synchronous online co-design sessions including: 1) Location and Technology Infrastructure; and 2) Location and Spectators.

4.3.1 Location and Technology Infrastructure. **Location** refers to the specific places from which children were joining our sessions. While adult volunteers tended to be fixed in their locations (e.g., single room with webcam), many of the children's locations shifted between sessions or even during sessions. At a micro-level, locations changed when a child moved around in their room, thus changing the view of the video. At a larger scale, children also moved to different rooms in their home, to different homes (e.g., their home and another family's home) and, a

couple of times, child participants even called in from a moving car. Overall, there was constant variance in how much a child moved depending on their location. Based on their location, the technology infrastructure changed.

Technology infrastructure refers to the basic structures and facilities needed for participating in synchronous online co-design sessions. This includes children's access to high-speed broadband, bandwidth, software, and hardware at the moment of co-design. Children's access to technology infrastructure is not static, rather shifting at any given moment depending on their location.

Examples of changing location and technology infrastructures. For Session 7, we had a combination of technology infrastructure breakdowns when RaymonF was facilitating. For context, EthanC and AlanC are brothers who joined our sessions through one shared computer. JackC was moving from a room to a car in the vignette below.

RaymonF : "Umm, EthanC and AlanC, why did you pick no cavities over gaming? I thought you'd pick gaming instead of no cavities. Let's see, EthanC and AlanC! Are you guys frozen?? Oh no, they're frozen!"

EthanC and AlanC: (Their online video chat got disconnected) / *AlanC and EthanC did not shift in their location but their technology infrastructure was not stable.*

RaymonF: (Quickly moves on to ask JackC) "*Umm, JackC what did you pick?"* (Facilitator notices that JackC was no longer in his room)

JackC: (moving in a car)

RaymonF: (Surprised) "What did you pick? I can't tell when you're inside the car. Oh sorry, you're muted. Let me unmute you. Let's see… you're muted. JackC can you unmute?"

JackC: “What were the options? I couldn't hear you. You sounded like robots.”

This instance shows how EthanC and AlanC’s challenges with their broadband in their location and JackC’s movement across physical locations came together to bring the design discussion to a halt. There was only so much RaymonF could do to continue the conversation given that going online meant every child could be in any setting, which might interfere with their engagement and interactions during the session.

Connection to Improvisation. This vignette highlights how the design researcher was not able to execute the session because there were unforeseen disturbances as a result of the technology infrastructure and the location of each child. While one would typically want to avoid such situations, this moment can be explained by the concept of **‘tensions’**, where an external structure disrupts the original plan [78]. This disruption is a motivation for artists who improvise to engage in the ‘curiosity’ of the unknown [78], wherein their interest in new contexts leads to a larger realization. In this particular case, after the session, all the researchers could have engaged in dialogues about whether this disturbance was a larger structural problem, thus questioning our method and not the participants’ actions and engagement. We might ask ourselves, how is our engagement dependent on bandwidth? How do we shift the responsibility onto us as researchers to explore alternative ways and methods for participants to be included regardless of their bandwidth capacity or shifting of locations? While we have not yet found answers for this session, we have identified the need to alter existing techniques for when there is a sudden disconnect.

4.3.2 Location and Spectators. Not only does location influence technology, but spectators, who are a part of the location, influence technology as well. Spectators refers to the people other than the participant designers in a session. Children, at a young age, are rarely alone. As researchers we were often exposed to the children's shared spaces, which included other family members, siblings, parents, friends, and even their pets. Below, we give two examples of parents as spectators.

Example Vignettes. In Session 6, the facilitator of the session gave instructions for the children to draw their ideas for two minutes. While the children were all engaged in drawing, JackC stated it would be better for them to just go in the breakout room. In the background, we heard JackC's mother correcting him saying that he should be drawing right now. In his interview, JackC reflected on how it was difficult to be himself with the disturbance of his parents and siblings in the room commenting on his engagement in co-design. He tried to find a closed space to have privacy. JackC's mom sometimes answered the question for him, and was part of the session. In contrast, during Session 4 when we did a design on the topic of the future of libraries for children during COVID-19, SugaC's mother JiminA was next to SugaC in the video chat.

RaymonF: "Oh wait, JiminA, and let's hear what she says, what she knows about libraries."

JiminA : "Alright, I'm actually multitasking. It looks like I'm here but I'm actually working."

RaymonF : "Oh I'm sorry. I thought you were here."

JiminA: "My computer is here. I apologize. Give me the question I will answer."

Connections to Improvisation. In improvisation, **'interdependence'** refers to how one's behavior is co-constructed and in relation to other actors and the environment. In our session, our improvisation was not only dependent on the children designers, but also on the co-constructed relationship with their family members in the room [78]. In the two examples given above, the spectators' involvement changes. While we invited pets, parents, and siblings to the session, we learned that someone being in the video chat frame did not mean that they were truly part of the session. By asking a question to the parent (SugaC's mother), we also engaged in the process of improvising. More specifically, we utilized the improvisational feature of '**transgression**', where we purposely deviate to learn something we did not know. Transgression is the process by which an artist purposefully invites unforeseen and unexpected factors into their process for discovery [78].

4.4 People's Co-design Interactions

This third theme examines the in-the-moment people engagements that happen during synchronous online co-design. We present two sub-themes that emerged regarding the individual's experience during the online co-design session: 1) Online Interpretation of Children's Reactions; and 2) Autonomy and Freedom.

4.4.1 Online Interpretation of Children's Reactions. This sub-theme encompasses the ways in which facilitators interpret a child's interest, motivations, and feelings that influence their interactions online. In the online space, we had fewer visual cues to interpret children's emotions and experiences, given we could only see what appeared on the screen. Audio can also be

limiting. Furthermore, if a child's camera was off, we had even fewer cues to draw on as co-designers. Understanding children's reactions is crucial because children express themselves using different facial expressions (e.g. confusion or boredom). Being online makes it more difficult to detect and interpret these cues. In Zoom video chat, we had to juggle between 10 – 15 faces in a grid on a single screen. Below we share two examples where children were highly engaged and two example activities that children disliked.

Example Vignettes. Children expressed in interviews they were the most engaged during Session 3 when they were designing ideas for remote co-design for refugee children. They also noted Session 9 was their favorite because they worked on improving the game Slither.io. In Session 3, AliceF asked the children: "What do you know about children and refugees?" Then, she gave details about the project and asked, "What are the similarities between refugee children and regular children?" Afterward, RaymonF played a one-minute video from UNICEF about children at the Shamlapur Refugee camp in Bangladesh. HopeC recalled this being her favorite session because it challenged her to think out of the box. SugaC stated that she liked the session she "like[d] helping my community". In Session 9, we asked children to design 'Would You Rather' questions based on their favorite game 'Slither.io'. In the interview, MarcusC and RyanC stated how they liked that they were able to create questions on a game they were used to playing.

Some children had strong negative opinions about Session 5 when they worked on the Sun Smart project designing new technologies to teach other children about skin cancer and sun exposure. TaeC stated it was the worst session because they were being asked to work on a topic that

seemed “so obvious.” Some children also did not enjoy Session 1, where we asked them to design the future of online co-design sessions with adults. AlanC stated that he saw no point in designing for the future of co-designing online as there was no future for it.

Connections to Improvisation. Improv actors, especially those who engage in comedy, need to ‘**listen’** [78] to their audience. They often use techniques such as prompting the audience with a question and, based on how the audience is answering the question, they will make jokes or certain actions diverging from the original plan. In our sessions, we also were improvising by reacting to how the children were answering the questions and helping them find personal connections to the projects. As a result of moving to the online space, interpreting interest and motivation is more difficult as we have fewer cues of what is occurring on-screen or behind the camera. In person, we were more aware of how the child was interacting with the group, which ultimately influences the group dynamics.

A big difference between children's favorite and least favorite sessions was how facilitators prompted the children to connect their interest to the activity. In Session 3 and 9, the facilitator was able to scaffold their interests into the design context and find cues for connections between the design challenge and the children's lives. However, in Sessions 1 and 5, the facilitator went directly into the session with minimum context to the problem and limited connections to the children's experiences. In contrast to the offline space, children could not work side by side with the adults and adults could not give them additional information when it seemed like the child did not understand the concept or the point of design.

4.4.2 Autonomy and Freedom. In the online space, children had more autonomy to do what they wanted. For instance, because we are a public university, children had to ask for permission to go the restroom because we are a public university. When they met us online, they could leave the session even without letting an adult know. Autonomy and freedom thus refers to how each child had more control of their actions while in the synchronous online space. Makhaeva et al. (2016) states how, in the design process, it is crucial to find the appropriate balance between freedom and structure for creativity [107]. In the online space, if a child is not interested, motivated or do not understand the session, it is easier for them to disengage by simply turning off their camera and microphone [104]

Example Vignettes. In multiple sessions, there were instances when a facilitator would ask a question to the children and there would be no response back. In Session 10, RaymonF asked the whole group, "What sounds do you like to hear as an alarm?". Children shared their answers after RaymonF called out their names. RaymonF moved on to RyanC to ask what he liked to hear. There was no response. KimF said that he might be muted. In his interview, RyanC shared that during the online session he would leave the session to get snacks when he was hungry. While adults thought there were limitations in technical infrastructure, children in their interview shared how they intentionally chose which activities to engage in. EthanC said he went on mute because there was noise from the dishwasher. HopeC said she often needed to step out to check on her lizard.

In Session 9, we used a modified Comicboarding [115] technique, where the children shared their preference on 'Would You Rather' questions and the adult took a screenshot for

conversation. However, during the session many children had their camera off which made it difficult to capture their preferences.

Connections to Improvisation. In improvisation, '**tension**' refers to instances when a participant tries to diverge from the structure [78]. While our technique had structure for what activities the child had to engage in, the online environment offered more autonomy to the child to simply log off or turn off their camera and engage in a different activity. It was also difficult to do behavior management in the chatting space. However, for the children, it was important for them to have freedom over structure. We learned that for the children, this freedom was a way for them to get breaks. By using the private chat feature, they were building friendships even when they were not responding to the facilitator.

5. Discussion

5.2 Revealing the Structure and Freedom in Synchronous Online Co-design

Prior work on children's co-design focuses mostly on co-located physical contexts [109,137,169]. Other children's co-design research in online settings has looked into opportunities for asynchronous online settings or using avatars in online game worlds [47,48]. However, the COVID-19 pandemic has forced both children and adult researchers into quarantine for a long duration of time. As such, for many user-experience researchers and designers, working with children in synchronous online settings may become more normalized than in pre-COVID-19 times. In this study, we found that online co-design sessions hold similar

considerations for designing with children as in-person do, while nonetheless introducing unanticipated and unscripted considerations. By considering synchronous online co-design as an opportunity for HCI improvisation, we reveal the tensions between structure and freedom, planning and destruction, and the clarity and fogginess that surface when implementing synchronous online co-design.

Much of the research on design techniques mitigate unanticipated dynamics with physical co-located sessions [109,137,169]. Through our conceptual model (Figure 1), we introduce different factors that could contribute to the engagement of children in an synchronous online session: *Project Logistics, People and Settings, and People's Co-design Interactions*. By adapting theories of improvisation, and leveraging features of the improvisation process, we provide a lens to support facilitators/designers to better anticipate and address disruptions that will be caused by a number of different factors. We take inspiration from musicians, artists, and actors who embrace improvisation as a form of creativity, as opposed to noise, in viewing the unanticipated factors that emerge. However, as researchers in HCI note, improvisation in HCI is only possible from a deep examination of prior experiences and accumulated knowledge [78,103]. In our research, we have engaged in years of investigation into physical co-located co-design with children and adults. Like others in the world, COVID-19 shifted our balance to an unfamiliar space to learn what new rules and knowledge exist to make synchronous online co-design possible. In this sense, our model offers a way to systematically consider the factors, which could improve and reexamine prior traditional techniques and interactions, for co-design in a virtual space.

At the same time, our conceptual model for synchronous online co-design is not a recipe for success nor a rigid, predetermined plan. Nor is the model meant to allow researchers and designers to just "make stuff up" at the time of co-designing with children online. Improvisation is about managing and embracing risk and structure to allow new ideas, techniques, and interactions to flow. Whether online or offline, when doing co-design with children there is always unclarity, noise, and disorder. As we have shown in our findings, synchronous online co-design has different pitfalls and challenges that are not present in co-located physical contexts. Our model informs designers of what deviations to consider, supports the use of moderate adjustments, and encourages discarding an activity in the name of creativity. By suggesting an improvisational model for co-designing online, we further Kang et al.'s [78] five key features of improvisation in HCI towards designing together with children and adults in online synchronous situations:

- *Reflexivity:* Engaging in synchronous online co-design is meant to invite further exploration of new ways to creatively work with children and adults together.
- *Transgression:* Not everything in synchronous online co-design is meant to be planned out. Instead, we invite researchers and designers to deliberately add unplanned elements of disruption into the situations.
- *Tension:* Synchronous online co-design is all about balancing opposing forces. It can embrace both the physical and online engagement, the fixed locations and changing settings, and the talkers and quieter personalities.

- *Listening:* Participants in synchronous online co-design listen together at all the things going on, including the changing situation, the context and technologies, and what happens between children-to-children, children-to-adults, and adults-to-adults.
- *Interdependence:* Interactions do not just happen between participants in synchronous online co-design, but between child-adults and technologies, the techniques, and the settings.

5.2 On Timing and Scalability of Improvisation

As prior literature suggests in improvisation theories [11,45,78], improvisation does not simply occur during an online co-design session but could be understood **before, during**, and **after** the session. Going online was unexpected for all of us, including adults and children. Before each session we had to brainstorm what techniques we could use and how they should be modified to a new design space. When we entered each session, there were unexpected factors such as the children's location and the technological infrastructure. During the session, we improvised how to react dynamically to these unexpected factors. Finally, improvisation in synchronous online co-design meant reflecting on and looking back closely at what we did, what shifted, and what decisions we made.

With respect to scalability, large efforts had to happen in our first meetings as we brainstormed how to go online. Small but more frequent moments of improvisation occurred when we managed micro moments, such as when we deviated from a session plan due to the interactions

that occurred during a session (e.g. a child being tired of raising colors for voting). In these situations, we had to do the macro-planning, which refers to coming into the situation with a general idea of what to do. We also had to do the micro-planning, that is, the frequent and smaller scale moment-to-moment shifts and decisions in response to dynamic changes of people, technology, and information.

Disorder does not simply lead to creativity; in disorder there is constant effort that needs to be followed by organizing, dis-organizing and reorganizing. Similar to our principles when working with children in physical settings, we were not looking for consensus. Rather, we see co-design with children as an active and constant iterative process. In this sense, our approach to designing with children is similar to Picasso's or other artists, in that it does not follow a linear progression. Rather, our interactions with children continuously change based on unknown technologies and contexts in an online space.

5.3 Ethical Consideration and Challenges

While an artist can, at some level, be creative to experiment and engage with the properties that emerge in the process of design, researchers working with children have limits and ethical responsibilities regarding children's wellbeing. Researchers must adhere to highest ethical standards for children, which could limit the level of spontaneity allowed. We extend the improvisation literature to consider the implications of doing improv with children by taking into consideration important ethical standards, such as technology policies (e.g., USA – The Children's Online Privacy Protection Act; Europe – General Data Protection Regulation). In

addition, future work may need to be intentional about children's screen time during online sessions, privacy issues of opening their homes to video cameras, and equity issues in technology and participation (e.g., how to include children with a certain level of Internet bandwidth for participation or different abilities in online spaces). We suggest three opportunities for future work:

- Screen time: Researchers might consider how their activities allow children to ensure their well-being (e.g., constant family check-ins, some physical movement for exercise).
- Privacy: Researchers might add a consideration of the necessary relationship building that needs to occur between researchers and families to understand and navigate privacy needs collaboratively.
- Technology and participation: Children with low-bandwidth were struggling with online technologies. We invite more researchers to brainstorm creative ways to co-design with lower-bandwidth and (a)synchronous hybrids.

When exploring new design techniques in an online space, or considering quick improvisation decisions that need to be made, we always adhered to online safety protocols such as limiting children's free exploration on the Internet. While we could have found new ways of interaction from purposely inviting unforeseen circumstances and uncertainty for discovery (through transgression), we also needed to be intentional and responsible for the outcome given our commitments to working with people from vulnerable populations.

5.4 Design Implications

In modifying the offline techniques for the online space, we learned that being dependent on mediating technology, such as the video chat and other tools, introduced more constraints. We also needed to understand how our participants would react to the changed mode of communication (i.e., using PowerPoint to draw and voting with colors and hands). There were multiple factors we considered when going online, including technical infrastructure and the mental model of understanding. Each technique we tried did not always accommodate each child's different needs, and possibly excluded some children during the session. While we acknowledge that there are difficulties in finding a perfect technique, we argue that there is a need of constant negotiation with the participants between the different tensions that arise during (and after) the session, as opposed to just going with the flow.

Among Kang et al's [78] five features of improvisation, interdependence highlights how improvisation is not a solo act; rather it is dependent on the 'others' activities and surrounding material environment. We build the concept of interdependence to an online environment. Through the analogy of a show, we argue that children were not merely the audience of the show that we strived to continue, but they were also **active actors** that altered the scene and directed how the session would go. Through the lens of improvisation, the different factors that emerged were not factors that solely adult facilitators troubleshot and intervened in. Conversely, these factors provided possibilities for children to showcase their capabilities (such as a child pressing mute when his mom had the dishwasher on or suggesting an adult prop their laptop to get a better camera angle) for the *show to go on.*

We believe our insights can help design practitioners prepare for improvisation. Practitioners need to know the larger systematic structures (e.g., infrastructures, contexts) and the potential interactions of people that govern how co-design sessions occur online before conducting sessions online. Our model provides 1) researchers/practitioners information about different factors, and 2) gives designers a lens to preemptively develop solutions (before), implement (during), and reflect (after) on the online co-design sessions. Moreover, our model creates generalizable knowledge for others to use in different contexts [114].

6. Limitation

We acknowledge that not all researchers have the infrastructure to do multiple co-design sessions as our team did. In many cases, researchers may only have one or two sessions with the families and children where it is difficult to deviate from the planned session. However, we argue that, in a synchronous session, regardless of how well and prepared the researcher is (such as sending prior surveys of understanding technological infrastructure), there are moments for improvisation. Yet, improvisation requires in-depth accumulated knowledge. Therefore, we encourage our framework and research to be used in adding more references to the unexpected (e.g., when a child joins a session from a moving car) to be ready for improvisation.

Importantly, we highlight that the children in this study already had an established rapport with the adults prior to us going online. In addition, multiple sessions afforded researchers extensive opportunities to understand each child's context. For instance, in the session where we asked children to find materials within their home, we knew each child's mobility needs and how they

would impact their participation. Not all researchers are able to build a rapport in a short period of time or meet as consistently with their co-design partners. In some cases, researchers will meet the children online for the first time, and continue to meet them online, without any prior interactions with them in an offline setting. In those cases, we suggest that these researchers intentionally focus on children's cues and constantly monitor how the child is feeling. As children interaction researchers, there may be moments where additional considerations should be made before experimenting with uncertainties in consideration of the ethics that are central to our approach.

7. Conclusion and Future Work

The COVID-19 pandemic has given us an opportunity to investigate doing co-design with children synchronously online. Beyond designing activities (the techniques), facilitators need a conceptual model to comprehensively think through creating a synchronous co-design session where each child feels like they are a part of the design team, regardless of the different contexts that influence the session. Our work provides a model of the different factors a researcher can take into consideration when moving co-design to an online space. Our model is built upon prior theories in improvisation, which concern a holistic view of the child, technology, and the technique.

As we move forward, and more research papers propose different software, different tools, and different plug-ins, we argue that our conceptual model processes center our users' interactions and moves beyond the dependence of technology. For instance, new ideas and theories about hybrid models of physically co-located children working in-tandem with children in synchronous

/ asynchronous online situations can lead to more ways to become more inclusive of children in co-design. These new ways of co-designing will also require conceptual models of improvising and co-design. Similarly, synchronous online co-design may become more prevalent in the PD context. This addresses the population of participants who cannot meet locally with designers but demonstrate a need for a sense of presence in the interaction. Such PD interactions could include chronically ill medical patients [23], teachers [17] senior citizens [12] people with accessibility issues [138], neurodiverse children [42,43], and other vulnerable stakeholders.

Ultimately, in our work, we care about creating a synchronous environment in which children feel like they are on the same playing fields as adults to create and design. We made modifications that always centered the experiences of the different children while enabling us to reach our design goals. We have noticed the value and possibilities of improvisation in our work, as there are more unexpected situations in the synchronous sessions, which required us to deviate from the plan. As opposed to perceiving the unexpected as something to be avoided, we have attempted to re-examine the nature of change and free space as a learning process for new inquiry to emerge.

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Positionality Statement

At the time I was conducting this research, I had around 6 years of experience of doing participatory design research with KidsTeam. I was also the teaching assistant for the "Participatory Design and Libraries" class for 4 years. Therefore, I had extensive knowledge of conducting participatory design in practice but also had a wide arrange of exposure to theories in participatory design such as about methods, techniques, and group dynamics. I also built many relationships from being the researcher in KidsTeam UW with both the academic and industry partners such as professors and students in University of Southern California and designer/engineers in Amazon. Therefore, when moving to the online space after the pandemic, there was trust built between the team of University of Washington of KidsTeam UW that my advisor Jason Yip led and outside partners of continuing. For every beginning year of the KidsTeam UW project, my advisor Jason Yip makes sure that we build a sense of teamwork among the group members. Therefore, over the summer the graduate students and children gather for a two-week program where we practice co-designing and do different activities such as playing video games, exploring design workshops, and doing a scavenger hunt in the university. I was the lead researcher in the 2019 summer where I participated in planning, leading, and collecting data of the session. Except for one child, the children for the KidsTeam Online study were all members I have interacted with before in person. Therefore, I believe that

the prior relationships I was able to build between the children may have influenced the way the sessions were being conducted but also may have influenced the answers they were providing in the interview data. For instance, they may have been more forgiving despite all the confusions that may have occurred as we were figuring out how to conduct online co-design sessions. However, the prior relationship may have also fostered a space for them to be more honest of how they were feeling as well. My background as a library and information science major and a qualitative researcher has also pushed me to explore ways of how the findings I learn can be utilized to people who may have less technical knowledge. Therefore, in order to co-design with children online, I was looking for sources where it did not require learning new knowledge but was aiming to work with existing knowledge.

Chapter 6 (Study 3)_Conducting participatory design with a focus on cultural awareness

Abstract

Participatory Design (PD) is a method commonly used in Western cultures with roots in Scandinavia. Post-Covid, many PD practitioners have transitioned to the online space, which has allowed researchers and participants from different geographical locations to co-design together. Yet, we still do not understand the ways that different cultures collide, mix and blend. By understanding how one's culture influences the participation of a child, researchers can better structure sessions for diverse input. This study examines a case study of researchers who study in the US but speak Korean and children from a Korean welfare center co-design together. A close analysis of video recordings, analytic memos, and parent/child interview data demonstrates the ways in which children participated in the design sessions. The sessions strived to build equal partnerships, therefore the facilitators (students from the US) paid special attention to various cultural sensitivities. Applying the cultural awareness theory from public health literature and using Bronfrebrenner's Ecological system theory, we offer implications on how scholars who are not fully embedded in one's culture make sense of different cultural norms and how, as facilitators, we can create a space in co-design space despite different cultural norms. Our findings show how different parts of the ecological systems from ideology, education systems, and ethnicity all influence the child's involvement in the session. We also add our discussion on

the new era of how cultures are not static but often shift due to the Internet era and how participatory design created a third space.

Introduction

Participatory design is a design method and a philosophy. It aims to directly invite the end user to the process of design and have agency over the product, which opens up space for them to shape the future of technology. Prior work indicates that codesigning with end-users leads to the creation of intuitive and accessible technology. Therefore, in the field of human-computer interaction (HCI) the method of participatory design has become a common practice among researchers. PD scholars have long strived to understand new methods and techniques to communicate with users, while taking into consideration the different demographic groups (elders [12], animals [155], neurodiverse children [42,107]) and environments where PD is conducted (schools [29], [126], refugee camps [1], libraries [167], and community centers [165].

The PD method stems from the Scandinavian approach of including union workers in the process of design in order to gain agency. PD originated in the 1970s when Scandanavian workers faced threats of being replaced by new technologies [84]. Over the years, PD has evolved and adapted to working with children as design partners [51,166]. Many early papers regarding PD with children share insights on what children have to offer for the design process, such as how the information they provide informs the design of future technologies (e.g. IDCL library [128], Nick.com ‘Do not touch button’, Nature Collection[81] and Creepy technology [169]. In recent

years, scholars have begun to further investigate how, as a method, PD can better involve different end-users in order to foster diversity and empowerment [30,82].

While PD methods of working with children evolved, oftentimes the work and findings are based on Western societies where there is a more balanced relationship between adults and children [39,51,149,170]. It is equally important for the research community to also understand how PD methods can be applied and refined in non-Western cultures, where there exist unique social relationships between children and adults. Hussain et al.'s [67] study in Cambodia highlights the challenges of conducting PD in a Southeast Asian culture where relationships between children and adults are more stratified. In their research, they found that children in Southeast Asian cultures take on more of a listener role in design partnerships. We build on Hussain's work by asking how we can build PD environments where children feel more comfortable providing their ideas in these cultural contexts. Additionally, we explore certain reasons why some children may be accustomed to listening, rather than talking and sharing out ideas. Similarly, Moraveji et al. [115] had similar concerns when working with children from a Chinese cultural background as they were accustomed to the memorization of knowledge rather than brainstorming techniques. Moraviji et al. [115] introduced a new technique of Comicboarding, which utilizes known plot formats, interaction styles, and characters in comics, to make it easier for the children to brainstorm ideas. From the above literature we conclude that, by being attentive to cultural differences, new techniques and strategies need to be developed to cultivate global perspectives and therefore, expand the reach of PD methods and research. The online space opens more

opportunities to design with a larger demographic group that represents different cultural backgrounds.

In this paper, we explore the challenges, opportunities, and compromises we make in conducting a participatory design session with children at a welfare center in South Korea. As a case study, we will first introduce the current Korean cultural landscape by highlighting the historical belief systems that influence the Korean language, history, and the education system. In addition, we will document the process of setting up a PD team with children and adults in South Korea and the resulting challenges and opportunities that arise. The few PD-focused studies conducted in South Korea utilize PD as a method to design new technology. These studies discuss the opportunities that PD provides children to discuss sensitive topics like sexual awareness education [99] and how it provides opportunities for participants to feel empowered and to gain agency [145]. Prior literature situated in Asian cultures (Cambodia [65], Korea [145] and Japan [121]) call for more PD studies that take place in cultures where social norms exemplify a top-down structure. Furthermore, in recent years, there has also been interest in collaboration, designing thinking, and creativity in Asian countries [89,101,146]. These ideals align with the ethos of PD.

In 2020, while many of us were forced to move online and limited to virtual social engagements, the online space has helped us to overcome the geographical barriers that limit who we can design with. Lee et al. (2021) investigated the considerations that researchers need to take when co-designing with children in synchronous online space. Building upon the conceptual model of

synchronous online co-design with children, in this study, we will understand what it means to be culturally diverse in the online space in our approach [100].

Research Questions

- What are the challenges and opportunities through participatory design with children in Korea?
- How do we integrate design with children in a Korean culture and education system?
- What is the improvisation that needs to happen in doing co-design with children online in Korea?
- What consideration should researchers take in being more culturally aware in doing PD in Korea with children?

In order to examine the challenges and opportunities in conducting PD with children in Korea, we did a case study wherein Korean graduate students studying in the United States conducted participatory design sessions with Korean children at a welfare center. We focused on the process of developing, implementing, and conducting co-design workshops with children. We documented conversations with administrators, video-recorded all 6 co-design sessions (a total of approximately 540 minutes), and interviewed children and parents involved in the co-design sessions in order to understand their experiences. All collected data was open coded through first (using inductive reasoning) and went through multiple rounds of deductive coding based on theoretical frameworks from the following areas: 1) cultural sensitivity in public health literature 2) the improvisation model of co-designing with children in a synchronous online space and 3)

Bronfrennbrenner's ecological system in understanding the child's world. By analyzing the data collected, our goal in this study was to understand how, as PD researchers, we confronted the challenges, noticed the opportunities and made compromises to the sessions to meet cultural values and tensions.

Based on our findings of how we design with children embedded in unique cultures and education systems, we make the following contributions: First, we share how the mainstream PD values align, and do not align, with Korean culture**.** Second, we provide insights from interdisciplinary theories of improvisation to the considerations of designing with children from various cultures in an online space. Lasty, we use theories from public health on cultural sensitivity to explore what it means to be culturally inclusive

Related Work

In the following sections, we will discuss three main bodies of work. In the first section, **2.1 Participatory Design with Children**, we discuss the literature about 2.1.1 child and adult relationships. In the sub sections, we will further discuss papers about 2.1.2 moving to the online space and share the Improv theory which states about the consideration of co-designing with children in a synchronous online space. Next, we discuss 2.1.3 PD with Children outside of non-Western countries with different cultural backgrounds. Afterward, we will provide **2.2 the context of Korea** and our **2.3 theoretical lens**.

2. 1 Participatory Design with Children

2.1.1 Child and Adult Relationship

Participatory design researchers who design with children often have a shared belief that, through creating more inclusive methods and techniques, we are able to involve the perspectives of children [42,51,60,71,168]. Therefore, PD researchers have explored many different areas to examine processes of working with children. For instance, PD researchers have investigated group dynamics, as well as group tensions and challenges [61,148]. Other researchers have created new techniques to communicate with children, such as layered elaboration [149], line judging [153] and Mission to Mars [29]. Yet, the extent of how much we involve children in the design process has differed [32,95,97]. For instance, in Druin's Cooperative Inquiry, children who are 7 to 11 years old are perceived as full equal design partners, where the children are co-designers throughout all stages of the design process. In this method, PD researchers work with a limited number of children for a long period of time (from 1 to 5 years) [11]. In other PD methods with children, the emphasis is on incorporating more voices in the process. Therefore, this often results in projects that involve working with many children within a short period of time [108]. In this study, we use the method of Cooperative Inquiry, which involves working with a small group of children over a longer period of time, to understand the process of becoming design partners within a PD project [52]. Druin [32] states how no children or adults are design partners from day one. Rather states there is a need to practice and understand different ways of communicating with each other.

The partnership between adults and children with different stakeholders is of interest to many PD researchers [42,61,170]. This is because the role of the adult researcher often strives to break traditional power dynamics, such as the adult being the expert. Yip et al. [98] further investigated what it means to be equal design partners by unpacking the definition into 4 dimensions: relationship building, facilitation, design by doing, and idea elaboration. The framework (in figure 1) shows how the relationship is dynamic, as opposed to being static. Yet, many of the studies that explore equal partner relationships are situated in Western countries, where there are relatively more democratic relationships between children and adults [42,61,170].

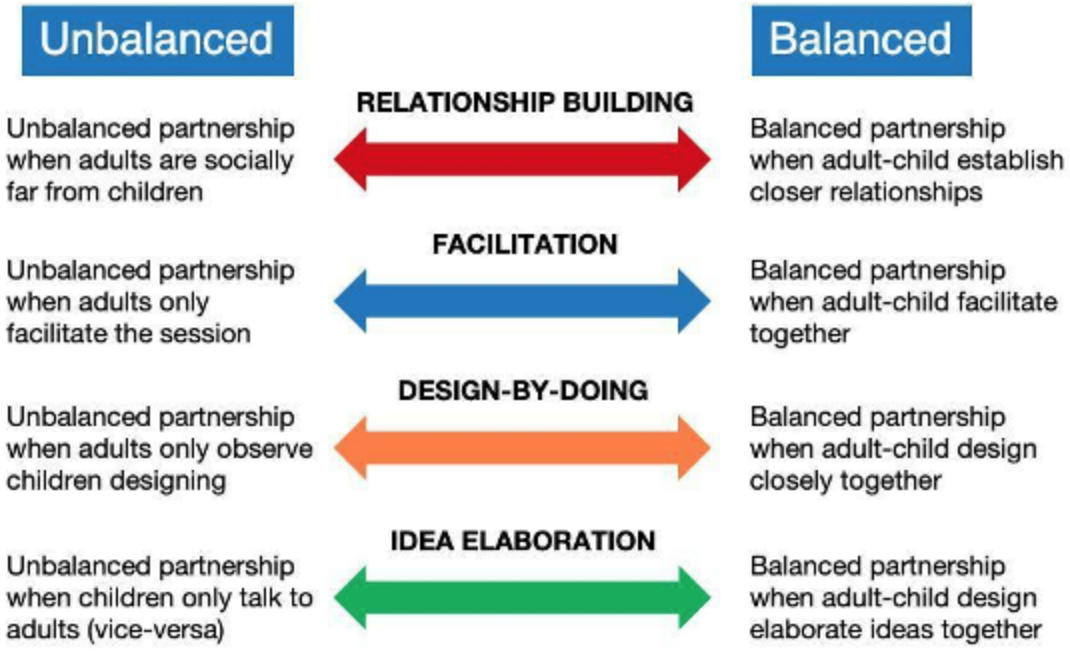

Figure 9: Four dimensions of equal and equitable design partnerships (Yip et al., 2017)

The few studies that have explored PD with children in non-Western countries note how the relationships of adults and children differ from Western countries [66,99,145,163]. In these

studies, children often take on the role of the listener, and the adult takes on roles with more authority. In this work, we further investigate adult and child relationships where there are more unbalanced interactions. An unbalanced relationship means a child or an adult is solely working on their own as opposed to collaborating. While Yip et al.'s model informs us as to what constitutes equal partnership, we do not yet understand how such themes are interrelated, or how the model changes when working with children from different cultures with different norms and different languages.

2.1.2 Moving to the Online Space

The co-design sessions with Korean children occured in the online space. There are practical reasons that the sessions will occur in the online space, such as social distancing. However, when we consider the future of designing with diverse groups of children globally, the online space is free from geographical barriers [47,49,151]. Designing in the online space also saves the time and energy of having to meet in a colocated space [106]. While there is research on co-designing with children in the online space, many studies have been conducted asynchronously (occurring at different times) to hybrid models [48,49,151]. Yet, for the age group of children ages 7 to 11, synchronous (in-the-moment) sessions allow adults to facilitate and provide support that the young children need, especially as there are more difficulties in asynchronous and hybrid models such as sending reminders [100]. In addition, HCI studies have shown the role of video-chat in building and maintaining relationships, and as a substitution for in-person communication [16,116].

We use the Improv model, which is a framework that outlines the considerations that need to occur when co-designing with children in a synchronous online space. Lee et al. [100], noticed that there was a need for more improvising in online synchronous sessions. As sessions were not pre-recorded but live, the researchers stated about dealing with many spontaneous occurrences. In the online synchronous space, facilitators did not have control over where and how the children were joining the sessions, therefore they needed to improvise. In figure 2, the conceptual model shown is called Improv. The three themes of Improv are: 1) Project Logistics of understanding the methods of what and how interactions can occur for designing online 2) People and Setting of understanding that in a synchronous online space, children can join from multiple location that changes the surrounding of people and 3) People's Online Interaction of being attentive that children have the autonomy of engaging or disengaging in sessions based on interest and motivation. When analyzing the data collected we were attentive to this improvisational framework, and took notes of any additional considerations that took place or belonged within the Improv framework of co-designing with children online.

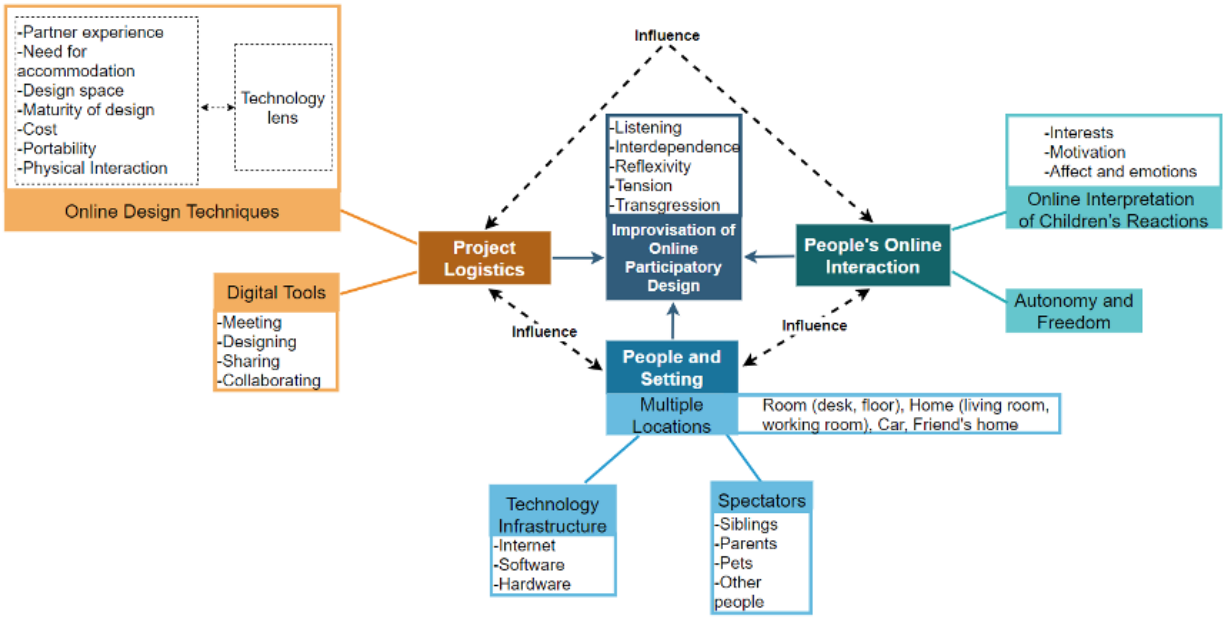

Figure 10: A conceptual model of conducting synchronous online participatory design with children.

In the case study of co-designing with children in Korea, we used the Zoom platform. Based on Korea's high level of Internet connectivity, children and their parents may have different usage of the computer. Korean children, compared to many other countries, own digital devices at a very young age [159]. We do not yet know how such cultural contexts specifically that of high internet usage, influence co-design. By understanding how such context influences this co-design environment, PD researchers can expect similar interactions as more children are connected to the Internet.

2.1.3 PD with children in Non-Western Countries.

Even though PD originated in Scandinavian countries, many cultures from all over the world have utilized the method (such as in South Africa [158], Indonesia[94], Korea [99,145], Taiwan [64], and Japan [163]. As the concept is loosely defined, there exist differing understandings of how and in what ways people participate in PD. The studies that explore PD in non-Western countries state how these cultures are different from the Scandinavian culture, which has a more horizontal relationship among people. In a Japanese study, Yasuoka et al. [163] discuss the ideal condition for PD to occur. The authors conduct a case study of PD where participants work together to address the aftermath of a disastrous tsunami. The study concludes that the Scandinavian context of participation is different from Japanese social value systems. The study shows how the characteristics seen in PD cases in Western societies notes that there are three underlying assumptions of PD: 1) equality 2) open discussion and 3) commitments for participation, which can be difficult in a Japanese culture. The article discusses how, despite Japan's movement for restructuring itself toward a horizontally structured society as opposed to a hierarchical society, it differs from Scandinavia where open discussion is more generally accepted [163]. The study also states how, in unique cases, PD could still work as a framework within co-design with differing groups of people. The article showed how, in extreme cases such as natural disasters, PD unites people to rethink social values and have open perspectives. In this study, we will examine what modifications we can make to the sessions while understanding the cultural values to create a more equitable environment.

PD scholars have noted that when design partners from different socio-cultural value systems come together, participants encounter difficulties [158]. Moreover, it is important to be attentive to these issues. As there are more international design teams across the world, there are more opportunities for different cultures to come together. In this case, the implicit and explicit rules that are obvious to the local people are not always obvious to the community outsiders. For instance, in the Cambodia study, foreign designers had to become accustomed to both implicit and explicit rules that they had not previously encountered, such as the religious beliefs of Buddhism and its culture [65]. In the study, the author notes how, in Buddhism, people are expected to show gratitude. In addition, criticizing others in public is considered rude. As a result, the Cambodian participants were not accustomed to criticizing others' ideas in public. To adapt to Cambodian culture, the PD scholars modified their methods and conducted one-to-one feedback sessions so that the Cambodian participants felt comfortable sharing ideas.

Jang [74] discusses cultural sensitivity through the two concepts of "adapting" and "translating". Adapting is accepting and empathizing the host culture's implicit rules as they are, whereas Translating refers to strictly applying one's own cultural norms to judge others' performance. The authors' decision to implement one-on-one feedback sessions in the Cambodian study is an example of adapting. This is similar to the Moraveji et al. (2007) study, where scholars created new methods to help Chinese children brainstorm new ideas, as the mainstream pedagogical method did not require children to do much brainstorming activities [115]. In another study in South Africa [158], where researchers designed with children, the authors noticed that "participation" was already a core value of the community. Leadership roles were also more fluid

and often shifted. Therefore, rather than having the researchers lead the session, they were considered as having "participated" in the session. In this cultural context, children did not need to be led by the researchers. Furthermore, the results of the South African study differ from the Chinese children's design case study [115].

From these studies discussed above, we learn how the PD sessions of each cultural community differ. In other words, the ways that researchers facilitated, the design methods and techniques researchers implemented, and the time participants required to feel comfortable sharing ideas were constantly changing as a result of cultural context. Scholars acknowledge the difficulties of understanding the subtle nuances of different cultures, and call for more studies where these differences are exemplified. This calls for a more conceptual process of how certain decisions are made in shifting environments, and how these decisions influence the goal of the design session. Therefore, in our study, we aimed to elicit the process of how different values collide and the tradeoffs that are made based on how the design sessions are structured for creativity and collaboration.

2.2 The context of Korea as a Case Study

In this section, we will give cultural and historical context about Korea, outline the reasons why we have selected this country as a primary research setting, and explain how our findings will add to the existing scholarly conversation on PD and cross-cultural design more broadly.

In macro cultural psychology, studies recognize that every individual is unique and is a cultural player. These studies discuss how individuals participate in overarching social norms, concepts and artifacts [7]. Scholars in cultural psychology believe that, in order to understand human behavior, we must understand the nature of psychological phenomena that make humans susceptible to cultural influence [147]. Cultural scholars state the need to discuss multiple factors that can influence behaviour. In this section, we share the current literature on Korea's social norms and education system, which may influence a child's behavior in this study. Piaget (1932) stated the following in the *Moral Judgment of the Child*: *in localized, small societies, each social unit is a closed system; therefore individuals tend to behave homogeneously . However, division of labor or, in today's terms, globalization, gives rise to individualism and to the formation of personalities in the true sense* [124]. Following what Piaget stated, we believe that the children we co-design with (ages 7-11) will all have unique individual personalities, but are also cultural players of Korean society. As they engage in co-design sessions, children's beliefs on co-designing with adults may or may not change based on how we design the session. To give a holistic view of the world that children in Korea are embedded in, we will discuss two concepts: 1) Education system- the public school system many children in Korea attend and 2) Internet connectivity- the country's high connectivity to the Internet.

2.2.1 The Education System: Extreme Competitiveness

In Korean society, children are accustomed to standardized testing for educational assessment. Therefore, administrators and teachers emphasize rote learning and memorization, which is a mechanical way of memorizing facts to find correct answers with very few independent thought

processes or meanings [87] In East Asian cultures, including Korea, there is also an emphasis on building a strong work ethic and devoting oneself to learning. Hard work, effort, diligence, endurance, perseverance, and persistence are all common virtues that are emphasized by teachers and parents alike to their children [87]. However, cultural studies have shown that while such collectivistic norms, like that of hard work, can be crucial for economic success, studies have also shown that this work ethic also functions as a stressor that makes it difficult to maintain a healthy family life [86]. Even though the Korean national education reform committee has had interest in finding ways of maximizing creative people in the academic community, prior research states it has left much to be desired [18]. In this study, we were co-designing with children who were embedded in the current education system. Therefore, we were attentive to what tensions and opportunities emerged between learning content knowledge to playing and exploring different approaches when co-designing.

2.2.2. South Korea at the Forefront of High-Speed Internet

In this section, we discuss our reasonings for conducting synchronous online sessions in South Korea. In previous sections, we used the term Korea. But for this section, we will be specifically referring to it as South Korea. South Korea is one of the most wired countries in the world. In the mid 1990s, the government had projects to build an information ‘superhighway’ to enable high-speed Internet service [98]. As a result of these early efforts, South Korea is ranked as the most Internet-wired country in the world, and it has the highest subscription rates for high-speed Internet in the world according to Organization for Economic Cooperation and Development

(OECD) statistics (OECD, 2020) . Reports also add that the broadband coverage is above 98% in both urban and rural areas. From the overall high information infrastructure, children are also connected to the Internet for their education and for leisure activities, such as playing esports or going to PC bangs (Internet cafes) [141].

High-speed Internet has also influenced the nation's e-learning environment. In Korea, there are more than 500+ e-learning companies that provide various forms of education to prepare children for exams [85]. We acknowledge that not all countries have the same infrastructure as in South Korea. However, recently published articles have stated how, globally, more people are moving to the online space and working from home [80]. As the Internet is now considered a core pillar of the modern information society, we have seen more countries experiencing a significant increase in the number of Internet users [38]. According to the World Economic Forum, based on the growth rate of Internet users, the disparities of Internet Connectivity are expected to close. Therefore, we hypothesize that South Korea's ideal situation, with many people having high-speed Internet connections, could be a reality for other countries that are also building networked communities through the Internet. Therefore, the findings of co-designing with children who were already avid users of the Internet gives indications for designing with other children in the future who are likely to become active users of the Internet as well.

2.3. The theoretical lens for Culture Study

In this section, we will discuss how we used theories of design and cultural awareness from public health science.

Cultural Sensitivity

The theoretical lens we used in analyzing the data is from the literature on Cultural Sensitivity [41,127]. In the field of public health, researchers have discussed defining and building a framework for developing culturally sensitive practitioners. Cultural Sensitivity is conceptualized by two dimensions, which are 1) Surface Structure and 2) Deep Structure. Surface Structure consists of practitioners making interventions to observable characteristics of a target population. For instance, it involves showing materials that include the people, places and languages target populations are accustomed to using. Surface structure also includes understanding what settings and communication styles are preferred for the program. The process is often achieved while working with ethnically matched staff members for recruitment and evaluation of a program.

The focus of this study will not only include identifying how the group of Korean children design, it will also consider how the group is similar to children from many different parts of the world. Similarities and differences will be identified by PD researchers who have worked with one group of children in the United States. In the field of participatory design, while there are studies that involve designing with multicultural ethnic groups, we have yet to create new methods and techniques that will enable practitioners to tailor the design process to be more culturally aware. By being culturally sensitive practitioners in participatory design, we are able to advocate for more inclusion. Below we define the key terms that will be used in this study, which are based on public health literature.

Cultural Sensitivity- When cultural characteristics, experiences, norms and values, and relevant historical and social forces are incorporated in design and the delivery of a program [127].

Multicultural- Practitioners' appreciating perspectives of multiple ethic groups, without the assumptions of superiority or inferiority [127].

Cultural Tailoring- The process of creating culturally sensitive interventions by adopting existing materials from ethnic populations [122].

Culturally Based- A program that combines culture and core values as a medium to motivate behavioral change. The literature states how culturally based interventions can be potentially effective, but they also have the potential to be culturally insensitive [127].

Overall, we used these terms to guide our analysis in order to create a space for diversity. Sue et al. [144] states how being 'culturally diverse' encompasses a multitude of perspectives from various communities and cultures. It differs from the culturally deficient model of pointing out the inferiority of one group. Through globalization, boundaries have collapsed and the technologies we design are used by children all over the world. Therefore, by understanding how different cultural beliefs collide, blend, and co-exist, we will be able to engage a diverse group of children in future design endeavors

Methods

Context

The project was initiated by the first author of this paper from [UW-blinded for review] that partnered with the local welfare center in South Korea. Welfare centers in South Korea play an important role in their local community by providing child-care services and educational programs in subject matters that are usually not taught in school such as topics in finance, health and the environment.

In 2021, due to the ongoing pandemic, the welfare center was short in staff and in online programs. Therefore, the welfare center partnered with the first author who had done multiple co-design sessions online and planned a series of workshops to co-design social robots. The welfare center administrator was new to the concept of co-design but was open to the idea of creating a space for the children to co-design social robots with the students in [binded for review]. The goal of the design sessions was to gain insights of what new programs the welfare center can offer in the future to youth.

Participants

Below we provide a table of adults from University of Washington in the US with their experience of co-designing with children. All students were mentored by the same professor in University of Washington on how to be design partners using the method of cooperative inquiry [52]. The students were a mix of undergraduate, master's, and PhD students.

Table 7: Adults participants in the co-design program

Name (Pseudonym)	Gender	Years of co-design	Experience designing online or in-person
KJ	Female	6 years	Both
Minhyung	Male	2 years	In-person
Johnny	Male	2 years	Online
Sungmin	Female	3 years	In-person
Colleen	Female	3 years	In-person
Youjin	Female	6 months	Online
Haley	Female	1 year	Online

In the next table, we share the information about our child partners who participated in the co-design sessions. We also add the information of attendance. To recruit children, flyers were co-created with the facilitator in KidsTeam and the administrator of the welfare center.

Table 8: Children participants and attendance in the co-design program

Name (Pseudonym)	Age	Gender	Number of Session Attended					
JooHyun	10	Boy	o	o	o	o	o	o
Shihoon	11	Boy	o	o	o	x	x	x
Soyoung	7	Girl	o	o	o	o	o	o
Siyeon	8	Girl	o	o	o	o	o	o
Soogyeom	8	Boy	o	o	o	x	o	o
SungWon	8	Boy	o	o	o	o	o	o
DongYool	8	Boy	o	o	o	o	o	o
GyuBeen	9	Boy	o	o	o	o	x	o
Jaehoon	7	Boy	o	o	o	o	o	o
JaeYool	7	Boy	o	o	o	o	o	o

Design Sessions

We had a total of 6 co-design sessions from April to May 2021. All the design sessions were online via Zoom. Co-design sessions were designed as an hour session. Children were sent arts and craft materials in a small box to be used for design prior to the study. Each co-design session

started with the question of the day and a design activity. For the design activities all the participants were divided into 2 or 3 groups. Each group consisted of 4 to 5 people (2 adults and 3 kids), but the number of children and adults depended on the attendance. During the design-time (about 40 minutes), each group did a design activity in the breakout room. To close, we came back to the main room and had a discussion-time for about 15 minutes. The facilitator led a discussion with all the groups to share what each group did during the design-time and how the activity was. The information of weekly topics, activities, and used tools are described in Table 9 below.

Table 9 Information about the co-design sessions.

Week	Topic (Design Prompt)	Goal of the session	Technique used
Week 1	Introduction of KidsTeam and Building relationship	Relationship building and identifying what 'help' and 'support' looks like to the children	Would you rather. [136]
Week 2	What is a robot?	Co-designing a robot that can help other people (Power circuits)	Bags of Stuff [154] (Prototyping) We gave children electronic power circuits and arts and craft material to design with.
Week 3	Identifying and solving problems	Co-designing a robot that can solve the identified problems (Drawing)	Big Paper [34]
Week 4	What will the future world look like?	Co-designing an electric car (Robot kits)	Bags of Stuff [154] (Prototyping) We sent children a battery charged motor kit to use them in their design.
Week 5	What is your favorite subject in school?	Co-designing a robot that can teach your favorite subject to other people or teach you what you want to learn (Online Big paper?)	Big Paper [34]

Week 6	Final Party and Wrap-up	Playing diverse games	No technique was used but we had a compilation of games and spaces for the children to connect with the adults such as Slither.io and breakout for drawing and chatting.

Data Collection

We collected data by recording online Zoom co-design sessions, writing analytic memos, and conducting interviews. After each co-design session, student participants added analytic memos about what they observed. Memos included details about how co-design sessions went and what was interesting. All the analytic memos were added within three days after each co-design session.

We also conducted semi-structured interviews with the children and parents after the end of the six co-design sessions. The interviews aimed to understand the experiences of being a part of the co-design session with adults. Interview questionnaires for the children had two parts – 'Children's personality and environment' which asked questions about the school education, family dynamic, about how much they expressed oneself, and about online connectivity, and creativity. For the second part of the question, we asked the questions about the experience of KidsTeam such as about their perception of interaction with other adults, parent's involvement within the session, and the relationship with other children. Interview questionnaires of parents were designed based on three points – 'KidsTeam' (Knowledge of KidsTeam and Modification of KidsTeam), 'Personality of their child', and 'Educational environment of their child'. The

interviews lasted for approximately an hour, and the participants received compensation of a 30 gift card to a bookstore. The interviews were recorded and transcribed in Korean.

Data Analysis

All researchers in this study first focused on getting familiar with facilitating co-design sessions. Each researcher was assigned to one co-design session and annotated the entire session in Korean. Each video had at least three viewers. The first viewer took the first round of watching and annotating the interactions that were occurring in the video. The second viewer watched the exact same video and filled in missing interactions and conversations that the first viewer did not write in the color of blue. Lastly, the third viewer watched the entire session while comparing it to the annotations. For interview data, we had at least two researchers transcribe the one parent and child interview. For all interviews, transcribed video data, and analytic memos there were two researchers who did open coding for one set of data. What we mean by one set is for video data it would be one session and for interviews it would be days of parent and child interview.

The seven authors of the paper met weekly for a total of 16 weeks. During the weekly meeting, the researchers shared what they noticed in the interview, analytic memo and video data. We then generated a codebook based on the video and interview annotations, and analytic memos. We focused on figuring out quotes considered significant enough to be analyzed from the annotations and analytic memos, and we began to develop themes for open coding with the quotes. After iterating processes for developing themes, we generated an initial codebook that had 8 codes. Once an initial codebook was created, each student participant did an open coding.

Each student participant was responsible for coding two video files that they did not annotate, two analytic memos, and one interview dataset. While coding the data, we had iterative processes for supplementing and refining our codes by sorting and comparing themes and codes. We share our codebook in the findings section.

Findings

This paper is an extension of prior theories on improvisation and of the considerations of conducting participatory design online with children. We use theories of cultural sensitivity to examine how we design with non-Western cultures. The cultural landscape of this paper includes the geographical location of Korea and Korean culture and the U.S culture of co-design. While we acknowledge that there are multiple definitions of how we define culture in this sense we will use shared culture based on nationality

We identified three main themes of co-designing with children in Korea with a focus on cultural awareness. We had a total of eight codes that our coders notified “interesting” in the session. What we identified as “interesting” was moments where we perceived interactions or behaviors that were different from what we usually saw when we were designing with the children in the US. We share the initial codebook in table 10. Based on the improv. theory we collapsed and prioritized codes that would directly fit the Improv model. We introduce the extension of the new theme in the order of the Improv model.

Our findings also show how different parts of the ecological systems from ideology, education systems, and internet infrastructure influenced the child's involvement in the co-design session. For each section, we use two theoretical frameworks. First, we used the improv framework, which states what researchers should consider when co-designing with children online. After we share our findings, we then reflect on the session using literature in cultural sensitivity to provide how practitioners can be culturally inclusive. We also add our challenges, opportunities, and modifications we made for each session throughout.

Table 10 Initial Codebook

Code	**Description**	**Example**
Digital literacy and Internet	This code is about instances or quotes relevant to children and adult's competency of navigating the Internet or comfortableness of being on the Internet	Hayley asked *"how did you know about Hydrogen cars"* and Doyool replied that he searched on the Internet. (Video Transcript_Session 4)
Perception on Education	This code is about quotes and descriptions on perception of education / current practices on public and private education	*Many teachers in public school assume that the children already learnt class materials prior to coming to class. So they don't cover the materials fully* (Parent Interview)
Showing and Telling	This is the behavior of children showing or sharing what they possess to the group	*The children start bringing the robots they have at home in front of the camera and share the brand or price of it. Some of the children are sharing the number of how many robot they possess* (Analytic Memo_Session 2)
Recognition	This code shows how children enjoyed or shared with their parents about being recognized and appraised by the teacher	*Gyubin states to his mom "Mom, I got a question right that middle school kids only know!"* (Video Transcripts_Session 2)

	(facilitator) in the group.	
Politeness / Permission	This code is instances when the child asks permission to the adult or ways the child shows courtesy and politeness to the group.	*Toward the end of the first session all the children bowed to the teachers on the camera stating "Goodbye, teachers" I think they still see us as teachers.* (Analytic Memo_Session 1)
Parent's Involvement	This code is instances where there is a parent's involvement in the session.	*A mom calls the child and we can hear her asking whether he has logged on to KidsTeam.* (Video Transcript_ Session3)
Sense of belongingness	This code is an instance where there is mention about geographical locations of where the child is situated and hangs out.	*I usually hang out with my apartment playground friends* (Child Interview)
Awareness of different countries.	This code is instances or quotes on awareness of other countries.	*Johnny states that Baskin Robin is not that popular in the U.S and Joohyun ask if is because U.S like meat* (Video Transcripts_Session 6)

1) **Project Logistics and Education System.**

Based on the project logistics theme, as a participatory design-focused facilitator it is important to plan out what is going to happen within the session and how we will communicate the topic with the children. **The authors' understanding of an ideal session** was that we would share open-ended questions to the children and the children brainstorm with the adults and interpret the questions based on their prior knowledge and understanding of the world. The goal of every session is to learn about each other's thoughts about a problem and build upon them in order to

create a solution. Our researcher in the team anticipated having random ideas that would flow in from the discussions.

What did we observe and learn:

In session 1, we tried to identify what social matters children cared about. The facilitator asked the question “If we are creating a social robot that helps other children, what would that robot be helping about?”. In order to discuss this matter, the main facilitator gathered a list of questions the children and adults would discuss together. The technique used for this session was similar to Would You Rather, where we provide children with options to choose from and as a group they would discuss the underlying reasons of why they chose that answer. For instance, in the session we had questions about asking “Since we are creating social robots that help other children, how do you receive help” The choice we have to the children was as follows: 1) your friends 2) your family or 3) a search engine Naver (similar to Google). We also had questions asking “Among different issues what matters to you most?” The choices we had for the children were the following: 1)The environment 2) School grades 3) Being Healthy 4) Being Happy 5) Coronavirus. The goal of the first session was to build relationships but also discuss in groups of sharing ideas and thoughts about sketching what help looked like. Many of the co-design sessions were designed which asked the children their thoughts of how they were perceiving the

problem and how they would design together for a solution.

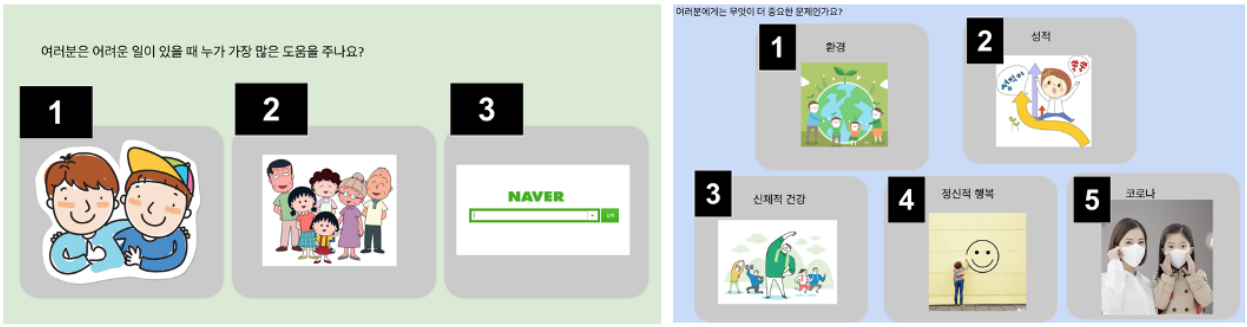

Figure 11 An image of the prompts we shared to the children

After the end of the total of six sessions, we asked the parents how they would modify the design sessions. The majority of the parents stated they wanted to receive the questions beforehand. The reasoning was for the child to practice with the parent to formulate a 'better' answer. This was different from the parents we had worked with in the US. However, as some of the researchers in the team had an understanding of "prior learning," we asked parents to elaborate on this answer. **Prior learning** is a common concept used among caregivers in East Asian countries where you learn class materials in advance. The definition of prior learning is different from the one used in the field of education where it means it engages issues about the relations between learning and experiences.

Every discussion in the interview data ended up questioning the parents' perception of prior learning. For instance, Gyubin's mother stated that "*Many teachers in public school assume that the children already learnt class materials prior to coming to class. So they don't cover the materials fully".* Shihoon's mother stated *"All the other children are doing it [prior learning], it is natural to learn beforehand the class materials."* Therefore, if the child does not go to class without any knowledge,

they often fail to follow class. Our researchers reflected on how it seemed that the parents were afraid that their child would not keep up with other children. We also noticed there was a lack of trust in public education. “I feel the school is not fully covering the class materials". The education system we learnt through our interviews and conversations with the welfare center administrators led us to believe that parents were not comfortable with the inability to predict the questions beforehand because they preferred to be prepared.

We also noticed high demands for content knowledge in the session. Content knowledge such as facts about learning what a robot is, what power is as opposed to discussing random open ended questions. This was evident even before the actual session when the facilitator was creating flyers for the program. The welfare manager stated how in the flyers there need to be a statement of exact outcomes from participating in the program. If not, she stated how the mother would not be interested in applying. Therefore, at first we had a draft that stated we were looking for children to co-design with us. However, we added in the flyers that from this program how creativity and critical thinking skills will be raised for modifications. We also had many questions asked from the mothers of the types of new knowledge the children were gaining from the sessions.

The Modifications we made: In the flyers, we stated the direct outcomes of the program stating how it would 1) raise a child’s interest and understanding of science and technology 2) train the thinking process and skills to finding solutions to everyday problems and 3)lastly raise one’s

confidence by learning how to express oneself. The administrator also insisted on using arrows to show about the raise.

To meet the demand of learning new content knowledge, we added slides to share some scientific facts and math materials prior to the session and had mini true or false quizzes. In session 2, the children were going to design a transportation system. Therefore, prior to the session, the adult facilitator added a slide discussing power, work and time. Within the session the adult facilitator briefly stated the formula of power and gave examples. The adult facilitator also added a comment stating "This is what middle school kids learn!" to the children who were 7 to 11 years old. Afterward, the adult facilitator gave a mini true or false quiz to the children stating that we are not here to test but this is just for fun. One of the children Gyubin got the answer right and with excitement stated to his mom next to hom "Mom, I got a question right that middle kids learn".

Additionally, the education system in Korea did not only influence the expectation of the session, it also influenced who was able to join the program in the first place. We noticed from attendance that after the first three sessions, Shihoon no longer came to the session. Luckily, we were able to interview both the child and the parent. Shihoon stated how he wanted to come to KidsTeam but his mom forced him to go to math hakwon [a private institution] instead. When we interviewed the mom and asked her thoughts about the co-design program she replied stating "For Korea's education reality you can't survive the competition with the things you learn in KidsTeam. You need the actual scores. It is not important that you are able to solve the problems. In Korea you

actually need to show that you got the full 100 points in an exam. In elementary, they got rid of some tests, but still in middle and high school the score is important and that means a lot of memorization". Correspondingly, in another interview, Joohyun, who was the same age, had full attendance. The mom stated that her son actually got good grades in school and that was the reason why she was able to give him time to join this kind of co-design group where you were designing and having fun. She stated that if he did not receive good grades in school it would be difficult to send her son to this kind of program.

Multicultural Lens

Our researchers' lens of what an ideal PD session of asking and being creative in the moment differs from the children and parents in Korea. Therefore, we were hesitant to share the prior questions as if they practiced with the parents beforehand it would not be their own thoughts but could have thoughts of the parents. However, in a multicultural lens that acknowledges the practitioner appreciating another person's culture without the assumptions of superiority or inferiority, there are values of discussing at the moment in some cultures it may be more comfortable to have discussion once one is ready and prepared. To add, any knowledge a child or person is talking about would have eventually been accumulated from outside. Therefore, we can view it as an opportunity to design with others. In addition, we need to understand the underlying deep structure of the different forces that hinder one to participate in the session. If it was valuable for the parents to have certain knowledge learnt within KidsTeam, rather than stating that it is not what KidsTeam we were trying to accommodate the needs by adding new sections such as the mini quizzes.

Figure 12 The children and adults engaging in a pop quiz

2) Internet Connectivity and Information Power

In the Improv framework, there is a theme titled "People and Setting" which has two sub themes of 1) Technology Infrastructure and 2) Spectators. Technology Infrastructure explains how children are able to shift locations and shift bandwidth while online. The spectator refers to the people other than the participant in the session.

What did we observe and learn: Throughout all sessions, all children had their cameras on in order to participate in the co-design sessions. There was no lag among any of the sessions. Without any additional instructions from the researcher, the children and parents naturally turned on their camera. Only in session 3, when the child stated that he had to receive a phone call, the

camera was turned off for a while. Except when the adult facilitator asked to reply on chat the majority of children always responded through voice.

In many of our co-design sessions, we asked a lot of questions as we strived for idea elaboration to occur. We noticed that many of the children utilized the search engines to look for the answers or points that were discussed during the co-design sessions. In Session 2, for instance the main facilitator asked “Does anyone know what a robot is?”. JooHyun stated “A machine resembling a human being and able to replicate certain functions automatically.” When the facilitator moved on to the next activity Joohyun stated “That it? What was the answer?”Later on during session 3, when talking about Internet usage, a child stated how he used search engines such as Naver to search for any answers that he did not know. Similarly, in session 4, the group discussed environmental cars and Doyool (age 8) stated about Hydrogen cars. In the analytic memo for session 4 many of the adult facilitators wrote being impressed by all the terminologies the children were using. However, later when the adults did a debrief after the session, one of the adult facilitators stated how Doyool also used search engine Naver to reply to the question the adult facilitator asked.

All parents in the study were also avid users of instant messaging. Therefore, in the parent interview many of the mothers reflected on what conversations the mothers were having with each other before and after the session. For instance, Sugyum mom stated “After the end of the first session, all the mothers gathered in KaKaotalk to have a heated conversation about what this session was. It felt so different from the classes we were used to.” When asked how the mother

group was formed, many moms talked about Mom Cafes on the Internet. In these forums, they would share information about best practices for raising their children. The welfare administrator explained to us that in South Korea, there is a word called “Information Power” and “Information Fight. On the day the welfare center had openings for KidsTeam, within five minutes, the group was filled with all ten students. Flyers and open recruitment were done prior to opening applications. Later, in the mother’s interview we learnt that the mothers were gaining information about when the welfare center had openings and stated how one mom was sad that she did not obtain a seat to the program even though she knew about it.

The theme of *Internet connectivity* in the Improv. framework only discussed how there were children with different bandwidths. We noticed that in a country that was rich in bandwidth, there was intense competition to gain more information. The information the mothers in the interview all strived for were information about learning opportunities for their children. We also noticed that since the mothers were actively discussing and reflecting on the session as a group in some sessions it was easier for mothers to form a public opinion. For instance, our researcher’s understanding of an ideal session is a group of children and adults that are different in age. From the different ages children and the adults would share different points of view. However, after the first few sessions, the mothers who were in the younger group age children did not like how their child lost the opportunity to talk as the older children were overshadowing the conversation. Therefore, the administrator called the lead facilitator and researcher to reflect the demand of the parents in the session. Therefore, from session 3 the younger children were grouped with some of the adults and there was a group of younger children. Later in the interviews, we learnt that

the 4 younger children mothers had a separate chatting space and knew the welfare center facilitator from previous programs. The online connectivity was not just about the stability of the Internet but we were noticing how the built environment to actively share information and form opinions were influencing how we would run the sessions.

The opportunities of working in the online synchronous space where there was high speed Internet was that many parents and children appreciated the fact that they were able to design with adults who were calling in from multiple states in the U.S. such as in New York, Florida and Seattle. In one of the calls when the adults were introducing themselves we were able to hear voices of parents and children having conversation such as “Mom, that teacher said he is calling from New York!” and the children also asked questions such as “Wow, what time is it in Florida?”.

Cultural Tailoring: Cultural Tailoring refers to creating culturally sensitive interventions by adopting existing materials from ethnic populations. Our team's goal in forming a co-design team with the welfare center was to reach a diverse group of children. Our definition of what we meant diverse was loose but we trusted the welfare center that they would be recruiting children different in age and gender. However, reflecting back on the interviews we noticed the majority of the children we were co-designing with were children who had mothers that were active in either mom cafe or chatting rooms and had the information beforehand. If we wanted to tailor our program for more diversity, our team should have tailored the recruitment process where we would be reaching out to children who may be the opposite of information richness. In other

words, children and families who would not know prior information that these programs exist in the first place. However, in our case, we learned this information after conducting the interviews where we were not able to modify our methods of the recruitment process.

3) People Co-design Interaction and Manners

Based on the *People Co-design Interaction* theme in the improv. model, when conducting synchronous online co-design with children it states how they had more autonomy of what they wanted to do. For example, compared to the physical space where children asked permission to the adults in the online space, it was simpler to leave the session. The authors also stated the difficulties of behavior management in chatting spaces. **Our understanding of an ideal session** is when the children both have structure and freedom within the session. This freedom such as talking with friends or chatting privately gives the children a chance to build relationships and go on breaks.

A big difference in the session the researcher noticed in co-designing with children in Korea was the level of respect and manner each child showed toward the adult. Different from improv. model which states that children had more autonomy in many actions the children often bowed or asked for permission for many actions. We share moments of how much the children were following the rules of the adults. In session 2, toward the end of the session all children and adults say their goodbyes and leave the Zoom room. There are three children (Siyeon, Sungwon and JooHyun) who remain in the main room. The main facilitator KJ asked “How did you all feel

in the session?" The children reply "good". The main facilitator afterward asked "Do you have any questions?". Sungwon states "When are we going to look at robots?". KJ replies "Next week". Siyeon and JooHyun are listening throughout. KJ asked "JooHyun and Siyeon do you have any more questions?" they reply no and state they are just sticking around. KJ states that she is going to go to the restroom really quickly and leaves the camera on. There is silence in the Zoom room among the three children. Joohyun states out loud "Ummm..I think I am going to go now". "Teacher?" KJ is still absent from the room. "umm.. Teacher? I think I am going to go now." But since there is no response back Joohyun remains in the room until KJ comes back. This instance shows a case of the child obeying and following the actions when there is approval from the adults. Even though the session has ended, the children who remained to stick around after the session are waiting until there is approval from the adults to leave. In other cases as well, the researchers in our study noticed many moments of politeness and permissions of actions which was one of our codes in data analysis. Every time the children came into the Zoom session or were late they also bowed to the adult facilitator calling us all teachers and stated reasons for being late. It was not just the children but the mothers who were on the side of the co-design session often made statements as "excuse me, teacher". If the child was not focusing on the screen, oftentimes we saw an adult's hand that would tilt the head of the child so they would focus. **Our understanding of an ideal relationship in co-design** from prior literature was where there was a more balanced relationship between the adult and child. Our researchers reflected how the practice of politeness and manners the children were showing made it difficult to break the power dynamics. Later when we shared our findings to the welfare administrator she shared how in Korea children were learning about manners and bowing also from Hak-won.

Especially in Taekwondo. We also heard from the interview data from mothers that they would send their child to Taekwondo to learn manners.

In addition, prior to the sessions, our researchers had long debates of what the children should call the adults in the session. While in the US team, it was natural for the adults to be called by their names. However, in Korea if the child met an adult for any educational or extracurricular activities after school they automatically called them teachers. Our researchers discussed whether we should incorporate new rules in our co-design session to ask the children to call by our names or another title than teacher. Our concern with the word "Teacher" was that it automatically brought up the power dynamics of a person being able to teach when our goal within the sessions was to build an equal partnership model between the adults and children. We explored if they should call us 'aunt', 'uncle' or 'sister' / 'brother' which was also a common term used to call someone in a friendlier way while showing respect. However, we were too distant in age and we discussed how it could be awkward for the child to directly state "aunt" or "uncle" without having any prior relationship. Therefore, without making a firm decision we decided to change as we go.

On the very first day of the session, when the adult facilitator opened the Zoom room 30 minutes before the session started, a mother and a child (Soyoung) logged on 20 minutes early. When first joining, the camera was off and the mother was helping the child log in as there was a message "logging on." Soyoung's mother, without any introduction, stated "Teacher, are you there?" The facilitator replied "Yes, welcome to KidsTeam." From the first day, the facilitator

automatically knew that the name the children would call the adults was going to be teacher. In Session 1, an analytic memo Colleen wrote *At the end of the session the children all bowed saying 'Goodbye Teachers!'*, *I guess we are teachers?* In order to still have some level of respect, instead of asking the children to call us by name we elevated the children's status by using more formal language to the child.

Cultural Sensitivity Lens: Cultural sensitivity is when cultural characteristics, experiences, norms and values, and relevant historical and social forces are incorporated in design and delivery of a program. While our group strived for a space to create a comfortable environment where children and adults worked as equal partners, the norms and values of respecting adults and hierarchy was something that the parents and children were used to. We learned that in this case, it was more comfortable and natural for the children to call us teachers.

Discussion

Surface and Deep structure

Creating an environment where people feel comfortable sharing and expressing their thoughts is an integral concern for participatory design practitioners. Prior literature has shown how scholars conducting participatory design in locales different from their own cultural background had to understand the norms and values that would influence the participation within the session [65,67,163]. The results of this research highlight that our definition of what we call

‘comfortable’ or what we may consider a ‘diverse’ team may change based on the country the scholar is in. In 2002, Druin shared ways of creating an environment where the children and adults would gather to design together. Druin states examples such as working on the ground, adults wearing more casual clothes like hoodies, calling the adult by name and asking the child not to raise their hands. However, through the lens of cultural sensitivity, we share how in this paper the society of Korea had high values in respecting adults and teaching their child manners. Therefore, it was natural for the children to call the adult ‘teacher’. In addition, our findings also indicate the importance of redefining what it means to create a ‘diverse’ team. Korea is a very homogenous country compared to the United States where the ethnicity is diverse. Therefore, in the United States when we recruit for children we actively seek diversity not only in age and gender but also in ethnicity. In a homogeneous country, where mostly the children are from the same ethnicity we may ask the question what it means to be ‘diverse’? Another emphasis in participatory design is that it strives to foster a democratic space. In many cases, participatory design scholars are intentional when recruiting participants. Based on our study results, in order to create a more diverse group, we may have had to be more intentional about families who were rich in information and families who may have lacked information and connection to the program. We also learnt that the mothers in this study felt more relieved and comfortable when certain content knowledge was taught within the session as opposed to discussing open random questions. Different countries may have different definitions of what it means to be comfortable and what diversity would look like. We believe a scholar who designs with children in another country can invest time in unpacking the meaning of ‘comfortable’ and ‘diverse’ as it will change the deep structure that influences the children in participating.

We believe our insight can help participatory design researchers be more intentional about recruiting more diversity in their group. For instance, in our particular study group diversity would be not only families who have an abundant amount of information with contacts for connections to but families who lack information and contacts to even know the study exists in the first place. In short, diversity does not just come in the form of ethnicity and age groups but also in forms of how much a person has information about a particular topic. There are multiple forces that may hinder one's participation in the program. In our case, the education system the children lived in led to who was able to participate or not in the session. We have shared the experience of how we were making modifications. Someone outside of the country may believe that giving children mini pop quizzes is not how co-design sessions should run. However, children are also dependent on their parent's decision of what programs they want their child to be enrolled in and what they believe their child benefits the most. Therefore we are not only meeting our team's goal of understanding the children's thought but also the demand for content knowledge, which is the current education system that is rooted in many other east Asian countries as well.

Co-designing in the open Internet space

The internet has opened the space for us to co-design with children on the other side of the world. In 2020, Lee et al. introduced the improv model on the considerations practitioners and researchers need when they have a synchronous participatory design session online with children. As South Korea is a country high in connectivity, we believe this is an ideal case study

of what future studies could look like when there were no problems in accessing the sessions. As shown in the data, different from the Lee et al. paper the connectivity was not the issue. As mentioned in recent Organization for Economic Cooperation and Development (OECD) reports, more countries are striving and working on providing faster internet connection as it connects to economic development. In addition, similar to the children in South Korea where many children own mobile phones and iPads, we have seen in many countries how the age of using such devices is lowering [19,88]. Our study results showed how many of the children were avid users of the internet but how it also influenced our design session. For instance, in the data we saw how the children were utilizing search from different search engines to answer many of the questions our adult facilitator was asking.

We may then question what it means to ask children questions on their thoughts if they have the ability to search for other people's thoughts on the Internet. We believe that certain behavior may also be due to the education system mentioned in prior literature of the pressure of getting the answer 'right' [160]. The value of co-design with the children was to hear their random, out of the box thoughts, however we may need to think about the techniques we use of asking the children their thoughts if they are exposed to an abundant amount of information on the internet. For instance, if the facilitator asked a question about a robot they wanted to create and the child finds a robot another child or adult created on the internet we need to rethink about what ways we can continue to meaningfully co-design together.

One direction we may go is a child's version of citation or a way of acknowledging prior knowledge but still adding space to hear their own thoughts. In prior literature, especially in the field of education, there have been many cross cultural studies where they state how East Asian countries are accustomed to rote learning, in other words memorization. From a multicultural perspective and taking into account the complexity of learning, we argue memorization and standardized tests do not always inhibit creativity to co-design. For instance, in a study which adopted a culturally sensitive framework and explored learners from Eastern cultures, showed how when adopting a memorization approach, learners from the Eastern cultures could learn beyond "rote". The data gives evidence that when memorization is a culturally ingrained approach, it can lead to deep understanding. Therefore, we believe as opposed to banning the use of search or forcing the child to only share their own ideas, we believe researchers in the future can further explore what acknowledging prior ideas could look like when designing in the space of the internet.

The Host Country and Visitors in the Online Space

In the public health science literature, scholars have long worked on how the goals of public health can be blended with cultural values and practices . In this paper, we attempt how the goals of co-design blend with cultural values and practices by using the theories of cultural sensitivity in public health. In the space of public health, while there were attempts to modify designs and practices to meet the needs of a particular population with a shared ethnicity, we have less information about how cultures collide when we are in the online space. Our study was designed in a way that we were considering Korea as the host country and the researchers connecting from

New York, Seattle and Florida in the United States as the visitors. Therefore, the researchers were making modifications and learning about not just the surface level interventions such as having the materials all in Korean but were attentive to the social infrastructure that the children were living in. Prior studies of scholars who have also done participatory design research outside of Scandinavia such as in Japan, China, and Cambodia were all considering those countries as the host countries and therefore following their rules . An example of following the norms or rules in talking about food is how people in the United States call cutted potatoes 'french fries' whereas in New England people call them 'chips'. The word 'chips' in the United States is different from what the New England people call 'chips'. Participatory design is also all about the language game of finding the common ground of communicating with each other [35]. For relationship building, a visitor may decide to call what the common language the host country is using. For instance, if we were to go to a restaurant in New England we would rather call french fries as chips.

The question then arises, what do the terms host and visiting country mean when we are in the online space? In our study, the researchers (adult facilitators) were coming from the states and we were working on a design problem that the welfare center in Korea had with Korean children. Therefore, we were treating the host group as Korea. However, as there are more opportunities to design in the online space, future studies may ask how we will define culture in the online space. If there were Korean researchers or designers working on a project for a center in the United States and with children from the U.S we may follow the rules and norms of the United States. But we may also ask in the future when there is a mix group of different cultures how we may

decide on taking encounters of different cultures. Our study was exploring how we were building relationships and learning about each other's world through synchronous video chat. Walsh et al. [152] explored how codesign was conducted in a gaming space where the children and adults were avatars. As the camera was on we were able to see how the children were Korean. However, different behaviors or interactions may occur if the camera were not on and we were embodied as a different person. Our study results show the excitement of families and researchers who were connecting from different parts of the world synchronously.

Limitations

Our study was an exploratory study that examined video, analytic memo and interview data of the 10 children who designed with the adults from the United States for 6 weeks in a suburban area. The children and adults were meeting once a week, therefore had a total of six sessions. We believe that our findings could have changed if we were to have more sessions. We also believe and argue that the 10 children who were involved in the study cannot represent all children in Korea. Rather in this paper we highlight moments where our understanding of the co-design session differed from the demands of the families. We were also aiming to utilize prior theirs in Human Computer Interaction (HCI) of how the children co-designing in the online synchronous space while also using theories in cultural sensitivity of the way we were attentive to the underlying culture.

Conclusion

In 2020, due to the global pandemic that forced many of us to move to online space, many countries explored how to be connected in distributed locations. In our study, we used the online space as an opportunity to co-design with children who were on the other side of the world. Being on the other side of the world, means there may be different cultural norms that may influence how people act and participate in the session. Not being able to respond to the differences can create a lack of meaningful conversations for design. In our study, we aimed to find the challenges, opportunities and compromises we, as facilitators needed to make in the session. Many of the products and services we use today are no longer only for the local community but are used for a wide audience. More HCI researchers will have projects that require the input of participants that are not within their local group. The cultural sensitivity provides valuable insights of how to be adaptive to accommodate families and students with different cultural backgrounds. The findings further our understanding of how the structural context in culture influences the participation of the children in co-design sessions. Future research work can also investigate how children from different time zones can work together as well in co-designing.

Acknowledgement

We thank our children and parents for being a part of the study and the Welfare center at Busan, South Korea for being open to partnering with us. We also thank KidsTeam UW for providing us with design materials that the children used to design with adults.

(NOTE: This marks the end of the original publication)

Positionality Statement

As the research about conducting participatory design in Korea is about cultural awareness, in this positionality statement, I will specify about my cultural background and upbringing. I was born in Seoul, Korea but my childhood was in Texas, USA. After 3 month from when I was born, my family moved to the states. At the age of 10, I moved back to Korea and I continued to live in Korea till I started graduate school in the US. Both of my parents are from Korea and ethnically Asians. Therefore, while I was first exposed to the U.S culture in the early years of my childhood, I also have experience with the overall Korean culture such as the education system as I completed elementary, middle, high school and undergraduate in Korea. Therefore, I was able to understand the nuances and underlying behaviors of the children that a foreign researcher may have not seen in analyzing the data.

Chapter 7 Discussion

In Chapter 7, I will revisit each research question and provide a summary of the findings from each chapter that aims to answer the research question. I will share the impact and importance of the findings as well for each question.

Revisiting Research Question 1

RQ1: How can we **develop** partnerships for participatory design within the context of partnering with public libraries?

What did I mean by develop?

A participatory design team or co-design team is called a "team" as it invites multiple stakeholders in the process of design. If it was just the researchers or just the end-users designing with each other it would not be considered a co-design team. Developing a team is having or structuring a space where different stakeholders come together to design. The goal of a co-design team is to engage in different techniques and to have a list of ideas from the sessions that would be applied to design. The people are in a way designing before designing but also sharing the different ideas people have. Ehn states how it is a way of playing the language game [35]. My question then is how the facilitator first forms the group and how the team all come together in the first place. Based on my multiple experience of co-designing it is merely impossible for one person to lead the entire group but there are multiple roles each team player is playing. In the case study I shared of conducting PD in the public library, I was exploring four groups of people

involved in the session: the graduate students who were first learning and being trained on how to conduct PD sessions 2) the parents and children who were involved in the co-design session 3) the public librarian and lastly 4) the researchers involved in the project.

Summary of the findings

I revealed in this case study, what structural underpinning allowed the different stakeholders to come together in the first place. I share how the class structure of moving beyond the service learning model to using the Academically Based Community Service model in the university setting allowed a space to invite more people in developing the course. I argue that it is not enough to simply put different stakeholders in a room, but understanding that each of these stakeholders have their own initial roles and responsibilities prior to the co-design sessions is important. I share in the findings how the initial roles can collide when we come together. Even though we are asking all groups of members to become designers we see in the findings how in what ways they are gravitating toward their initial roles such as in the case of the librarian who was concerned about the quality of the program or graduate students wanting to meet the requirements of class assignments.

The outcome of collaboration is simply not all positive. While in prior literature (Chap2) depicts how the co-design session can lead to informing design, I have shown in this study how in order for collaboration to occur it takes time for the different stakeholders to understand each of their roles and how to contribute to design. For instance, in the findings I share the instances of how when multiple stakeholders of people come together there was frustration of grasping what the final product would look like and how the ideas were developing together. I share moments in

the findings where our design partners (children) were not interested in the design process or the graduate students not being sure of how to patch the ideas together.

The study[4] conducting Participatory Design in a library suggests how pre-service librarians (the graduate students) perceived working as equal partners in PD to be a difficult model to replicate outside the classroom without support from external partners. One way to address this challenge is to involve volunteers from the community, who are already patrons in the library, for a more sustainable model. For example, as opposed to just the pre-service librarians working with children in the program, local teens can work side-by side with the children. Currently, our team is exploring ways the teens in the community can collaboratively develop a learning curriculum with children and librarians. So far, I can point to some successful and promising pilot cases in Seattle Public Library where the teens have initiated in leading the sessions to model what a co-design session can like to the graduate students.

The findings suggest that while the course attempted to teach the students about the importance of working with the community, teaching how to effectively reach out and persuade various stakeholders was something that was missing in the class. For pre-service librarians to employ new approaches in programming, courses that specifically focus on communication and persuasion skills, as well as evaluation/assessment methods, can be useful. In addition to the

[4] This section of the literature review is previously published work. To cite material from this section, please cite this original work as well as the dissertation:

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challenges inherent in communicating the idea of PD, another barrier in widely adopting PD in libraries has to do with whether pre-service librarians themselves identify as designers.

Impact and importance of the finding

The significance of these findings is that we unpack the process of each stakeholder group being on board with the co-design project. Based on the finding, we learn that each group of stakeholders (children, researchers, public librarians, graduate students) motivation of joining and understanding the co-design program itself differs. Therefore, when we come together often there is miscommunication that can lead to breaking trust or misconceptions toward each other. Therefore, our findings indicate the level of how much intense conversation the facilitator needs to practice in communicating the needs of the different stakeholders.

About the conversation of how we first develop and establish a team to conduct participatory design, I situate the conversation through the lens of theory and practice. How does what we read and learn about the theories of participatory design play out in practice when we are actually interacting with the people in the community? I have used theories in the 'theory and practice' gap to understand what types of gaps exist and in what ways we are able to learn and develop groups. I argue that the dual nature of the curriculum of being able to engage in both theory in reflecting in the classroom and engaging with youth in the library provided the right amount of comfort and discomfort. The impact of the finding indicates that there are two levels of reflection in improving to develop a group together. The first level of reflection is when the group discusses the overall big ideas and themes from the co-design session which focuses on the artifact. However, the findings also indicate that another important level in developing the group

is a discussion of reflecting altogether in the session itself of how the it went. The facilitator could ask questions to the different groups of what methods of communication mode each group would prefer and what questions, confusions and concerns they may have over the process. I also argue that the proximity of how close or far one group is to each other differs. For instance, the parents may be more comfortable discussing their concerns or questions to their public librarian as opposed to reaching out to one of the researchers or the instructor of the class. Likewise, students may have a better time asking the teaching assistant or researcher about the process as opposed to the librarian or directly talking to the families. In this case, it is crucial to set expectations and a road map of who may be the point person when the group gets larger.

Different from prior literature that highlights the value and importance of coming together, in this study I highlight why teams may be hesitating to work together in the first place and also share the anxiety or worries people may have when establishing a team. By sharing what could have gone wrong in building relationships, I also show how when working with a community needs keen attention to how one is feeling but also how these relationships are delicate.

The findings also suggest how researchers or practitioners conducting participatory design sessions were partnering with community workers and people who provide service (public librarians) for recruitment. In the data, I notice that the relationship between and researcher to the children and families in the community differs from the built relationship the public librarian has developed with the community.

I also give implications not only to the researcher of how to form relationships and connections in order to develop a team, but also share the mindsets of the community partners they have

toward research that is not simply about collecting more data and for publication but allowing the families in the community to connect with the graduate students as well. I share examples of how this communication and knowledge gap of theory and practice can be reduced by sharing practical implications of how often one can meet and learn about the other group they are working with.

Another significance of these findings is that I depict how the graduate students and the public librarians are first learning about what it means to co-design and what it takes to co-design together. In prior literature within participatory design, oftentimes the context of the researchers are those with numerous experience of co-designing with end-users in a project. Other prior studies directly discuss the outcomes of the sessions without explanations of how the team was formed in the first place or what challenges and opportunity it has entailed. From understanding how we first bring in newcomers it shows what pedagogical support educators can provide when structuring a class for students (or new comers) to practice participatory design skill sets.

Revisiting Research Question 2

RQ2: How can we **maintain** partnerships for participatory design by transitioning to the online synchronous space?

What did I mean by maintain?

Despite the fact that one crucial aspect in participatory design teams is relationship building which is highlighted in prior literature (Chapter 2), we have less understanding of what it takes in

maintaining the partnership. Maintaining partnership is being able to adapt to the changing external and internal forces that change over the period of time to continue to co-design. The importance of maintaining is providing a space where skilled practitioners can continue to design with partners in my case children despite changes. The importance of maintaining a team is that as we learn from developing a co-design team, not all stakeholders become a designer on day 1. There is a learning curve of understanding each other and learning how it is and what ways we express our thoughts for design.

Summary of the findings

I revealed in this case, how theories in improvisation and HCI were utilized to sustain the project while being adaptive to change. The context of the study was in the online synchronous space. The findings show how Zoom the video chat function was a tool that both children and adult facilitators could instantly use without the burden of learning a new skill set or having to purchase a new software or hardware. However, we learn that while the synchronous space to co-design with children offered in the moment idea elaboration there were numerous difficulties facilitating the session. The study shows how the synchronous online space had many more factors that were out of the control of the adult facilitator. Therefore, in this finding rather than answering the question of "how to" continue to co-design online my team changed the question of "what to" consider. The three main themes that is extracted from the data set is the following: 1) Project Logistics which discuss the techniques transitioning to the online space and overall planning the activity for the co-design session 2) People and Setting which discuss that as people are coming from multiple locations the technology infrastructure and spectator of who the

different people and animal that are present during the call changes as well. Lastly, 3) People Online Interaction discusses how people have more autonomy online and how it is difficult to understand online interpretation of people's interaction. The framework was then connected to the theories in improvisation of how we further engage in co-design with children. By connecting it to theories of improvisation we learn the following 1) improvisation is not occurring just within the session, but it is occurring before, during and after the session 2) improvisation is not simply done by the facilitator of the session but the children were also active in improvising within their context such as muting themselves when their was noises outside. However, the findings also indicate that when improvising with children, different from artist and musicians 3) there is a need to adhere to online safety protocols as adult facilitators. This is because we need to be responsible about working with vulnerable populations.

Impact and importance of the finding

The significance of these findings is that in order to maintain the project, the facilitators in the study attempted to not burden the people by asking to change or adapt, rather we attempted to newly structure the sessions for people to continue with design within the environment they were already situated in. For instance, in the framework of Improv that shares the considerations when moving to the online space to co-design with children, the framework is wide enough to incorporate each individual situation. Specifically, in the theme of 1) People and Setting, I share how when moving to the online space the location changes and in consequence the setting within the location influences the child in designing with the team. Rather than stating that there is a unified way the facilitator needs to conduct the session, I suggest how the design goals are met

while being attentive to the differences of how each child can participate in the session. For instance, if there is low connectivity using the camera, a child can instead join the discussion by using the chat function. If there are more than one family member or pets in the sessions when transitioning to the online space that is present in the Zoom calls the facilitator can invite these families, friends or pets to be a part of the session as opposed to viewing it as a disruption of the session.

For further implications, I state the importance of the facilitator actively notifying how each individual can continue to contribute to the co-design team in order to maintain the team. In the early example I shared specific instances where we were adapting to our new situation moving to the online space. However, it is not just the pandemic that forced us to think about how we adapt to change. As time flies, researchers in the project graduate, the children grow up and the research funds we once had are gone or if we are lucky the team grows with more resources. Based on the change, people schedules and how we can contribute changes. However, for meaningful change to occur as opposed to putting a halt to the project due to any unforeseen circumstances, I suggest ways we can continue by also using the lens of improvisation of making the most of what we currently have at the moment. An important lesson we learn from improvisation is also being okay to diverge from the previous plans we had and using it as a stepping stone to learn more or think of it in a different direction as opposed to considering the project as a failure.

The co-design teams I introduced in this dissertation are all small size groups where there are usually 8 to 10 children and 6 to 7 adults. In this dissertation section, I have discussed how these

groups are maintained—even in situations where they had difficulties participating within the existing framework. However, we also need to consider how children who are not part of the team can still benefit from the findings or ideas the team has produced. In other words, "how are the ideas and artifacts produced used for the children and people who were not part of the team?" is a question facilitators need to consider in the future. In all case studies, the co-design sessions were informing adults on how children preferred to interact with certain technologies. While the children in our team cannot represent the perspectives of every child, the findings nonetheless offer additional ideas of how technology can be modified in learning spaces. I argue that the co-design session was a safe space to experiment before technology or programs were implemented. While the cost of conducting multiple sessions requires many resources, such as time and money, they allow us to produce an improved final product or program by collaborative design. We may also consider how we utilize the online space in international and cross-cultural contexts. The role of the facilitator would then be to create a safe space where there are shared rules of how, and in what ways, the ideas are collaboratively shared and elaborated on. For instance, more children can react to the ideas that the KidsTeam participants produced by readily available and approachable technologies with low barriers to entry.

Revisiting Research Question 3

RQ3: How can we **expand** participatory design partnerships by co-designing with children in an East Asian context while being culturally aware?

What did I mean by expand?

Different from RQ2 where I attempted to maintain the program, expanding focuses on not being static but expanding in multiple levels of the people we work with but also the way we conceptualize co-design itself.

Summary of the findings

The overall internet connectivity, education system and norms of the relationship between an adult and child all influenced the participation of the child in the East Asian context. While I was able to make modifications using the cultural awareness theories in public health to respect the culture while co-designing, there were factors that the team were not aware of until the very end of the design sessions. For instance, we noticed that while we strived for a diverse group of children, we did not have a working definition of what we would consider as diverse. Even though we partnered with the welfare center in Korea that helped us with recruitment of children different in age and gender, from the interviews we learnt the majority of the children who attended the sessions had good grades in school or their mothers had rich information about education and programs. We learn that many of the children felt pressured in receiving good numerical grades at school and parents were interested for their children to learn content knowledge which differed from the purpose of the co-design program we offered to the children. Therefore, the children who already had good scores at school were the ones who were participating in the session. Based on the cultural sensitivity model which states about the surface level and deep structure, we notice that there are many deep structural forces of why there could have been discomfort if we were to use the method and techniques we use in the US KidsTeam. For instance, while the children in the US may feel comfortable calling the adults by

their names and having a more informal conversation with adults, we notice that the values and norms in Korea that the children were brought up with could make it uncomfortable to ask the children to be equal design partners to the adults. Therefore, I argue in the paper how we need to redefine the meaning of what it means to be ‘diverse’ and how what is ‘comfortable’ can change based on the setting.

When we asked the children whether they thought the KidsTeam program felt like school or more of a place to play, the majority of the children did not view KidsTeam as school but a place to play. This was even though KidsTeam Korea was modified to include activities such as pop quizzes, which would seem more educational in US contexts. In the interview data, many parents and children appreciated the fact that the adults were interested in listening to children’s ideas, and that it was different from any other program they had previously participated in. However, from the interviews we learned different reasons why the parents hesitated to send their children to the program. These reasons include missing opportunities to learn content knowledge, and not developing skill sets that directly lead to numerical scores. We also found reasons children hesitated to share their ideas in the moment as they were more accustomed to practicing or being prepared to share their ideas prior to being asked. We noticed that many of the children and parents did not want to be exposed to answering questions when they felt they were not fully prepared.

Impact and importance of the finding

The findings of this case study was significant, not only because they reveal how interactions change due to the societal expectation and infrastructure that influences the involvement in the

co-design session but as they raise the question of "What adaptation do we need to take to respect one's culture while still obtaining to co-design together?" As participatory design sessions have roots in the Scandinavian culture oftentimes, scholar who have conducted PD in other parts of the world stated the challenges the researcher faced in adopting to the model they have used in the past due to the differing ways of hierarchical relationships [65] that is shown in the Japan study, the way we learn knowledge or manners [163] and about critiquing others [66]. In the case study I analyzed, I give implications of how we can actively appreciate the culture as it is and modify the technique and methods we use in the co-design sessions by using the cultural sensitivity lens in public health. As opposed to stating what is the right or wrong way of doing things and imposing my thought of what is co-design, I open the discussion of what could be co-design based on the norms and values people are living on.

What is important about this case study is not about revealing the difference of how children in Korea were co-designing from the children in the United States that the researchers were used to designing. But the significance lies on what modifications and compromises were being made when noticing the difference. While, many studies have revealed the tensions and challenges that arise from co-designing in a different cultural context, my findings reveal how we can reexamine our sessions by using the theories in cultural sensitivity which provide the space for multiculturalism of appreciating one's other culture and norms without assumptions of superiority and inferiority.

The findings of this research also contribute to our understanding of the roles the facilitator can play in modifying the plan of the co-design day that could support and influence the children to

feel more comfortable participating in the session. For instance, if there is more societal pressure from parents or friends of not liking the feeling of feeling unprepared for a session, we may give options to the children and families to prepare for the sessions beforehand by sending the materials or allowing them to practice with their families of sharing ideas before they present or share in the day of the co-design session. While some researchers would prefer to have the children work on a task at the moment to spark new ideas or conversation, we will also need to think of children who are used to rote learning and being prepared than in the moment design.

Chapter 8 Conclusion

Concluding Remarks

As I conclude my dissertation research, one of the most important things I learnt in research is that innovation and change can come from the form of collaboration of working with different stakeholders with different expertise. However, in order for collaboration to occur there are multiple efforts we need to take. First, in order to have a participatory design group where multiple stakeholders share their ideas it takes a tremendous amount of time and resources to create partnership in the first place. Next, in order for us to continue to have meaningful discussions and not last as a one off project we need to explore new spaces such as the online environment to continue to meet with the users. Lastly, when creating avenues to co-design we are striving for more inclusion and diversity by understanding that there is an existence of different cultural values and norms that changes the way we participate and engage in co-design sessions.

In each of these case studies, I have introduced both the challenges and opportunities the team confronts when creating, maintaining and expanding the program. In each case study, I center my discussion on the crucial role of the facilitator. For instance, in the first study of the university students partnering with the librarians and families at the public library, it was important that the facilitator understood stakeholders' prior roles that may come into conflict with their new role as co-designers. In this example, the facilitator was actively opening a space where each group of people (children, parents, graduate students, librarians) are getting to know new information about each group, such as the library's policy and the time constraints of graduate students. In the second study, wherein participants moved to the online space, the role of the facilitator was to identify the external and internal factors that manifested when synchronously going online. By identifying the external and internal factors that could influence the session, the facilitator was improvising for the codesign session to go on, as opposed to excluding participants. By using the theoretical framework of improvisation, as opposed to viewing change as disruption, the facilitator was viewing diverging from the original plan as a creative outlet for learning new methods such as exploring ways that children can continue to design—even if they were in the car or with an unstable internet connection. Lastly, the third case study introduced how the facilitator was attentive to the cultural differences of the children in Korea. In the third case study, we learn that, even though the relationship between children and adults looked different than Western culture, children were still co-designing. This study gives us indications of how a facilitator perceives the success of the program. We learned that evaluative standards, such as how diverse the team was and how comfortable the children were to share ideas to the adults, all needed to change when working with a new culture.

As captured in the findings, the extra steps we take as practitioners and researchers to understand the complexity of the participants we are designing for will result in better design that centers people as opposed to technology. Researchers in Human Centered Interaction should consider ways to support both newcomers and end-users in order to foster more diversity and inclusion in the field. The term participatory design is a loosely defined term that refers to a democratic method of designing with the end-user. The current existing frameworks, such as the equal partnership model [170], unpacks the question of what it means to be equal contributors in design. In my dissertation, I explore what this partnership looks like in different contexts. I argue that, as people, we all have free will and our own individual thoughts of what we like and dislike. Yet, external and internal factors may hinder us in expressing what we truly believe in. As shown in the different studies, based on context, one may decide not to participate in the co-design session for multiple reasons—culturally or due to external factors like internet connectivity. I state it is the role of the facilitator in unpacking what may be the underlying reasons of why one may not—or cannot—participate and to make modifications for the design sessions.

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