THREADS OF TRADITION:

LEVERAGING TECHNOLOGY FOR INTERGENERATIONAL KNOWLEDGE TRANSFER IN MAYAN TEXTILE PRESERVATION

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Abstract

This thesis is centered on the preservation of Mayan weaving traditions in Guatemala, which are currently at risk. This situation poses a threat to the loss of unique textile knowledge and cultural heritage. Rooted in the understanding that technology can support traditional crafts, this thesis proposes a human-centered participatory design approach to create a digital tool aimed at preserving and transmitting these traditions across generations. Ethnographic design research methods, including interviews, helped uncover the sociocultural factors influencing knowledge transmission and inform the development of digital technologies. The key research question asks how technology can effectively support the intergenerational transfer of weaving knowledge within Guatemalan textile traditions. This study contributes to the preservation of cultural heritage, the exploration of social interaction dynamics within generations of weaving communities, and the development of socially responsible technologies to safeguard this heritage for future generations.

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CHAPTER I: INTRODUCTION

This study examines the potential role of technology in preserving Maya weaving traditions in Guatemala for future generations. Through the use of technological solutions that honour tradition, the study aims to help maintain the continuity of these weaving practices. This approach helps safeguard Maya cultural heritage amongst challenges posed by globalization and economic pressures.

Guatemala, a country in Central America between El Salvador and Mexico, is home to a rich culture belonging to the Maya. Among the Guatemalan Maya, there are over 20 distinct ethnic groups, each with unique traditions and cultural practices (Söchtig, Álvarez-Iglesias, Mosquera-Miguel, et al., 2015). One of the most significant expressions of Maya identity is through their handwoven traditional clothing, known as *traje*. Traje serves as a form of personal and community identity, showcasing regional motifs, patterns, and symbolic meanings.

The act of weaving is central to Maya culture, and the integration of spiritual beliefs into their textiles is a significant aspect of Maya weaving. The weaving method most commonly used is backstrap weaving, a practice of pre-Hispanic origin (Macleod, 2004). According to Mayan mythology, the moon goddess Ixchel taught the first woman to weave on the backstrap loom. Ixchel is not only the goddess of weaving but also of conception and childbirth, combining these aspects of life symbolically (Prechtel, 1988). As noted by Prechtel (1988), “The sticks making up the backstrap loom are perceived by the Tzutujil as aspects of various of the thirteen important female deities known as Ixoc Ahaua”. This connection highlights how the Maya view the act of weaving as a sacred process, intertwining their spiritual beliefs with their artistry. Weaving is not

merely a practical task but a cultural and spiritual practice that connects the weaver to their heritage and deities.

1.1 Problem Statement

For over two thousand years, Mayan weavers have woven their history and stories into vibrant textiles using backstrap looms (Prechtel & Carlsen, 1988). Weaving is commonly used to make either household items or traditional attire, also referred to as *traje*, which serves for everyday wear as well as ceremonial purposes. However, this ancient tradition is at risk due to the impacts of modernity and globalization. A decline in the number of Mayan weavers, particularly among the younger generation, indicates a significant move away from traditional weaving practices (Tomita, 1990). One of the contributing factors to this trend is rural migration and the attraction of urban life as younger individuals leave their hometowns in pursuit of economic opportunities outside of traditional weaving (Hanson, 2015). The commercialization of textiles for mass markets and tourism has led to the loss of authentic designs and a decline in the quality of craftsmanship (Tomita, 1990). The COVID-19 pandemic has also significantly impacted Indigenous artisans, disrupted textile production and jeopardized their livelihoods (Piper, 2023). A threat to the survival of Maya textile traditions is the loss of intergenerational weaving knowledge. As younger generations move away from traditional practices, the transmission of weaving skills from elders to youth is increasingly disrupted. As a result, exploring new ways to support knowledge transfer is essential. This project examines how digital tools can help preserve Indigenous weaving traditions in Guatemala by facilitating intergenerational learning and cultural continuity.

CHAPTER 2: LITERATURE REVIEW

This chapter examines literature related to Maya weaving, focusing on key areas: the historical and cultural significance of Maya textiles, the colonial and economic challenges faced by Maya communities in Guatemala, modern efforts to revive and preserve traditional textile crafts. It also explores craft-based learning in intergenerational education, the role of intergenerational communication in transmitting weaving knowledge, and how technology contributes to both craft revitalization and knowledge transfer. Through a critical analysis of these topics, this review highlights the crucial role of both traditional methods and technology in efforts to preserve the legacy of Maya weaving.

2.1 Challenges in Maya Weaving - Colonial and Economic Impact

Understanding the Mayan and Guatemalan historical context is essential when researching Mayan textiles. This context provides crucial insights into the challenges and resilience of Maya textiles today. Throughout history, the Mayans have encountered many challenges. Despite constituting at least half of Guatemala's population, the Maya have long endured systematic exploitation, discrimination, and marginalization within Guatemalan society (Macleod, 2004).

The oppression experienced by the Mayan community can be traced back to the Spanish conquest in the 1500s, when Mayan artifacts and objects were destroyed. The systematic discrimination against Indigenous people in Guatemala continued through the years, extending into the Guatemalan civil war of the 1980s, a devastating period which resulted in a Mayan genocide that claimed the lives of almost a quarter of a million Indigenous people (Vandewiele, 2018). The violent disruption caused by the war prevented many from practicing and passing

down their weaving skills. As a result, those who were unable to weave during the war could not transmit their artisanal and cultural knowledge to younger generations and led to a significant decline in the production of Indigenous textiles for clothing (Vandewiele, 2018). Moreover, during the war, the distinctive patterns and designs of traje were used by the Guatemalan government to identify and target Indigenous leaders. These leaders, who often moved from community to community to avoid persecution, were tracked based on their traditional clothing. The unique motifs and colours of their woven garments made it easier for government forces to recognize and target them for violence and repression (Vandewiele, 2018). This targeting of Indigenous individuals based on their traje had significant effects, as described by Macleod (2004), "One only has to think of the Indigenous women who had to remove their traje-experiencing a sense of loss-after fleeing the extreme repression in their municipalities in the early 1980s, leaving the country and 'camouflaging themselves'... Those who were internally displaced also often had to change dress in order to disguise their place of origin." (p. 685). The widespread violence against Indigenous communities in Guatemala during the civil war contributed to the decline in many traditions, including textile production (Vandewiele, 2020).

Furthermore, economic factors caused by globalization have also affected weaving traditions, with companies favouring machine-embroidered pieces for their ability to produce textiles more cheaply and quickly (Macleod, 2004). To compete with mass-produced products, artisans must sell their handmade pieces at lower unsustainable prices, leading to a decline in the number of people making traditional handwoven huipils and other traje. As a result, fewer people are wearing traditional handwoven Indigenous textiles due to their higher cost and the widespread availability of cheaper, machine-made alternatives.

More recently, the COVID-19 pandemic significantly impacted weavers, who relied heavily on tourism for income. With travel restrictions disrupting their income, many artisans in Guatemala had to change their business strategies, turning to social media as a means to reach a wider, international audience (Piper, Townsend, & Jabur, 2023). This shift has now become a central part of many artisan's businesses, demonstrating not only the resilience of artisans but is also an example of the transformative potential of technology in preserving traditional craft industries. It emphasizes the importance of research in preserving traditional practices and knowledge alongside modern technology for the digital age (Alvelos, Chatterjee, & de Almeida, 2021).

Preserving the art of traditional weaving is crucial not only for maintaining cultural heritage and identity but also for supporting the livelihoods of Indigenous artisans who rely on this craft. The unique designs and techniques of traditional weaving represent centuries of cultural history and knowledge that are at risk of being lost.

2.2 Revival and Preservation of Textiles

The revival and preservation of textiles are important to maintaining the cultural significance of traditional practices. The loss of this practice can lead to the disappearance of unique historical knowledge and economic challenges for Indigenous communities reliant on these crafts. Previous studies have examined revitalization strategies to sustain culturally significant products and practices, aiming to adapt them to modern contexts and future needs while preserving their cultural value (Titisari, Rigout, Cassidy, & Dallabona, 2019). For instance, the Anti-Amnesia project developed strategies to preserve traditional Portuguese crafts by

creating curricular content for art and design students and establishing research and pedagogical models to sustain these cultural practices (Alvelos, Chatterjee, & de Almeida, 2021). Another study titled "Research Approach for Revitalizing the Traditional Craft Practice" explored how design and technology can revitalize traditional Indonesian stitch resist dyeing. This study involved participant observations, questionnaires, and semi-structured interviews with various artisans. It recommended developing low-cost, portable tools that mimic traditional techniques to enhance quality and consistency without altering existing work cultures (Titisari, Rigout, Cassidy, & Dallabona, 2019). Similarly, in “What Our Mothers Wore, We Wear, Vandewiele (2018) researched preserving traditions by utilizing photographic repatriation to recover lost textile designs. Weavers in Guatemala were able to use photographs of lost textiles kept in museums to "rebuild lost heritage" (Vandewiele, 2018). With the aid of these photographs, the weavers recreated and incorporated the lost designs into new works, effectively preserving and reviving traditional patterns. While various strategies have been explored to revive and preserve textiles, intergenerational knowledge transfer is still a factor in ensuring the long-term sustainability of traditional weaving practices. The next section examines how craft-based learning serves as a crucial vehicle for transmitting textile knowledge across generations.

2.3 Craft Based Learning in Intergenerational Education

Intergenerational education refers to the exchange of knowledge, skills, and values across different generations, often in families and communities. This form of learning existed long before formal education, traditionally taking place in multigenerational households where elders would pass down knowledge such as craft skills and cultural traditions through daily interactions (Trujillo-Torres et al., 2023). This learning process allows older generations to share their

experiences and knowledge while younger generations gain a deeper understanding about history and culture. This process not only helps preserve cultural heritage but also strengthens community bonds (Trujillo-Torres et al., 2023). Understanding the value of intergenerational education, particularly in preserving cultural identity, emphasizes the importance it is to my research on how technology might facilitate the generational transmission of Mayan weaving skills.

A review of literature about the importance of craft knowledge highlights its role as an intergenerational learning model that not only provides skill transmission but also supports cognitive and motor development. Craft-based learning, whether within families or in formal education settings, engages younger generations in hands-on activities that enhance developmental plasticity and motor skills (Veeber et al., 2015). In *A discussion of the necessity of craft education in the 21st century*, the importance of craft education for preadolescents (ages 10–16) is emphasized, as this period is especially sensitive to developmental, social, and educational influences. In countries like Estonia and Finland, crafts remain a permanent part of the school curriculum, recognizing the developmental and educational needs of preadolescents (Veeber et al., 2015). These findings are relevant to the research as they highlight the advantages of craft education for younger generations and can inform the design of technology to support the preservation of weaving traditions. Understanding the advantages of craft education suggests a direction for creating a digital tool that can teach weaving skills but also engage younger generations in ways that support their cognitive and motor development.

When developing tools that use technology for intergenerational education and knowledge transfer, it is important to consider the unique communication and learning styles of

each generation. Insights from the paper *From the Traditionalists to Gen Z: Conceptualizing Intergenerational Communication and Media Preferences in the USA* (Gao, 2023) provide useful guidance in this area. For example, majority of Baby Boomers have embraced social media platforms like Facebook to stay connected with family and friends, but prefer tangible, non-digital forms of communication. While Gen Z, having grown up as digital natives, is highly comfortable with technology (Gao, 2023). This comfort opens up possibilities for educational models that leverage digital platforms to bridge the generational divide. To effectively foster intergenerational communication, tools must be designed with each generation's preferences in mind, using familiar digital formats for younger users while remaining accessible and intuitive for older generations. This approach ensures that digital tools not only facilitate knowledge exchange but also engage both young and older participants in meaningful ways (Gao, 2023).

In line with the themes explored in the literature review regarding the challenges faced by traditional crafts and efforts towards their preservation, the objective of this study is to explore the role of technology in the intergenerational transfer of weaving knowledge within Guatemalan textile traditions. Technology has the potential to facilitate the intergenerational transfer of weaving knowledge within Guatemalan textile traditions by making this knowledge more accessible and engaging for the younger generation, while also preserving this heritage through documentation of weaving techniques, creating digital tools for education, or finding other innovative ways to pass down the art of weaving**.**

2.4 Role of Technology in Craft Revitalization and Intergenerational Communication

The use of technology in craft revitalization has helped artisans worldwide adapt to modern challenges while preserving traditional techniques. In response to competition from global markets, hand-knot rug artisans in India are using computer software to streamline the labour-intensive process of weaving carpets (Gupta, 2024). Computer software has been developed to generate talim codes, a traditional method used to guide the weaving process (Gupta, 2024). This technology has made the process of rug-making easier, with artisans now being able to create rugs faster with fewer errors (Gupta, 2024). It is important to note that the traditional technique of hand-weaving the carpets has remained unchanged, with technology primarily improving the design phase of production. Carpet designer Shahnawaz Ahmad, states "If the [Handicrafts] department hadn't taken this step, maybe this trade in handwoven carpets would have died in a few years". (Gupta, 2024). This case illustrates how technology can help boost productivity and quality while also preserving traditional handicrafts. It also provides information on how similar approaches could benefit the transfer of weaving knowledge within Guatemalan textile traditions.

Beyond enhancing production, technology has also been used to facilitate the transmission of cultural knowledge across generations. Elders, especially grandparents, often play a central role in transmitting cultural knowledge, history, and culture to younger generations, serving as "curators" of intangible heritage (Moffatt, David, & Baecker, 2013). This intergenerational connection, while traditionally reliant on face-to-face interaction, has increasingly turned to technology as a mediator in maintaining these bonds over physical distance. Existing research, such as the "Shared Stories" project, illustrates how digital tools can be designed to support cultural and heritage knowledge sharing within families. The “Shared

Stories" tool facilitates intergenerational connection between grandchildren of all ages and grandparents using family history, this asynchronous digital storybook allows grandchildren to select photos and send audio messages to ask their grandparents to share stories behind images (Moffatt et al., 2013). The audio message and photo are sent to the grandparent via a wireless picture frame, allowing the grandparent to send an audio message in return. The team intentionally decided to incorporate asynchronous audio messaging as it creates a more personalized interaction while accommodating to the busy schedules of young adult grandchildren who may not always be available for in-person interaction. These features were determined by surveys conducted with older adults regarding their experiences with communication technology and family history archiving practices (Moffatt et al., 2013). Tools like the "Shared Stories" project foster storytelling and interaction across generations, strengthening intergenerational bonds and offering platforms for the preservation of family and community histories (Moffatt et al., 2013).

Applying this framework to the preservation of Mayan weaving, technology could enable elder weavers to share their knowledge with younger generations through digital platforms that document and showcase weaving techniques, patterns, and their cultural meanings. For example, video tutorials, virtual workshops, and mobile apps could be employed to facilitate learning even when younger individuals are physically distant from their communities. These systems allow younger generations to engage with elders at their own pace, accommodating busy or modern schedules while still fostering meaningful exchanges. In the context of weaving, this could mean younger participants could access pre-recorded lessons or live discussions about weaving techniques, enabling them to learn and practice remotely. This flexibility helps ensure that

weaving knowledge is transferred across generations despite physical separation or shifting interests among younger people, offering new pathways for keeping traditions alive in the digital age.

While technology has played a significant role in craft revitalization, its misuse can also threaten the very traditions it seeks to preserve. One of the key tensions in craft is how digital technologies are redefining what it means to create. In the case of digital tooling, it is now "unnecessary to hold electric tools in most cases, and the outcome derived from digital tooling is predetermined, without imperfections." (Song, 2022, p. 2369). This shift prioritizes efficiency and precision over human touch, raising concerns about whether traditional craft practices like Maya weaving could be reduced to mere mechanized processes rather than cultural knowledge. If technology reshapes the definition of craft itself, there is a risk that traditional weaving could be perceived as outdated or even replaceable by automated processes, undermining its role as a carrier of cultural identity. Rather than just adopting new tools for efficiency, the role of technology in craft revitalization should also focus on supporting intergenerational knowledge transfer by enhancing access to learning materials and preserving traditional techniques.

The literature highlights the challenges faced by Maya weaving traditions, from colonial oppression and economic pressures to the modern threats posed by globalization and the COVID-19 pandemic. Efforts to preserve handcraft traditions include intergenerational education, craft-based learning, and digital interventions. Research on intergenerational knowledge transfer highlights the importance of hands-on learning and adapting teaching methods to different generations' communication styles. Studies on craft revitalization show that

technology has played a role in documenting, teaching, and sustaining traditional crafts worldwide. However, when it comes to Maya weaving in Guatemala, most preservation efforts focus on cultural appreciation or economic sustainability, with little research on how technology can directly support knowledge transfer between generations. This study aims to bridge that gap by exploring how technology can be leveraged to support the intergenerational transfer of weaving knowledge in Guatemala.

CHAPTER 3: METHODOLOGY

This project adopts a human-centered participatory design approach, aiming to explore the preservation and transmission of weaving knowledge within local communities in Guatemala. Research methods included self-ethnography through hands-on weaving sessions, interviews, and focus groups with weavers to document generational weaving experiences and gather insights about how the weaving knowledge is currently being passed down and any challenges.

A key theoretical foundation of this methodology is the Epistemologies of the South framework, developed by sociologist Boaventura de Sousa Santos. This framework advocates for recognizing and valuing diverse forms of knowledge, particularly those that exist outside of Western knowledge and those that have been marginalized by Eurocentric perspectives. Santos argues that "we are facing modern problems for which there are no longer modern solutions" (Escobar, 2017, p. 67). This statement reflects the idea that many contemporary global challenges stem from the dominant and modern ways of thinking, which are often rooted in Eurocentric, capitalist, and individualistic ideologies. These systems, which created the problems, are now insufficient to solve them. To address these complex issues, Santos proposes turning to alternative ways of understanding, particularly those marginalized by Western frameworks. Central to this idea is the concept of the pluriverse, which suggests that the world is not a single reality ruled by one dominant worldview, but rather made up of multiple worlds, each shaped by different cultures, knowledge systems, and experiences (Escobar, 2017, p. 68). This framework encourages a critical reflection on design practices, questioning whether they

continue the exclusion of non-Western knowledge or can help contribute to a more inclusive and broader understanding of alternatives to existing systems (Escobar, 2017).

In the context of my project, the Epistemologies of the South framework provides a helpful way for examining the role of technology in preserving Maya weaving traditions. By recognizing and valuing Indigenous knowledge, the framework aligns with my goal of exploring how digital tools can support intergenerational knowledge transfer in a way that respects traditional Maya practices. Weaving knowledge in these communities is often passed down through oral traditions and storytelling, which are integral to how cultural practices are transmitted. This is why my methodology includes participatory methods like interviews and focus groups, providing weavers the opportunity to share their experiences and insights in their own words and images. Through this lens, my research not only seeks to preserve cultural heritage but also aims to contribute towards more inclusive design practices that challenge dominant knowledge systems.

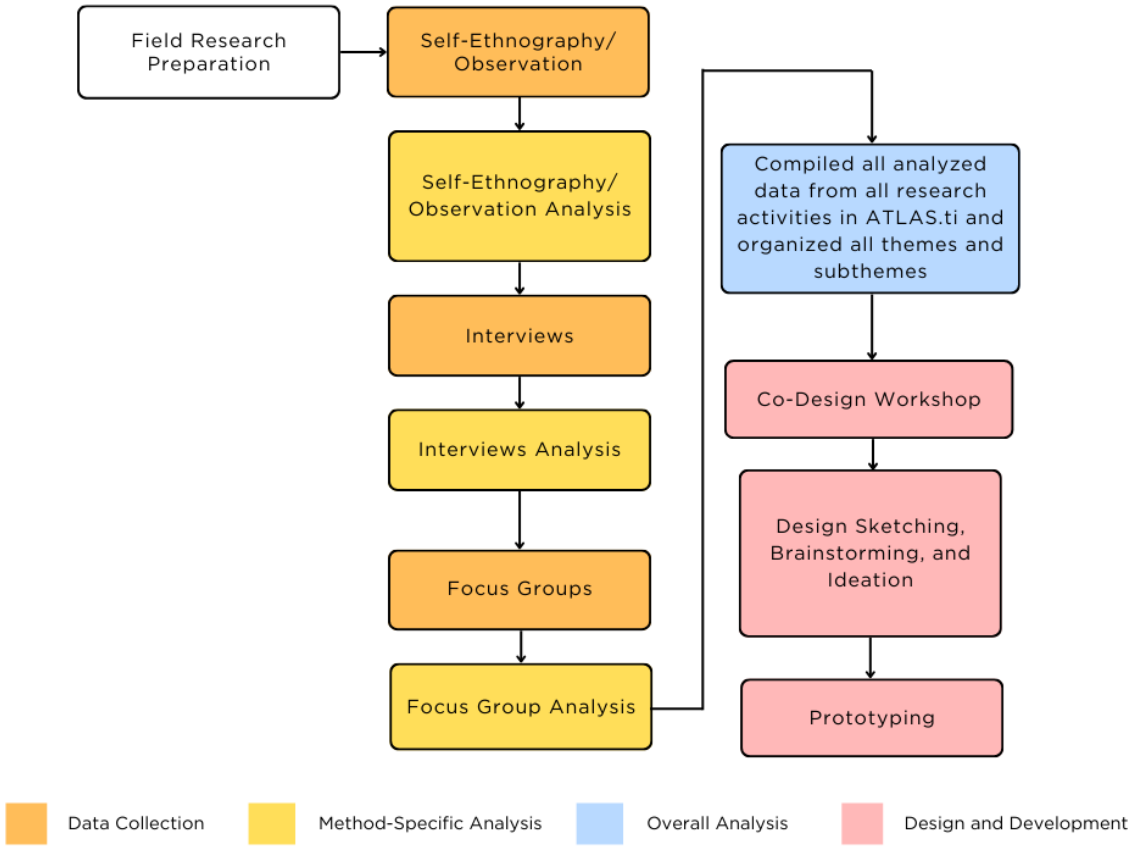

Figure 1. Methodology and Design Process

The research methodology was designed with the framework in mind, prioritizing collaboration and ensuring that participants' knowledge and experiences shaped the study. The project worked with Batz Asociación, a women's weaving cooperative located in San Juan La Laguna.

As someone who is half Guatemalan and half Ecuadorian, I have a personal connection with Guatemala. During a previous visit to Guatemala, I reached out to Batz Asociación to take a backstrap weaving class, motivated by my interest in textile arts. Through that initial experience,

where I created my first woven piece, I also became aware of growing concern that fewer young people are learning to weave. This experience stayed with me, and when this research project began, Batz Asociación was the first organization I contacted.

Research activities brought together participants from different age groups, fostering discussions and exchanges of perspectives on the transmission and challenges of weaving knowledge. The overall process, from field research preparation to the finalization of the design, is depicted in Figure 2. The process begins with field research preparation, followed by self-ethnography/observation to gain firsthand experience with weaving, providing insight through personal reflection and immersion in the practice. Then, thematic coding from self-ethnography informs the development of interview questions. Interviews were chosen because they provide a personal and in-depth space for participants to share their individual experiences with weaving knowledge transfer. After the interviews, the transcripts and notes were analyzed using thematic coding to identify recurring themes, subthemes, and key insights. These findings were then used to guide the design of focus group questions. Focus groups were selected to encourage a community-based dialogue, where participants from different generations can discuss shared challenges, successes, and strategies for preserving and passing on weaving traditions. The focus group analysis stage was where the data was examined to identify new themes or insights that emerge from group discussions. After the focus group analysis, data analysis was conducted to synthesize all the collected data from self-ethnography, interviews, and focus groups. The insights from the data analysis then guide the co-design workshop, where participants actively engage in brainstorming solutions. Following the co-design workshop stage, the design sketching, brainstorming, and ideation phase begins. In this phase, insights and concepts

gathered from earlier research methods and the co-design workshop are translated into initial design concepts. The process moves into the prototyping phase, where the refined concepts are turned into prototypes.

3.1 Self-Ethnography

Figure 2. Woven piece created during self-ethnography session

As part of the self-ethnography, the process of creating a piece on the backstrap loom (Figure 3) was done under the guidance of an expert weaver from Batz Asociación, a teacher who shared their weaving knowledge and techniques throughout the process.

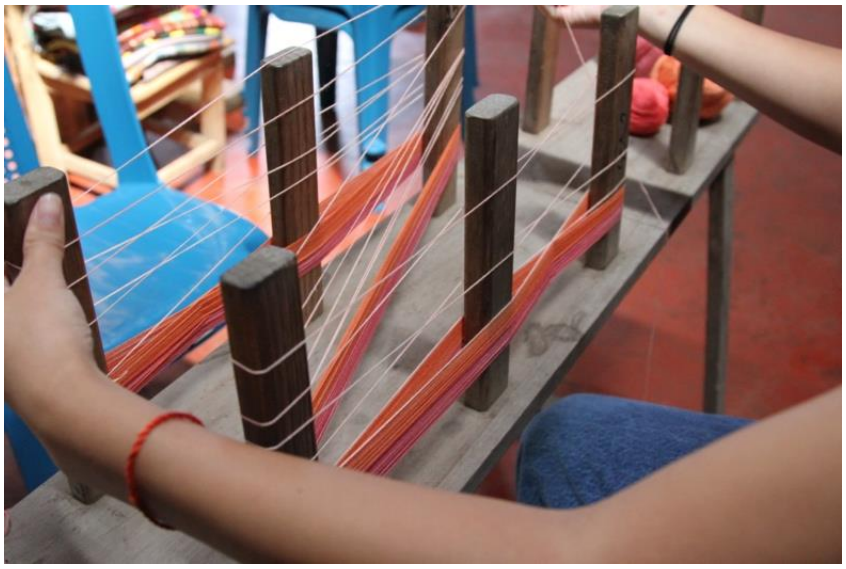

Figure 3. Preparing the thread for the loom by using the warping frame.

Figure 4. Wrapping yarn around stick to prepare the shuttle/bobbin.

The process, completed over two days, included spinning cotton to create the thread, warping threads on the warping frame (Figure 4), preparing the shuttle stick (Figure 5), and weaving a tapestry. The warping stage required threading yarn through the heddle sticks and arranging it on a frame, which established the foundation for weaving (Figure 4). Each step demanded considerable skill, precision, and patience. For instance, the warping process was challenging due to the thin threads and the need to maintain the crisscross pattern accurately. Any small misalignment in this stage can compromise the whole loom setup, resulting in holes or a distorted weave later on.

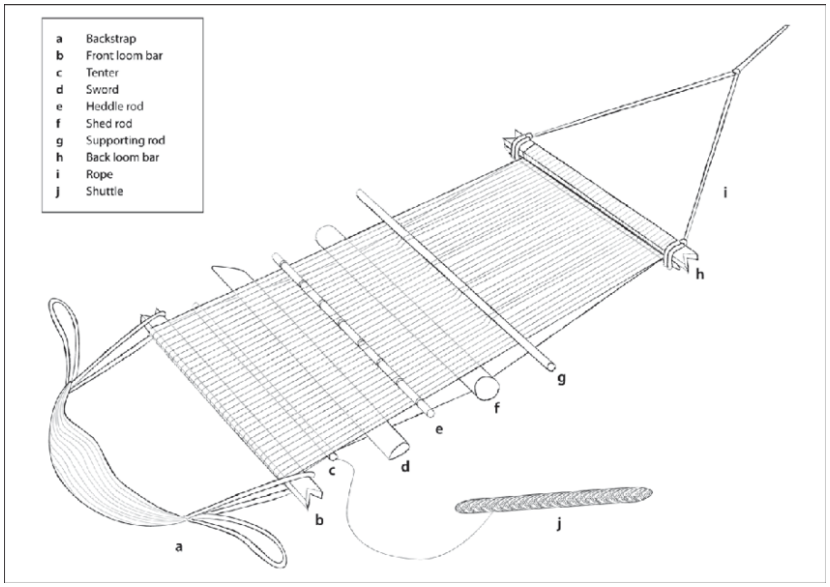

Figure 5. Diagram of the parts of a backstrap loom. From Toolkits and cultural lexicon: An ethnographic comparison of pottery and weaving in the northern Peruvian Andes, by L. Andrade and G. Ramón, 2014, Indiana, 31, p. 300. Copyright 2014 by Indiana.

To create a simple pattern on the backstrap loom, the following steps were followed. Figure 5 presents different loom components.

1. Pass the bobbin through the weaving toward the left.
2. Lay the flat wooden stick flat inside the weaving.
3. Hold both the thick stick at the top and the smaller stick that is threaded through the warp and perform a slight "up-down" motion to open the shed (an opening in the warp).
4. Remove the flat wooden piece, insert it into the opening and push it down to tighten the weft.
5. Stand the flat wooden piece upright to open a new shed, then pass the bobbin through toward the right.
6. From the center, pull the small threaded stick up toward you to open another shed, adjust the tension by leaning forward slightly to loosen the weaving.
7. Remove the flat wooden piece, insert it into the opening, and push it down to tighten the weft.

This hands-on engagement provided insights into the physical and cognitive demands of learning to weave. Precision, coordination, and patience were essential, particularly in managing thread tension and correcting misaligned threads. The process also demonstrated how integral hands-on knowledge is when learning weaving. Small actions, such as pulling the thread with the correct amount of force or adjusting one’s body position to create the right tension, are skills learned through physical practice rather than just observation. An additional layer of insight emerged from the economic challenges of teaching weaving. For many artisans, weaving is a primary source of income, and dedicating time to teach others often comes at the cost of valuable production hours. The labor-intensive and time-consuming nature of the craft also highlighted the shift among some artisans toward pre-spun, pre-dyed commercial yarns. Furthermore, the economic pressures and competition from machine-made textiles were evident as factors threatening the continuity of traditional methods.

3.2 Interviews

Semi-structured interviews with seven women artisans ages 30-70 were conducted as part of contextual inquiry to gather individual perspectives on weaving practices, the transmission of weaving knowledge to young people, and the challenges faced by different generations in teaching and learning the art. Each participant was interviewed individually, following a semi-structured format that allowed for the exploration of topics that came up naturally during the conversation. The interviews, lasting approximately 20 minutes each, were guided by open-ended questions about the weaving experience designed to encourage discussion. Participants were asked about their weaving background, how they learned to weave, and the significance of weaving in their lives. The conversations also explored intergenerational knowledge transfer, including how weaving is taught, changes in learning methods over time, challenges in passing down knowledge, and ways to encourage younger generations to engage in weaving. Data was collected through audio recordings and detailed notes, with transcripts later analyzed to identify recurring patterns and themes. The complete list of interview questions can be found in Appendix A.

3.3 Focus Groups

One focus group session with four artisans was conducted to enable the exchange of ideas and experiences among participants, aiming to uncover collective insights and community dynamics. All artisans were women weavers aged from their mid-30s to late 50s, capturing a range of adult generational perspectives. The session lasted about an hour and was designed to encourage open discussion on how participants perceive the teaching and learning process of

weaving within their community, as well as the challenges they face. The complete list of focus group questions can be found in Appendix B. During the focus group, participants discussed their personal experiences with weaving, how they initially learned the craft, and their perspectives on how weaving knowledge is traditionally passed down within the community. These questions were developed based on the thematic analysis of earlier interview and self-ethnography results, aiming to uncover sub-themes and gather more detailed insights.

3.4 Data Analysis

The data analysis in this study involved thematic coding after every stage of data collection. Thematic coding aims to understand the data fully by identifying patterns and themes through continuous review (Wan, 2017). During the self-ethnography, focus groups and interview sessions, detailed field notes were taken, and sessions were audio recorded for documentation and analysis. Thematic coding was applied to transcriptions of these audio recordings and notes in Atlas.ti, enabling the identification of recurring themes and patterns.

CHAPTER 4: Results

This chapter presents the key findings from the research organized by emerging themes. To begin, after analyzing the interview data I compiled all the themes from the self-ethnography and interviews, into a co-occurrence chart (see Figure 7) as an interim step to inform the development of focus group questions. A final chart was later developed to capture the co-occurrence across all research activities, presenting the central themes, subthemes, and supporting participant quotes (see Figure 8).

	Craft Conservation	Financial Challenges	Income Source	Generational Differences	Embodied Learning	Interest	Learning Strategy
Craft Conservation		4	4	3	1	4	7
Financial Challenges	4		4	1		9	
Income Source	4	4		7		2	3
Generational Differences	3	1	7		2	1	5
Embodied Learning	1			2		1	7
Interest	4	9	2	1	1		3
Learning Strategy	7		3	5	7	3	

Very Low Low Medium High Very High

Figure 6. Co-occurrence chart showing the themes and sub-themes identified from self-ethnography and interview analysis.

The strongest co-occurrence is between Interest and Financial Challenges (9), suggesting that economic struggles significantly impact engagement with weaving. Similarly, Generational Differences and Income Source (7) indicate that younger and older generations view weaving's

financial potential differently, reflecting shifting economic priorities. After this process**, s**ome themes were organized into sub-themes to reflect more specific aspects of the findings. This structured analysis phase also informed the development of the focus group questions, allowing me to explore these themes further and gather more detailed information and nuanced sub-themes.

Themes	Subthemes	Description	Quotes
Craft Conservation		This theme focuses on the ways weaving traditions are preserved and maintained. Participants discussed how traditional weaving practices are safeguarded through community efforts and mentorship.	" I have a grandkid who is 7 years old, and I have taught her (to weave), if I didn't teach her then the weaving knowledge would end there. The weaving knowledge is being passed and she is carrying that tradition." (Interview Participant, 58)
Financial Challenges	1. Income Source 2. Challenges	1. Many participants emphasized that weaving is their primary source of income, particularly because they did not have the opportunity to attend school. Some describe weaving as a flexible job that enables them to balance work with caregiving responsibilities. 2. Many weavers mentioned relying on their craft as their primary source of income, yet selling their pieces is not always consistent or reliable. Some mention difficulties in finding customers. These financial uncertainties create stress, making it difficult to depend solely on weaving for survival.	"For me too, it (weaving) was for the money but also I did not study/have an education and my mom only knew how to weave. So for me, that's why I was interested in weaving. Just like how my friend said, when we sell one weaving piece, we are able to put food on the table." (Focus Group Participant, 58)

Generational Differences		This theme explores how weaving practices, motivations, and teaching methods have shifted across generations. Many older weavers learned out of necessity, as weaving was both a livelihood and an expected household skill. In contrast, younger generations have more educational and career opportunities, leading to a shift in the role weaving plays in their lives. Interviewees describe differences in learning approaches.	"When I learned to weave, I suffered a lot, apart from the rocks being used (on their knees) when weaving, if we didn't make stuff or couldn't weave well we would get hit. The flat wooden piece of the loom would be used to hit our hands/knuckles to learn. So it was much more demanding than it is today. Now I teach my kids and grandkids with lots of love and patience." (Interview Participant, 54) "Before, when I first learned to weave as a kid, women did not study or go to school—they stayed in the house, and all the women would weave. Slowly, as the town and community developed, women began to study and go to school." (Interview Participant, 58)
Learning	1. Challenges 2. Embodied Learning 3. Interest 4. Learning Strategy 5. Learning through observation and imitation 6. Muscle memory development 7. Tacit knowledge	1. Participants identified specific difficulties they faced when learning to weave. 2. Embodied learning was shown in both participants' experiences and self-ethnographic documentation. Many aspects of weaving involve physical actions, such as how far to move the body back when pulling the thread. Early learning often begins with simple, hands-on tasks like rolling yarn. These physical interactions play a crucial role in skill acquisition. 3. Participants repeatedly emphasized that interest is	"Learning to weave on the loom, and also setting up the warping frame with the threads is the hardest as there are so many thin strands and the pattern is intricate and it's easy to get confused" (Focus Group Participant, 58) "When I was about 7 years old I started to roll the thread, which is one of the first steps in weaving." (Interview Participant, 35) "Its more difficult when they view weaving like a job/chore. When they view it like that they're not interested. They'll know how to weave but not want to practice." (Focus Group Participant, 54) "A young person learns more faster and is better and weaving

		essential for learning to weave. If a child is not interested, they are unlikely to practice or progress. Many noted that weaving requires dedication and that without genuine enthusiasm, learners tend to give up. Some weavers mentioned that in past generations, weaving was a necessity rather than a choice, but today, interest is a major determining factor in whether younger generations continue the craft. 4. Many weavers agreed that it is easier to teach young children because they can develop skills gradually over time. A common strategy involves starting with small, simple pieces before progressing to larger, more complex designs. 5. Many participants mentioned that when they were young, they first learned by watching experienced weavers before attempting to weave themselves. This was also reflected in the self-ethnographic photos. Sitting beside a skilled weaver and mimicking their hand motions, techniques helped before hands-on practice began. 6. Repeating the same motions over and over helps learners internalize the process. The self-ethnographic photos captured this process, showing repetitive actions performed to solidify	because they need more strength when weaving and an older adult will have less strength/time. (Interview Participant, 58) “When I was young I would watch my mom, then I would learn to roll the yarn and stick, when I was old enough I was able to go on the loom and learn “(Focus Group Participant, 29) “When they (the children) are 6 years old you have to give a small amount of “homework” for about half an hour, they need to wind the thread first. When they are 8-9 years they need to be taught to set (the loom). The other step is the weaving, when they are 12 years old they have to learn how it is down, how everything is placed, how the sticks are placed, it is like a process.” (Focus Group Participant, 58)

		technique. Participants also mentioned that when children are learning, they sometimes receive "weaving homework" to practice for short periods, such as half an hour, reinforcing their muscle memory. 7. Tacit knowledge refers to the skills and understanding that are difficult to articulate but are learned through practice and experience. Many aspects of weaving, such as knowing the right amount of tension to apply or intuitively adjusting body posture, fall into this category.	

Table 1. This table presents the central themes and subthemes identified through self ethnography, participant interviews and focus groups, along with descriptive summaries and representative quotes.

4.1 Self-Ethnography themes

The data collected during the self-ethnography session, including photos, videos and written notes about the process, was analyzed using Atlas.ti, where themes such as learning**,** embodied learning**,** and financial challenges emerged (Table 1). Embodied learning, a sub-theme of learning, was particularly significant in understanding the process. The experience of learning weaving highlighted that it is not something that can be fully grasped through observation alone but requires hands-on practice. This was especially evident during the warping stage, where small mistakes like skipping a thread could disrupt the entire weaving process. The experience demonstrated the precision and patience needed for weaving, emphasizing that learning this craft requires active engagement.

Financial challenges also emerged as a theme, reflecting the economic pressures faced by traditional weavers. The preparation steps, such as spinning, dyeing, and warping, are highly time-intensive, making it difficult for artisans to compete with cheaper, mass-produced textiles. Many weavers choose commercially available pre-made yarn to save time and effort, especially when juggling responsibilities like caregiving and household work. Additionally, teaching weaving comes with its own challenges, as taking time away from production to teach results in lost income. These economic realities contribute to the decline of traditional weaving, as younger generations are drawn to more stable and lucrative career paths. These themes shaped the next phase of research by informing the interview questions. Specifically, after this stage, I sought to understand how long individuals had been weaving, their experiences teaching others, and how weaving knowledge is passed down across generations.

4.2: Interview Themes

The interview transcripts were analyzed using Atlas.ti, where recurring patterns and themes emerged, including income source**,** generational differences, craft conservation**,** learning challenges**,** and interest (See Table 1). One of the most prominent themes was the role of family in preserving weaving traditions. Participants frequently emphasized how knowledge transfer begins within the household, with mothers and grandmothers serving as primary teachers. For instance, one participant shared that when some families do not teach their children to weave, those individuals have to actively seek out opportunities to learn: “Yes, there are people in families where their parents never taught them to weave, but they wanted to learn, so they had to ask me to teach them, and I did.”. Another participant reflected on how weaving traditions have

shifted over time, explaining, “Before, when I first learned to weave as a kid, women did not study and go to school, they were only at the house, so all the women would weave. But slowly, as the town and community developed, women began studying and going to school. Now, there are women who work at offices and don’t know how to weave, and there are some women who still do.” According to her, she believes they are losing the knowledge slowly, so she must teach her grandkid to continue the tradition.

Income source also emerged as a recurring theme, highlighting the dual role of weaving as both a cultural practice and a vital source of income. Participants discussed financial pressures such as inconsistent market demand and limited sales opportunities, which threaten the sustainability of weaving. These challenges often place weavers in a difficult position, balancing the need for economic survival with preserving the cultural significance of their craft.

One participant explained, “For me, weaving is my life—it’s everything because I didn’t go to school and don’t know how to do other things beyond weaving. It’s my source of income. I’m a widowed woman, and I need to buy food and clothes for my kids. Weaving is the only way I can get income, it’s my life.” Another participant shared how teaching her grandchildren to weave was a practical decision, given the economic realities in Guatemala: “Right now, I’m teaching my grandchildren, who are 15 and 8 years old, to weave. Yes, it’s important for them to study and go to school, but often they don’t end up working in their field of study because opportunities here in Guatemala are so scarce, so I teach them to weave so that if they don’t find work in their field of study, they can weave and have an income.”.

Generational differences were another significant theme. Older participants described weaving as central to their cultural and economic lives, whereas younger generations often prioritize education and professional opportunities. As one participant noted, weaving was once a necessity for women who stayed at home, while younger women today have broader aspirations. This societal shift has contributed to the gradual decline in weaving knowledge and engagement. One participant reflected on how weaving was taught in the past, sharing, “My mother taught me to weave, and in those times, we didn’t have chairs, they didn’t exist. I would weave on the dirt floor, which wasn’t paved. When you weave, you move, so I would put rocks on my knees to keep myself secured on the dirt.”. Another participant explained how challenging it was to learn weaving during her childhood: “I learned from my mom, but back then, girls didn’t go to school, only boys did. It was very hard for me to learn to weave. I suffered a lot because I didn’t learn fast enough.”.

The challenge of sustaining interest among younger generations was frequently mentioned. Participants explained that younger individuals often lack the time or motivation to learn weaving, as they focus on other career or educational paths. This declining interest poses a critical challenge to the continuity of this cultural tradition. One participant reflected on the difficulty of teaching those who are uninterested, sharing, “The challenge is teaching adults (to weave) because it’s harder to show them. There are people who are not interested in learning and won’t learn. I have a lot of patience when teaching.” Another participant illustrated this point with a personal example: “Yes, it is more about the interest. For example, I have a niece whose mother, my sister, weaves a lot. But my niece does not because she is not interested. She says, ‘I have to study and become a professional,’ and that’s what she did. She does know how to weave,

but she doesn't do it. There needs to be interest, if they are interested, they'll do it. If not, they won't.". These experiences highlight how personal motivation, and external priorities shape younger generations' engagement with weaving, threatening the tradition's continuity.

Learning challenges and strategies emerged as key themes, highlighting the intricate nature of weaving and the thoughtful approaches required to teach it effectively. Participants emphasized that younger generations benefit most from structured, hands-on learning tailored to their developmental stages. As one participant noted, "A young person learns faster and is better at weaving because weaving requires more strength. An older adult will have less strength, energy and pressure. Younger people will have more strength to make the weavings more perfect.". At the same time, the difficulty of tasks such as setting up the warping frame and managing intricate patterns highlights the need for patient, step-by-step guidance. As one participant reflected, "Learning to weave on the loom and setting up the warping frame with the threads is challenging. There are so many thin strands, and the pattern is intricate, it's easy to get confused.". The insights gained from interviews, particularly regarding generational differences, interest levels, and the strategies used to teach weaving led informed the focus group questions. During the focus groups, I asked more specific questions about interest and motivation in younger generations, as well as the strategies used to teach weaving.

4.3: Focus Group Themes

The focus group conversations revealed detailed insights into how weaving knowledge is passed down through generations. One key subtheme was muscle memory development, with

participants emphasizing that learning often starts at a young age (See Table 1). Children begin with simple tasks like rolling yarn or prepping shuttle sticks, which help them become familiar with the tools and rhythms of weaving. These introductory activities lay the groundwork for mastering more advanced skills, such as setting up a loom or weaving intricate patterns. Tacit knowledge also plays a critical role in this process. Participants described how certain techniques and skills are not explicitly taught but instead absorbed through experience and repeated practice over time. This intangible aspect of learning often defines the expertise of seasoned weavers. Observation and imitation emerged as another important theme. Young learners often sit beside family members, carefully watching their movements and methods before trying the craft themselves. This hands-on, practice-based approach reflects the cultural importance of learning by doing, ensuring that skills and traditions are passed down within families.

Embodied learning, as well as interest and motivation, were recurring themes in the focus group sessions. While some children are naturally drawn to the craft, others view it as a chore, particularly when juggling competing priorities like education or career aspirations. One participant pointed out, “It’s more difficult when they view it like a job or chore. When they view it like that, they’re not interested. They’ll know how to weave but won’t want to practice.” This lack of interest makes it challenging to sustain engagement with the craft, hindering the internalization of the skills over time. Muscle memory development also came up as a theme as participants explained how weaving skills are gradually internalized through repeated practice, allowing learners to build precision and confidence over time. One participant recalled her own early experience with weaving, saying, “When I was about 7 years old, I started to roll the thread, which is one of the first steps in weaving.” (Weaver, age 30, interview). Participants also

described how learning progresses in a structured, step-by-step manner. As one person outlined, “The first step, like my friend said, is to teach step by step. When they are 6 years old, they are given a small amount of ‘homework’ for about half an hour to learn to wind the thread first. When they are 8 or 9 years old, they need to be taught to set the loom. The other step is the weaving, when they are 12 years old, they have to learn how it is done, how everything is placed, how the sticks are placed, it is like a process.” (Weaver, age 58, focus group). This approach not only ensures skill acquisition but also leverages the physical advantages of younger learners.

4.4 Main Themes Across Research Activities

Thematic analysis of the focus group sessions and interviews was conducted using Atlas.ti. Four main themes emerged across all research activities: craft conservation, financial challenges, generational differences, and learning. Themes were identified based on the frequency and significance of topics discussed. For example, if multiple participants spoke about weaving as an economic necessity or a financial challenge, those responses were grouped under the broader theme of financial challenges.

A chart illustrating the occurrence of all main themes and subthemes across all the research activities can be found in Figure 8. Learning was the most common theme across all research activities, with learning strategy being the most frequent sub-theme. This reflects the focus on how weaving skills are taught and passed down. Participants shared step-by-step teaching methods and explained the processes involved in learning the craft. The second most

common sub-theme was embodied learning, highlighting how weaving is a hands-on activity that requires practice to build skill. Learning interest was the third most frequent sub-theme, as participants often mentioned that a child's interest and motivation are key to continuing the tradition.

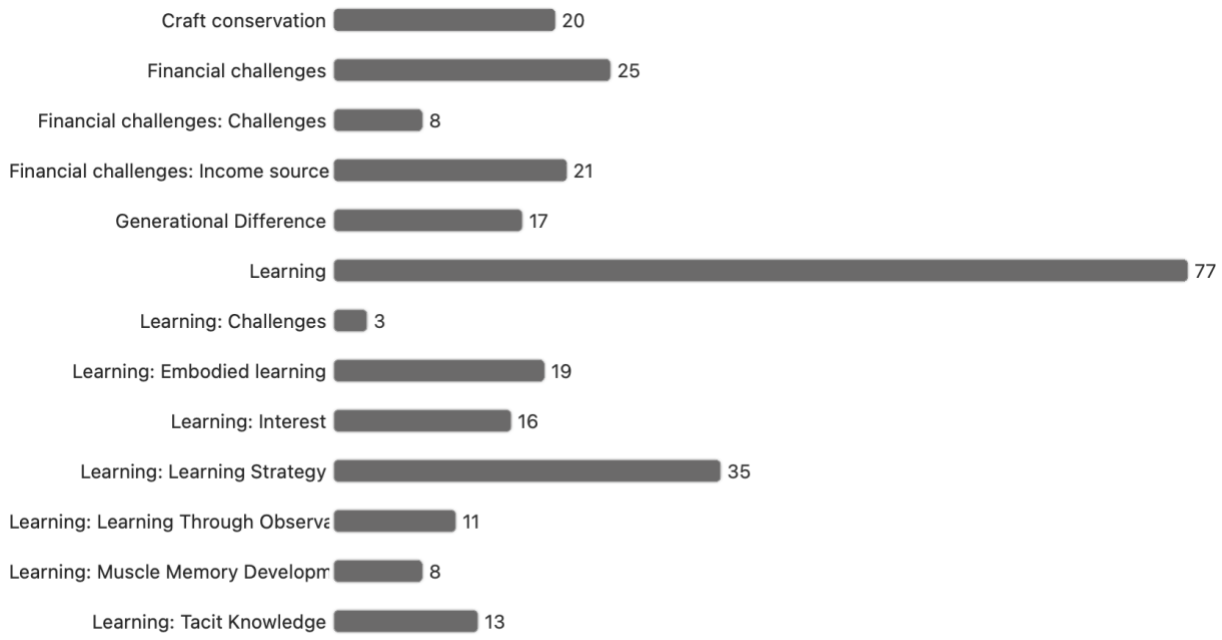

Figure 7. Chart displaying the occurrence of major themes and sub-themes across all research activities, highlighting their relevance and frequency in the study.

The theme of learning was the most common theme and provided insights into the transmission of weaving knowledge, encompassing sub-themes such as learning challenges, embodied learning, interest and motivation, learning strategies, observation and imitation, muscle memory development, and tacit knowledge. Participants described the intricate process of learning to weave, from mastering initial tasks like rolling yarn to gradually internalizing complex techniques through hands-on practice. Personal interest and economic necessity were

identified as critical motivators, while observation and imitation served as the earliest learning strategies for young children. The development of muscle memory and the transfer of tacit knowledge further underscored the embodied and implicit nature of the learning process, highlighting its depth and complexity.

Financial challenges is the second most common theme, encompassing two subthemes: challenges and income source. Participants highlighted the dual role of weaving as both a cultural practice and a source of livelihood. They described the difficulties they face, such as inconsistent market demand and limited sales opportunities, which threaten the financial sustainability of their craft. At the same time, weaving remains a critical income source for many families, enabling them to support themselves and meet essential needs.

Generational differences showed the shifts in engagement with weaving. While older participants described weaving as a necessity for survival and a primary means of earning income, younger generations often prioritize education and professional aspirations. This generational shift has contributed to a gradual decline in interest and active participation in weaving practices, presenting significant challenges to the continuity of these traditions. Craft conservation was also a key theme, with many participants describing efforts to preserve weaving knowledge within their families. There was also concern about the diminishing cultural significance of weaving and an urgent need to safeguard it as a vital aspect of their heritage.

CHAPTER 5: FINAL DESIGN

5.1 Design Process

An online co-design workshop was held with five members of the Social and Technological Systems (SaTS) Lab on January 14 to inform the final design (See Figure 9). The five members are graduate students in design, digital media, and global health, with expertise in graphic design, participatory design, and technology design.

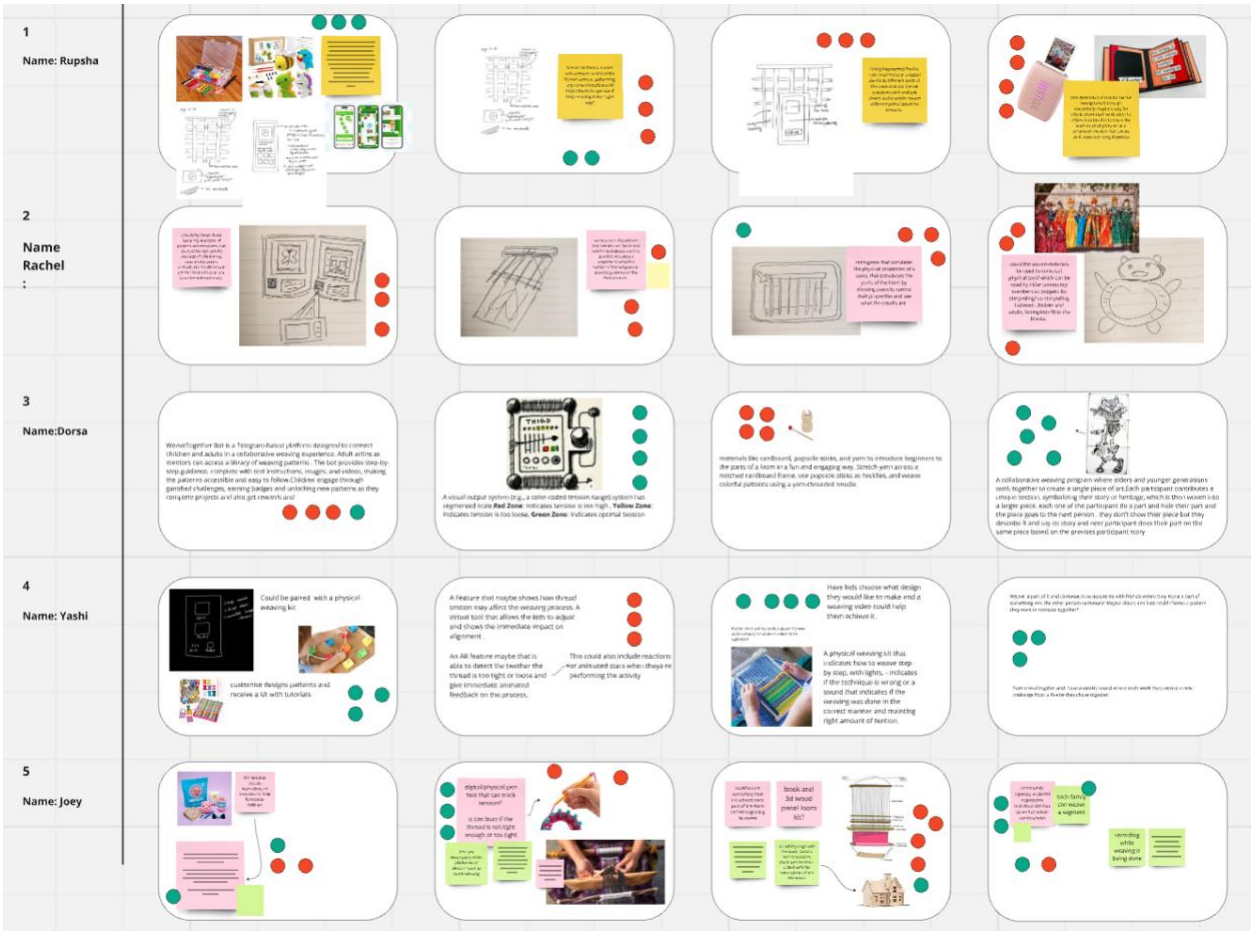

Figure 8. Participant data on the Miro board.

The two-hour session began with a presentation of the themes found from all research activities to provide participants with a necessary background of the project. After the presentation, participants took part in a "How Might We" activity, designed to encourage brainstorming by reframing challenges as opportunities for solutions. A Miro board was introduced with four prompts to guide the discussion and inspire creative problem-solving.

Prompt	How might we create a platform for children that frames weaving as a fun, creative hobby instead of a chore?	How might we design a tool that helps learners understand and maintain proper thread tension in weaving?	How might we design a tool that introduces beginners to the different parts of a loom in an engaging and easy-to-understand way?	How might we create an experience that strengthens the connection between elders and younger generations while learning to weave?
Theme	Relation to Generational Differences: Participants shared that older generations weave out of necessity, but children today are less likely to continue if they see weaving as a chore. This question explores ways to make weaving more appealing for younger generations, so they'll want to carry it on. Relation to Interest: Participants emphasized that	Relation to Embodied Learning: Thread tension is a physical, hands-on skill that weavers learn through feel and repetition. This prompt asks how we can preserve that tactile, physical aspect while designing a digital tool, ensuring the learning experience still feels connected to traditional weaving methods.	Relation to Learning: This question is about helping beginners learn the basics of the loom in a simple and fun way. It makes the process less confusing and helps them feel confident as they start.	Relation to Generational Differences: This question focuses on finding ways to bring elders and younger people together, so they can share weaving knowledge and stories, keeping traditions alive.

	children need to be interested in learning weaving. Framing it as something fun and creative can help spark their curiosity and excitement for the craft.			

Table 2. Table illustrating the co-design workshop prompts and their connection to the research themes.

These prompts were rooted in the main themes identified in my research (See Table 2) For example, the prompt about framing weaving as a creative activity is related to generational differences and the importance of interest, reflecting participants' concerns that if younger generations see weaving as a chore or job, they will not continue the tradition, and their belief that sparking curiosity and excitement could sustain the tradition. Similarly, the prompt on thread tension addressed embodied learning, recognizing that physical, hands-on skills like maintaining tension are deeply tied to the traditional methods of weaving, and how can we incorporate that in a digital tool. The prompt on introducing beginners to loom basics aimed to simplify the learning process and boost confidence, aligning with the broader theme of learning. Finally, the prompt on intergenerational connection focused on bridging gaps between elders and younger people, fostering opportunities for knowledge sharing and the preservation of weaving traditions. Participants quickly brainstormed ideas for each prompt on the Miro board. After generating ideas, each participant explained their concepts to the group. Finally, the group voted on the ideas they felt had the most potential to move forward and those that should not be developed

further. This collaborative process was instrumental in refining the design direction and ensuring that the final design addressed key challenges identified during the research phase.

The final design was shaped through a combination of participant insights from the co-design session, findings from focus groups and interviews, and my own self-ethnography. I revisited the research themes and considered the most common challenges participants described, especially the aspects of weaving they found most difficult to learn, such as maintaining thread tension, internalizing patterns, and building muscle memory. My own experience struggling with these same challenges further reinforced their importance. To process the co-design data, the top-voted brainstormed ideas were categorized based on how well they addressed the major learning barriers identified in the research. For example, many participants stressed that weaving is challenging to learn without hands-on guidance, which resonated with my own struggles in developing pattern recognition and maintaining consistent tension. One brainstormed idea proposed a visual output system with a color-coded tension range—red indicating excessive tension, yellow for tension that is too loose, and green for the optimal range. This concept inspired an integration in the app that provides real-time, color-coded feedback to help learners adjust their tension and improve their weaving skills.

5.2 Tool for Weaving Knowledge Transfer

The proposed tool is a learning platform that integrates a physical mini frame loom with an interactive mobile application to introduce children to the fundamentals of weaving. The mini loom, a simplified version of the traditional frame loom, serves as an accessible entry point for

young learners (See Figure 12). Since the backstrap loom is highly complex, this tool introduces weaving through a step-by-step progression, beginning with basic exercises on the frame loom and ultimately preparing learners for backstrap weaving. The tool utilizes computer vision and body-tracking algorithms to capture the child's interactions with the loom, allowing it to analyze their progress and identify mistakes. This system could leverage depth-sensing or Existing technologies, similar to systems like Osmo, Xbox Kinect and other body-tracking systems, are used to enable motion-tracking and depth-sensing capabilities. These technologies could be adapted for the app portion of the system, enabling it to monitor and analyze a learner's progress through the recognition of hand movements and thread placement (See Figure 10.). The app will provide real-time feedback on key techniques, such as maintaining proper thread tension and following weaving patterns accurately. The app will be able to provide immediate feedback on essential techniques, such as maintaining proper thread tension and following weaving patterns accurately.

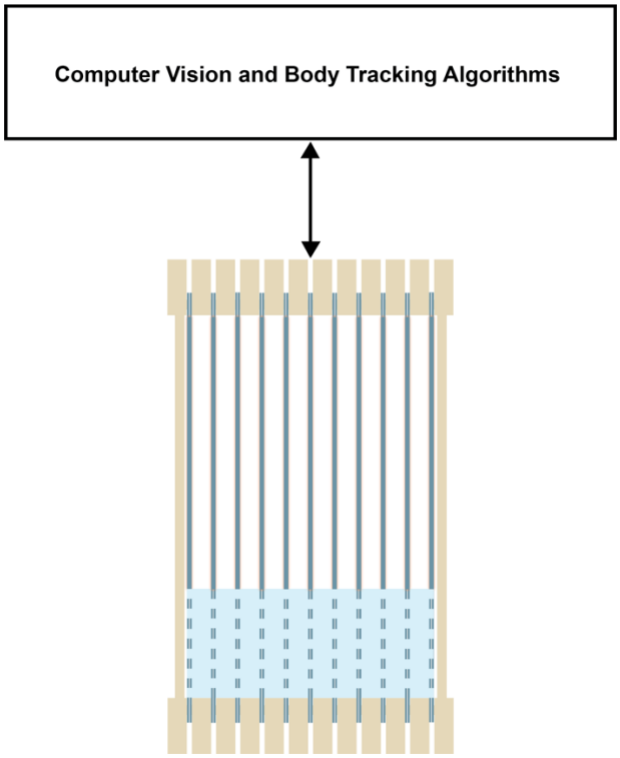

Figure 9. Computer vision algorithms track and monitor the weaving and learning process to capture interactions with the loom tool.

This app is being designed as a conceptual prototype to explore how digital tools can guide embodied learning in children, using interactive cues to support hands-on skill development.

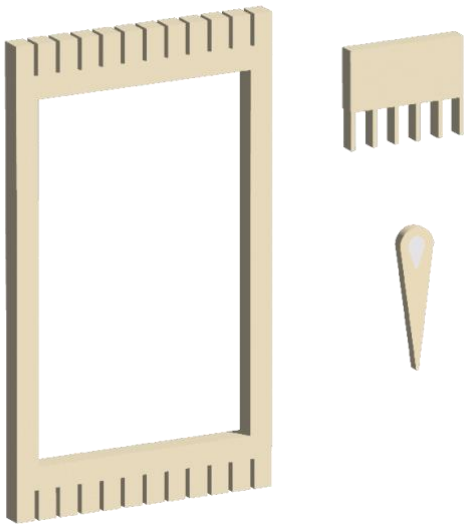

Figure 10. A frame loom with a brush for pressing down the weft and a plastic needle, designed for kids to weave safely. The plastic needle minimizes the risk of injury while ensuring durability for young learners.

This concept aligns with key findings in the research. First, the tool supports embodied learning by ensuring that digital instructions ds not replace hands-on practice but instead enhance the learning experience. While the app provides guidance, children interact physically with the loom, reinforcing the tactile and motor skills essential to weaving. Research on embodied interaction highlights that “affordances offered by body movements” play a crucial role in how children engage with interfaces, products, and spaces (Desai, Blackler, & Popovic, 2019, p. 6). By integrating both physical and digital elements, the tool fosters sensorimotor learning, allowing children to develop a deeper understanding of weaving techniques. Second, it addresses interest and engagement by incorporating gamification into the learning process. The app includes rewards, and different levels to make weaving more engaging for children and

encourages consistent practice and motivation. Third, the tool aligns with learning strategies by targeting the same age range in which weaving is traditionally introduced, children between 6 and 12 years old. Many weavers also have limited time to teach due to economic constraints, this tool allows children to learn independently at their own pace while still incorporating parental or teacher involvement. A dual-interface system enables parents and educators to log into the app where they can monitor progress, weaving time, and detected errors, offering support as needed. This tool does not replace mentorship but rather augments it, making sure that the weaving knowledge continues to be passed down in a hands-on and engaging way. Additionally, its flexible design allows for integration into different learning environments, such as schools as part of the curriculum, after-school programs, or home learning settings, for broader engagement.

Figure 12. The app's dual login screen allows users to enter as a learner or a teacher, tailoring the experience to their role.

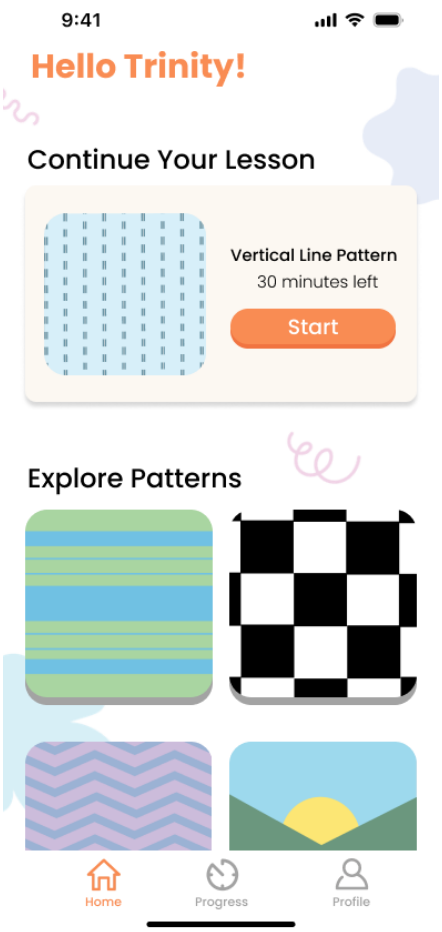

Figure 11. The student homepage provides options to select a weaving pattern or continue an ongoing lesson.

The first screen users encounter is the dual login screen, which allows them to enter as either a learner or a teacher, tailoring the experience to their specific role (see Figure 11). This role-based access ensures that both learners and teachers have appropriate tools and interfaces to meet their needs. Once logged in, learners are directed to their homepage, where they can select from new lessons that they can start, as well as options to explore additional patterns (see Figure 12). This layout helps to keep the user's learning experience organized and easily navigable, allowing them to track their progress and quickly access relevant content.

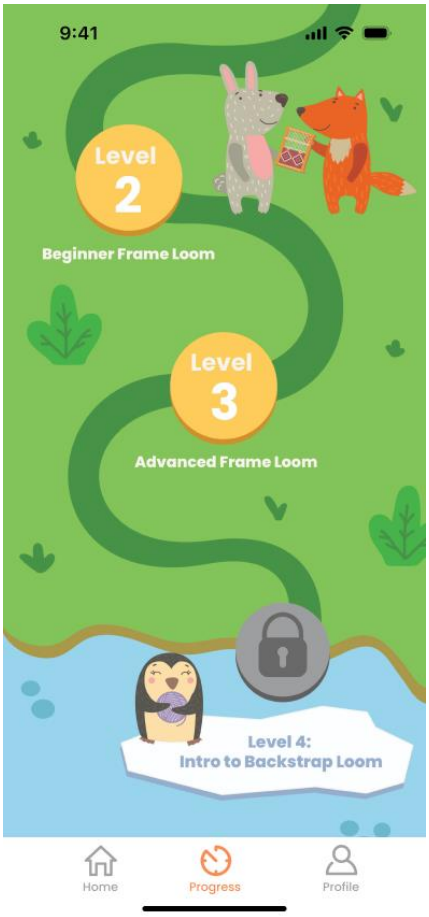

Figure 13. The progress page visualizes different achievement levels, helping learners track their weaving journey.

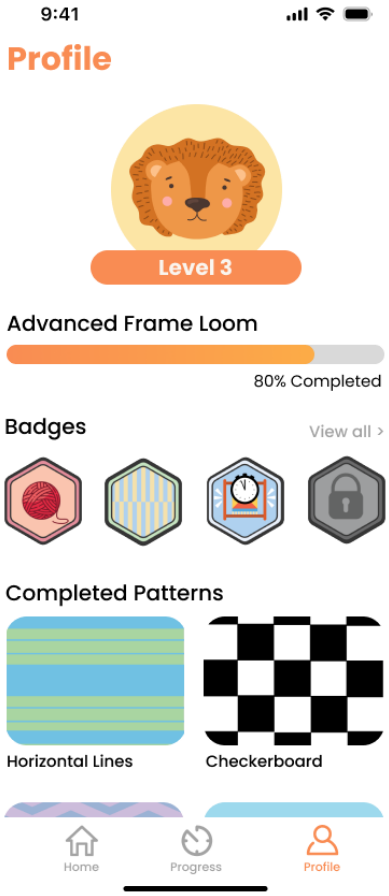

Figure 14. The profile page displays completed patterns, earned badges, and the user's current progress within their level.

An important aspect of the app's design is its integration of gamification to make the learning process more engaging for younger users. The progress page visualizes different achievement levels, making the learners' journey feel like a fun challenge. As they progress through the lessons, users can unlock new levels (see Figure 13). In addition, the profile page provides an overview of each user's completed patterns, earned badges, and their current progress within the app's levels (see Figure 14). This feature not only showcases the user's progress but also presents fun patterns that can be unlocked as the learner practices and advances

through different stages. It helps keep the experience motivating by giving learners a clear visual of their achievements and what's still to be unlocked.

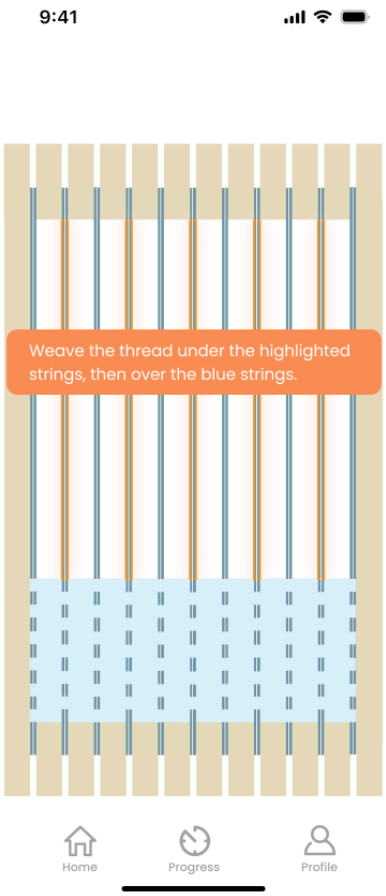

Figure 15.The weaving screen provides live, step-by-step instructions, visually guiding learners on which threads to weave under and over.

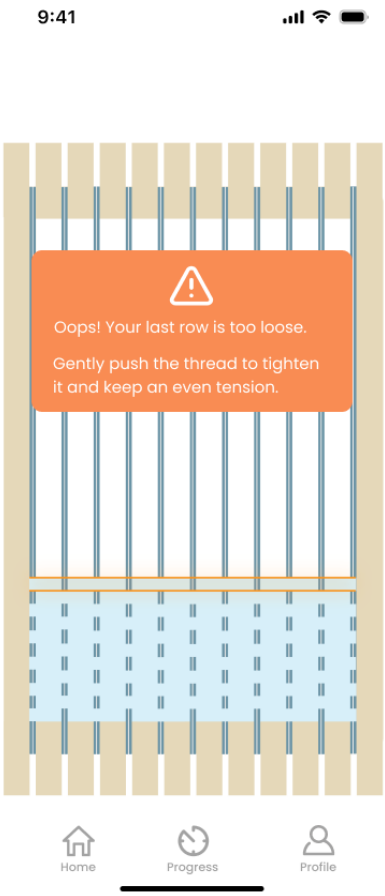

Figure 16. The weaving screen provides real-time guidance, detecting errors and offering instant feedback to help learners correct their weaving patterns.

A key feature of the app is the weaving screen, which provides live, step-by-step instructions to guide learners through the weaving process. The screen on the iPad displays a design or illustration of the learner's loom, reflecting their current progress in real-time. As they weave, the app highlights the threads that need to be woven under or over, offering a clear visual of what needs to be done next (see Figure 15). This feature is helpful because weaving with so

many thin strings can be tricky for beginners, and the highlighted strings ensure that learners stay on track throughout the process. In addition to providing step-by-step guidance, the weaving screen also offers real-time error detection and instant feedback to help learners correct mistakes as they go (see Figure 16). Weaving is a delicate process, and even a small mistake can sometimes ruin the entire piece. However, it's often difficult to spot exactly where the error is, and undoing the work to fix it isn't always an option. This feature helps by immediately highlighting any errors, allowing learners to quickly correct them before they become a biggerissue.

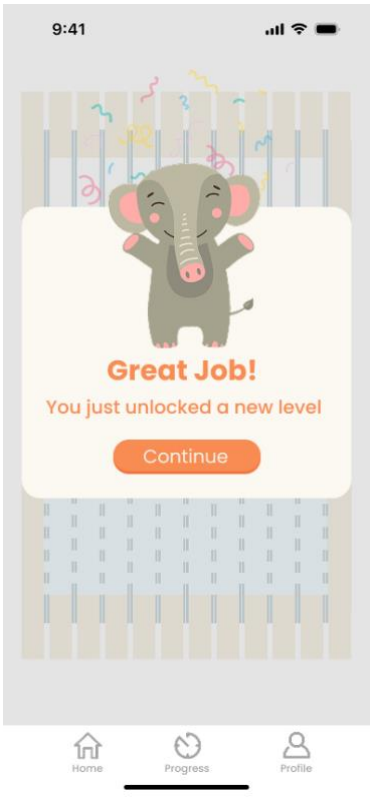

Figure 17. Upon finishing a pattern, learners receive a completion message and unlock a new level.

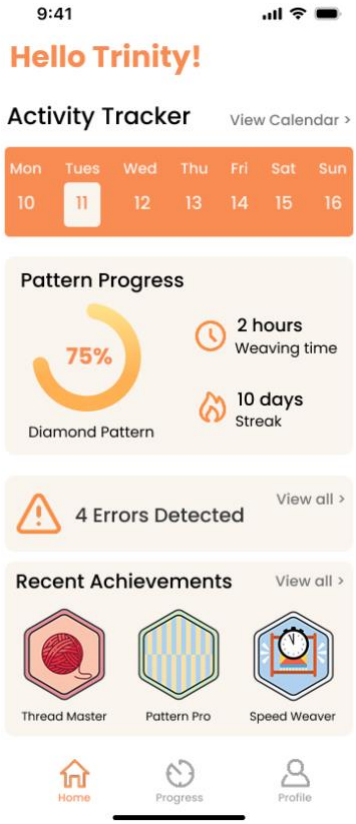

Figure 18. The parent dashboard provides an overview of the child's weaving activity, including daily pattern progress, time spent weaving, streaks, recent achievements, and any detected errors

Once learners finish a weaving pattern, they are greeted with a fun and celebratory completion message, marking the end of their current level and unlocking the next one (see Figure 17). For parents and teachers, the app offers a dedicated dashboard that provides an overview of their child's weaving activity (see Figure 18). This dashboard displays key information, such as the child's daily pattern progress, time spent weaving, streaks, recent achievements, and any errors detected during the session. This helps parents and teachers stay involved and offers insight into their progress while also highlighting areas where additional practice may be needed.

Figure 20.The child progress page visualizes weaving growth over time, highlighting strengths, areas for improvement, and upcoming levels. Parents can preview the next level to see what their child will learn next.

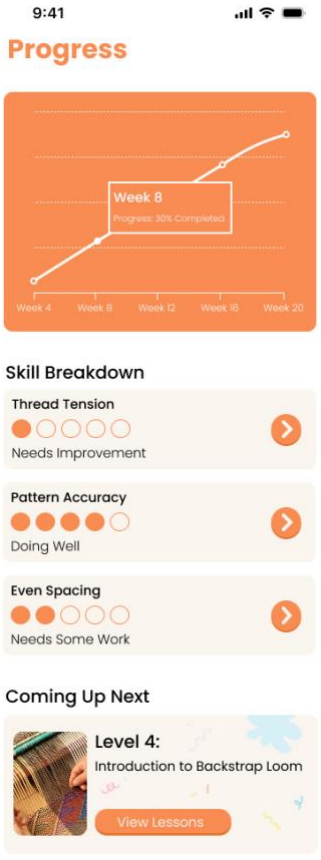

Figure 19. The graph tracks the child's weaving progress over time, showing the percentage of the level completed each week.

In the parent and teacher interface, the child progress page offers a visualization of the learner's growth over time (see Figure 19). This page highlights the child's strengths, areas for improvement, and upcoming levels. Additionally, a skill breakdown is provided to pinpoint specific areas where improvement is needed, making it easier for parents and teachers to offer targeted support. To further track progress, a graph displays the child's weaving achievements over time (see Figure 20). This graph shows the percentage of the level completed each week, providing a clear, visual representation of the child's progress. They can also click on individual skills, which takes them to a dedicated screen with resources on how to help the child improve in those areas, including extra lessons or activities they can provide (See Figure x)

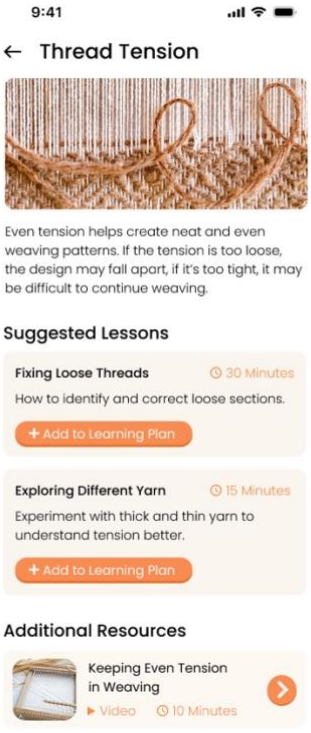

Figure 21. Example of a skill detail page displaying targeted lessons and resources to support improvement in a specific area.

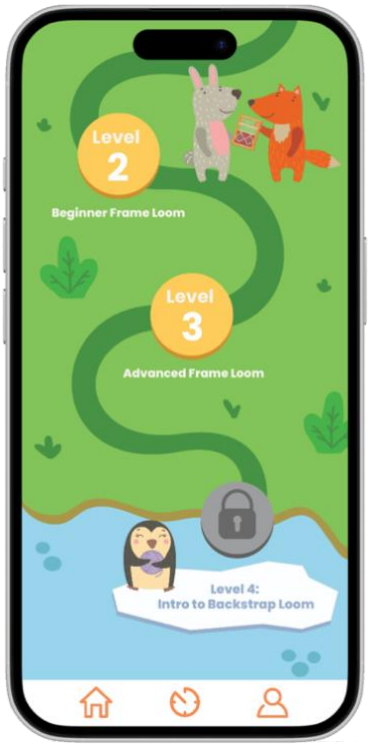

Figure 22. App interface displayed on a mobile phone

CHAPTER 6: LIMITATIONS AND FUTURE WORK

Due to time constraints, I was unable to conduct interviews with children, which meant direct insights from younger learners were not included. Additionally, the scope of participants was limited to members of Batz Asociación. While this provided valuable perspectives, a broader range of experiences could have been captured by including women from different weaving organizations across Guatemala. Future research could expand the participant pool to include weavers from various regions and organizations to gain a more comprehensive understanding of intergenerational knowledge transfer. Additionally, testing the app with children would provide valuable feedback on how younger learners interact with the tool. Another key consideration for future work is language accessibility to ensure that any tools developed are available in Indigenous languages. Further community consultations and design iterations will be required to shape a tool that is not only functional but also embraced and accepted by the community it aims to serve.

CHAPTER 7: DISCUSSION

This study looked into the potential role of technology in supporting the preservation of Maya weaving traditions in Guatemala for future generations. Through self-ethnography, interviews, and focus groups, weavers shared their experiences, highlighting both the challenges they face and the opportunities for keeping their traditions alive.

The findings reveal that weaving knowledge is primarily passed down within families, with mothers and grandmothers playing a central role as teachers. This process depends on embodied learning, where skills are developed through hands-on experience rather than just observation. However, the transmission of this knowledge is becoming less common due to shifting generational priorities. While older weavers see the craft as both a cultural tradition and a source of financial stability, younger generations are increasingly focused on formal education and career opportunities outside of weaving. As a result, fewer young people are learning and practicing the craft, putting its continuity at risk.

Despite these challenges, technology presents an opportunity to support the intergenerational transfer of weaving knowledge by providing new ways to engage younger learners. Based on the research themes, this study proposes a hybrid learning platform that integrates a physical mini frame loom with an interactive app. By incorporating digital feedback and gamification, this tool provides an option for learning that connects with kids growing up in the digital age.

This research highlights the importance of supporting and sustaining Maya weaving traditions. By exploring how technology can complement traditional learning methods, this study

contributes to efforts to preserve Indigenous knowledge and provides insights that could inform future initiatives in cultural heritage education and preservation.

GLOSSARY OF TERMS

Backstrap Weaving: Backstrap weaving, a distinctive technique in Mayan weaving traditions, involves the use of a specific type of loom. This loom consists of two loose, parallel wooden bars that secure the yarn vertically in place. One end of the loom is attached to a tree or post, while the other end is fastened to the back of the weaver's body using a strap (Prechtel, 1988). The practice of backstrap weaving in Guatemala dates back to at least the Preclassic era (Vandewiele, 2018).

Huipil: A huipil is a traditional blouse worn by women, woven on a backstrap loom. These blouses often feature intricate patterns or symbols that reflect the geographic region of origin. Huipil designs vary significantly across different regions, each showcasing unique cultural and artistic characteristics (Tomita, 1990).

Traje: In the Mayan community of Guatemala, traje is traditional attire that plays a role in expressing cultural identity (MacLeod, 2004). Each community has its own unique style of traje, which serves as a symbol of individuals' cultural affiliations, ranging from linguistic background to social class (Vandewiele, 2018).

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APPENDIX

Appendix A: Interview Questions

Demographic Questions

- How old are you?
- What is your occupation?
- Do you weave?

Background and Experience

- How long have you been weaving?
- Can you tell me about your background in weaving?
- How did you learn to weave, and who taught you?

Cultural and Personal Significance

- What does weaving mean to you personally?
- How do you feel about the current state of weaving traditions in your community?

Intergenerational Knowledge Transfer

- Are there particular family members who play a key role in passing down weaving knowledge? Who are they, and what do they do?
- Has the process of learning how to weave changed over the years? If so, how?
- Have you ever taught anyone to weave?

- Can you describe any experiences you've had in teaching younger generations to weave?
- What challenges have you faced in passing on your weaving knowledge?
- What are some ways to get people more interested in weaving? How could we make it easier for them to start?
- What else would you like to share about your experiences?

Appendix B: Focus Group Questions

- What strategies do you use when teaching children or young people to weave?
- What do you think children or young people find the easiest when learning to weave
- What challenges do you think children or young learners face when starting to weave
- How do younger learners typically approach weaving for the first time?
- What do you think sparks interest in weaving among young people?