



Learning Aid to help teach Devanagari Script to Bharwad Children

Geer Cow Herders

Nagpur, Maharashtra

Supervisor: Prof. Girish Dalvi

Vinay Kumar

22M2250



Approval Sheet

Interaction Design Project 2 titled "Learning Aid to Help Teach Devanagari Script to Bharwad Children" by Vinay kumar (Roll Number 22M2250) is approved for partial fulfillment of the requirement for the degree of 'Master in Design' in Interaction Design at the Industrial Design Centre, Indian Institute of Technology, Bombay.

Guide:

Vinay Dalvi

Chairperson:

[Signature]

Internal Examiner:

Sweeti Pal

External Examiner:

*for external
Vinay Dalvi*

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Vinay Kumar

MDes. IxD

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Acknowledgement

In this journey, I've come to realize that I'm not alone; things have evolved like rhizomes, interconnected and collaborative. Many teachers have played a crucial role in shaping my thinking, especially in the design thinking. I extend my heartfelt thanks to everyone who has supported me, both directly and indirectly. A special note of gratitude goes to my guide, Prof. Girish Dalvi Sir. His motivation, guidance, and individual attention to each of us have been invaluable. There are many other aspects for which I'm thankful to him.

I'd also like to express my appreciation to Tanaya, Malay, and Shruti for their unwavering support during challenging times. Tanaya, particularly, was instrumental during the field study and evaluation process, and Malay and Shruti have played key roles in shaping and articulating my ideas.

Dr. Ajanta Sen ma'am deserves a special thank you for her guidance during the primary research and ideation process. I extend my gratitude to the NGO that provided me with the opportunity to work with their fellows and

accommodation during the research period. Ganesh Birjdar Bhaiya, with his thorough discussions on Beda's approach, provided essential grounding before my actual visit. I'm also thankful to the fellows of Asola Beda and Than-Than Beda, who consistently allowed me to interact with the community and supported me to the best of their capacity.

A very special thanks to the community people and children who generously allowed me to conduct my study on their land. While it's impossible to recall all the names, I'm grateful to each and every person who supported me.

Also a special thanks to my classmates who encourages me to do things and helped me through the resourcing materials.

Also thank you so much to Prof. Jayesh Pillai Sir for providing me a Laptop in difficult time.

Last but not least, my sincere thanks to my family for their financial and moral support throughout the project.

Vinay Kumar

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1.Abstract

The Bharwad Community, colloquially known as 'Lal Gaay wale,' leads a semi-nomadic lifestyle, continuously moving with their cattle. This lifestyle presents a unique challenge to education, particularly in the realm of language. Our study employed both non-participatory and participatory research methods to comprehensively understand the community's lifestyle and the current state of education, revealing a significant lack of exposure to formal education among most children.

Communication predominantly occurs in Devanagari script within the community.

In response, this project aimed to empower the community in creating educational aids for learning the Devanagari script, leveraging their inherent skills in art and craft. Various activities centered around Devanagari script-enabled aids were designed to actively involve children and the community in the learning process. The tools were then tested within the community, resulting in a sense of belongingness and further creativity. The community members not only embraced the aids but also extended their creative endeavors to develop similar tools for numeracy and Hindi writing.

The impact of the project on the community was significant, providing them with a means to express themselves through artwork. Furthermore, it offers a clear direction for reconsidering similar crafts in the development of localized and contextualized educational aids. This project serves as a model for empowering communities, especially those in resource-constrained environments, to create their educational tools using locally available materials.

2.Introduction

The Bharwad community originates from Gujarat but migrated to the Vidarbha region of Maharashtra, predominantly inhabited by Marathi and Hindi-speaking communities. The Bharwad community has been living in this area since 1972. They communicate primarily through the Bharwadi language; over time, they have gradually adopted Hindi and Marathi. However, most of their interactions remain verbal, with very few individuals in the community able to read and write.

Their lifestyle is semi-nomadic, with the Bharwad community residing in a village for 6-8 months of the year. During the remaining months, they migrate to engage in cow herding and grazing in the Nagpur vicinity. This seasonal migration pattern has hindered the regular education of their children, who become involved in family businesses instead. Consequently, a generational gap in education has persisted within the family. Now, parents are recognizing the importance of education, as reflected in statements like "बस कहा जा रही है पता नहीं चलता है" (We don't know where our future is headed), "आत्म सम्मान होने के लिए" (For the sake of self-esteem), "हमारे धंधे में मदद हो जाएगी" (It will aid our profession), and "हम तो स्कूल की एक सीडी भी नहीं चढ़े" (We

haven't even set foot in a school). In response to this awareness, an NGO named Learning Companions emerged, intending to provide primary education up to the 4th standard. They actively engage with the community, working closely with children and adults.

During my P1 research, we identified disparities between the educational content and the children's language comprehension. Consequently, the primary objective of this project is to develop content and tools that facilitate an understanding of the Devanagari Script. Given the community's rural setting and limited resources, the project strongly emphasizes creating locally sourced educational aids. These aids are designed to enable parental participation in the education process, recognizing that parental involvement is crucial for the initiative's success.

3.Objective

To comprehend the educational status and challenges faced by the Bharwad Community, with a primary focus on children up to 16 years old who are yet to be introduced to the formal education system, this design project centers on understanding the Devanagari script. Given the exceptional nature of the materials, society's perceptions of education, and the social structure, initially, the following objectives were focused on achieving a comprehensive understanding of Devanagari. However, they were later revised, and now, the project aims to achieve the following design objectives:

- Children should be able to write the letters of Devanagari.
- Children should be able to recognize the Letters of Devanagari.
- Combination of Letters/Word formation.
- Understanding of Matra and use of it with Letters.
- Involving Parents and the community to make aids for these children.

4.Motivation

4.1. Personal

I have spent most of my time in rural areas, where I completed my primary and secondary education in government-operated primary and secondary schools. This experience has fueled my inner enthusiasm to explore this domain from the perspectives of research and design.

In terms of interaction design education, I aim to explore research methods and techniques to engage with real users, outdoor communities, interact with them, conduct interviews, observations, writing, and field visits. This study has provided me with valuable exposure to employing these techniques in the field.

Additionally, I was motivated to understand children's behavior and the final results of this research will be utilized in NGO classes.

4.2. Rational (Why Language)

Until we live in a cocoon, we don't need to communicate much with the world outside. However, as we come into contact with others, various types of communication take place. Therefore, language is one of the skills that needs to be learned for effective communication.

The Bharwad community, originally from the Bharwad region of Gujarat, communicates in Bharwadi. However, as they are now in Maharashtra, Devanagari has become the prominent language for communication.

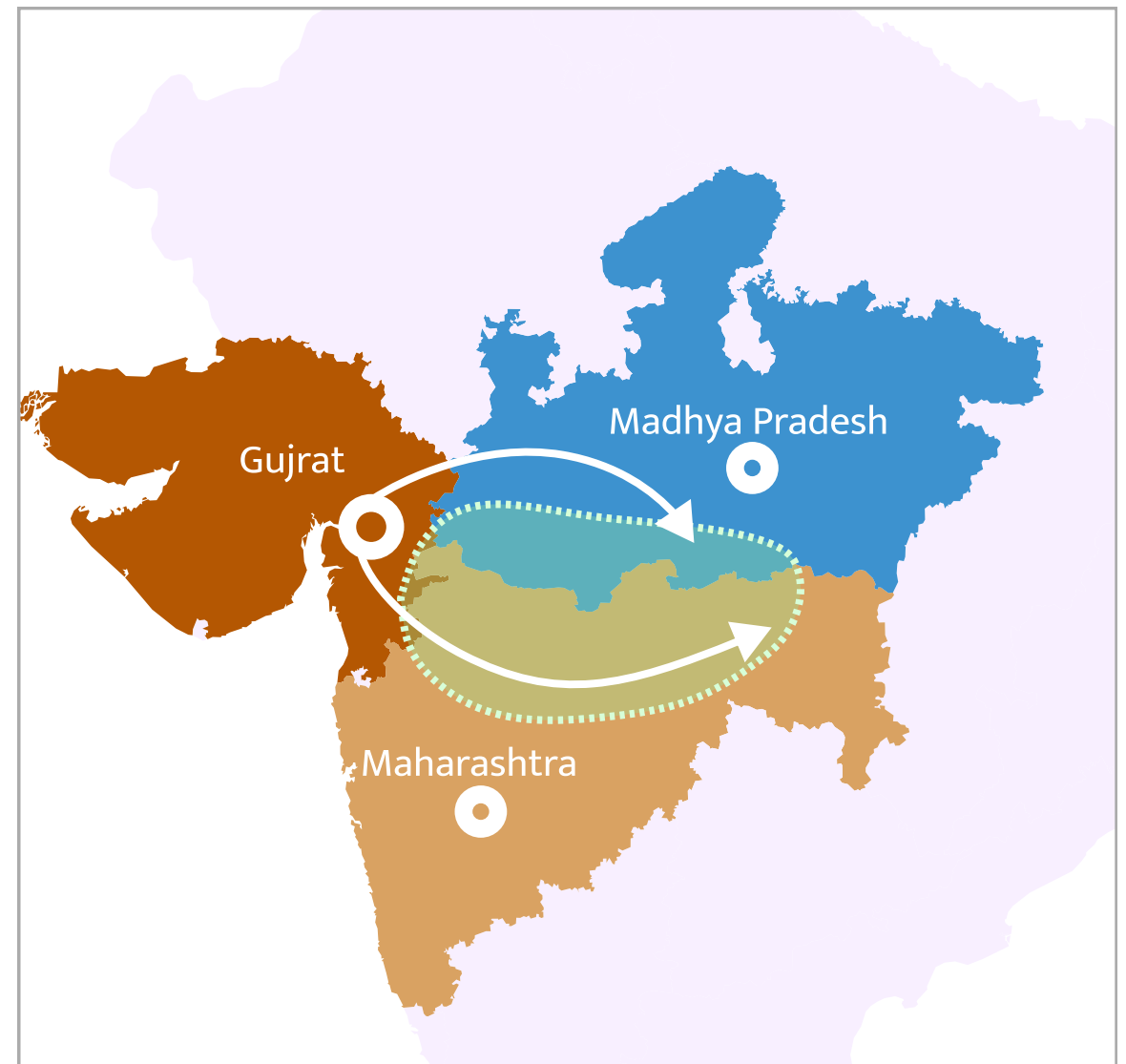
In my research, I found that they face challenges such as limited access to current communication technology, business opportunities, and various facilities (Government schemes, medical services, banking, transport, etc.).

5.Primary Research

5.1. About the community

5.1.1. History:

The Bharwad community originates from the Gujarat state. In 1972, numerous Bharwad families migrated towards the Maharashtra and Madhya Pradesh border. Many of them have settled on the outskirts of cities, with Nagpur being a preferred location due to abundant grazing lands and water bodies.



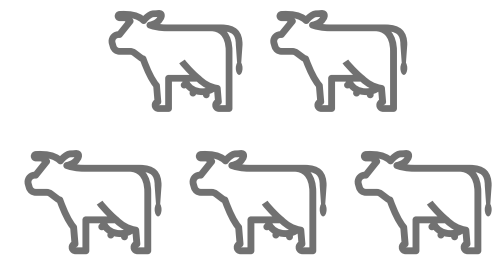
Map: Bharwad Migration During 1972



≈70 Bede (Living Place of
Bharwad's)



≈6000 in Population

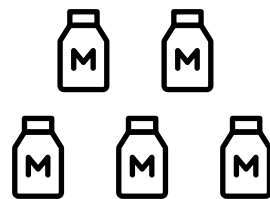


≈50-120 cows per family

5.1.2. Occupation:

Traditionally, Bharwads are engaged in animal husbandry, specifically in the rearing of Geer Cows. On average, each family has 50 to 150 cows, and the entire family participates in the work related to cow rearing. Most male members are responsible for grazing the cows. During the rainy season, they take the cows to nearby forests where grass is easily available. As grass becomes scarce, they migrate to different places around Nagpur in search of suitable grazing areas for the cows. Along with cows whole family lifestyle also changes they start migration with family on bullock cart.

They predominantly spend their time in rural areas near water bodies, agricultural fields, and forests. They produce raw milk, which is mostly sold to Haldiram and some local vendors. In addition to raw milk, they also have cow dung, organic fertilizer, and Nate (bull), which they sell to farmers.



≈20l - 130l milk /day



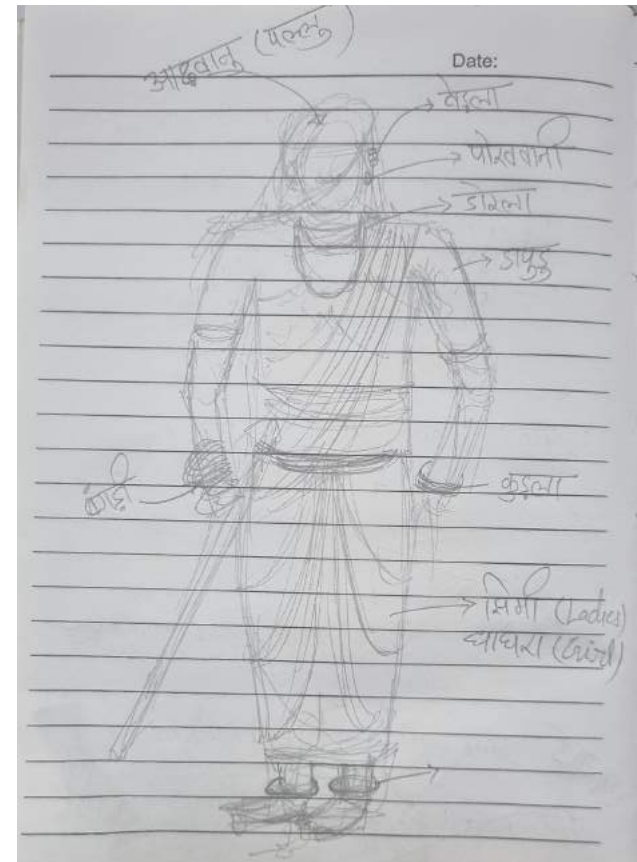
Lifestyle during Migration

5.1.3. Culture:

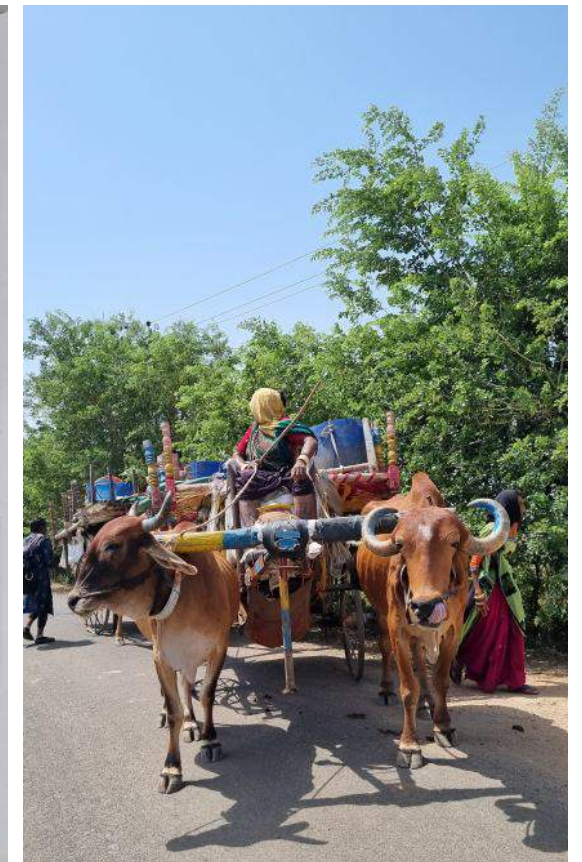
Bharwads primitively belongs to state of Gujarat and the culture followed is Gujarati. Traditionally engaged in Cattle Rearing and Farming. They always live in group of 5 to 20 family, this group is known as Nehda (Beda) and Shapru(Ghar).

5.1.4. Language:

The Bharwad community's mother tongue in Bharwadi is a Gujarati language dialect. They have lived in Maharashtra for approximately 50 years and now understand Hindi and Marathi. However, reading and writing are uncommon in the community, so they struggle to read letters.



Elements of Attire



Migration Story



Beda (Permanent Settlement)

5.1.5. Lifestyle:

Firstly they are migrants in Vidharbh region. and they are asociated with the cow herding to most of the lifestyle moves around the cow herding, as they find dificulty in finding fadder for cows in their settlement they have to start migration to places where they can find the enouph grass and water. so this migration start from November and continues till the first mansun rain accurse. this that time generaly moves around the Nagpur district in rural and forest areas. So their life style in semi-nomadic.



Migratory Lifestyle

5.1.6. Art and Craft:

They spent most of their free time creating Dhagadi and applique work on cloth. They use Bhanjara embroidery work with glass attached to it. They do this for their daily used clothes, female Dupatta, male Gamcha, bedsheet decoration, gift items, etc., as shown in image 5.6. This practice is passed from generation to generation. They mostly do This type of work during the rainy season and the migration, depending on the conditions.



Banjara Embroidery



Applique Work

5.2. Empirical Documentation

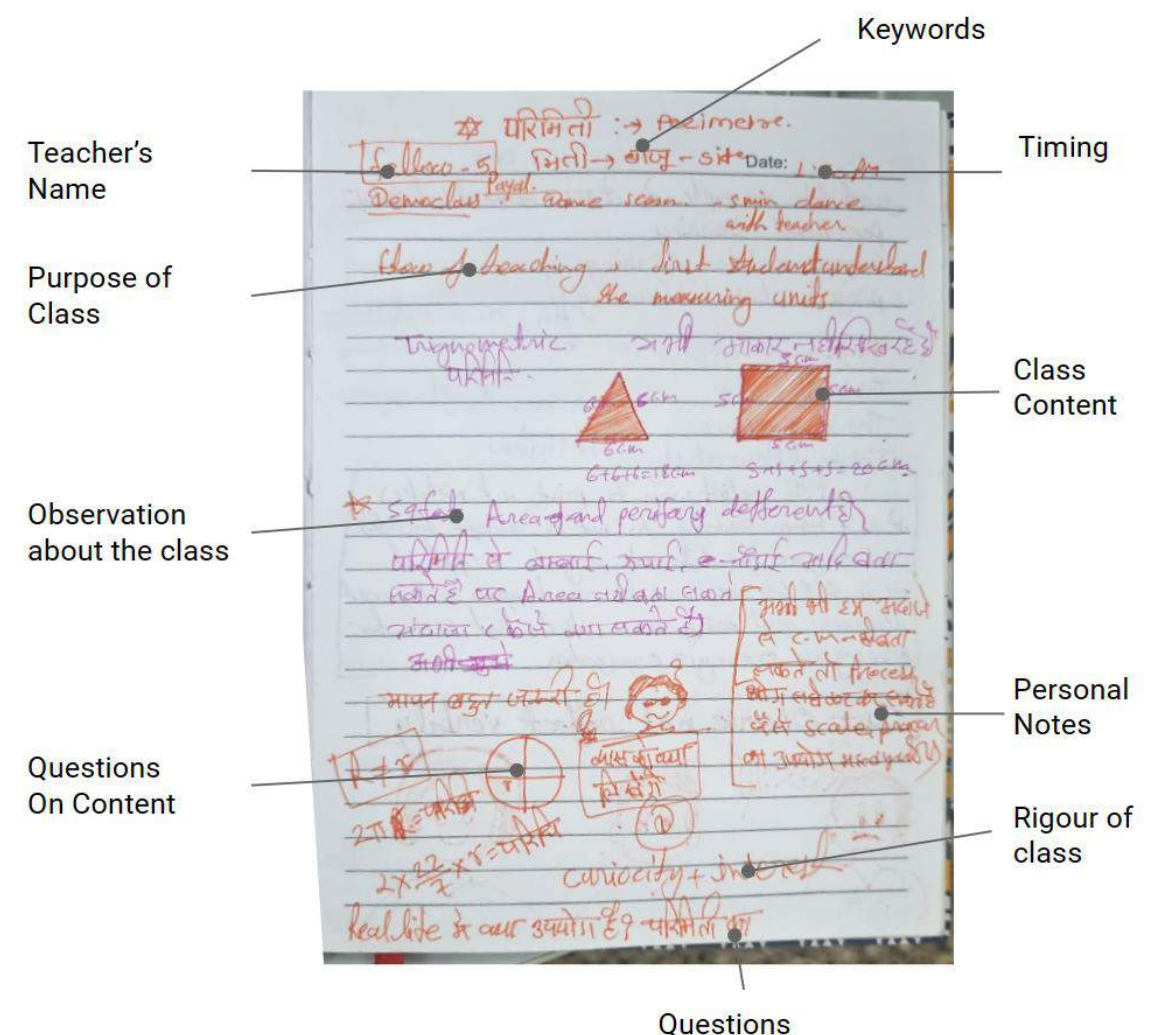
To understand the Bharwad community, I have been on-site, collaborating with an NGO to gain insights into the community and its current education system. The research methodology employed comprises a mix of participant and non-participant observation, along with an ethnographic study. These methods involve various research techniques such as note-taking, conversations (interviews), observations, active participation with fellows, and sketching. This comprehensive approach aims to provide an in-depth understanding of the education status and behavior of the Bharwad Community.

5.2.1. Participant Observation:

Engaging in participant observation, I immersed myself with the fellows during classes, actively teaching children. This involved visiting Bedas and interacting directly with the community. Through this process, I gained firsthand insights into the community's behaviors, interactions, and educational practices.

5.2.2. Non-Participant Observation:

Observed the fellow's class being with them but not participating in the activity; it provided a more objective perspective. Also, I get the chance to watch the course from different lenses, like how fellows start the class, how they interact with children, and what mediums they use to deliver the teaching content. In this, I got to take notes and sketches of the class. Also, participate in a demo class conducted in the NGO. where fellow practice. It gave me an idea of their class mediums and how we can improve this.



Class Observation During the class

5.2.3. Ethnographic Study Approach:

It is not a complete ethnographic Study but some techniques has been used to gain a comprehensive understanding of the Bharwad Community, its education system, and the factors influencing educational access and participation.

5.2.4. Conversations (Interviews):

It help me to engaging in conversations with community members, parents, and children through informal or semi-structured interviews provides valuable insights into their perspectives on education, challenges faced, aspirations, and attitudes towards formal schooling. These interviews allow for the collection of qualitative data and the opportunity to ask follow-up questions to gain deeper insights.



Interaction With Children and Community

5.2.5. Note Taking :

Essential during field visits, notebooks serve as invaluable companions to document instances and nuances, especially in rural bedas. The notes taken come in two forms: field notes and personal opinions on events.



Interaction With Community

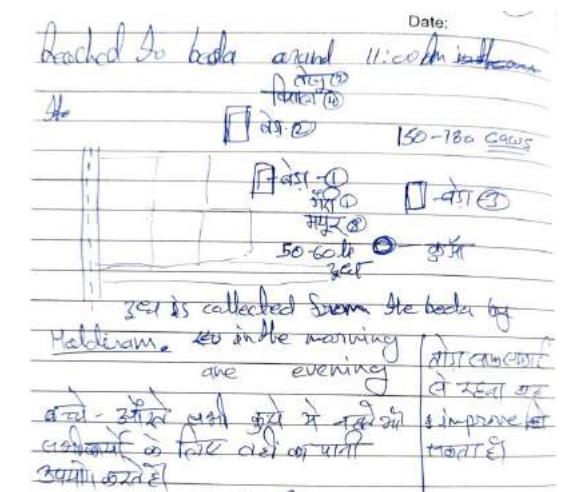
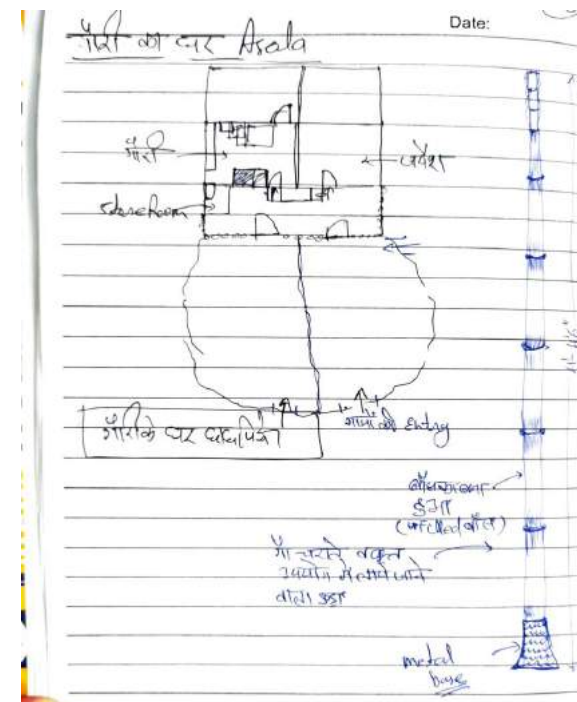
5.2.6. Active Participation with Fellows:

By actively participating in the community's activities, such as classes, institute events, or community interaction, this helped me to build trust, and gain a deeper understanding of the community's values, norms, and educational practices.



5.2.7. Sketching:

Sketching or visual documentation is used as a supplementary method to capture specific aspects of the community's educational practices, learning environments, or cultural artifacts. Sketches had helped me to take visual representations that enhance the research findings and facilitate cross-cultural understanding.



5.3. Mode of Children's Interaction

5.3.1. Storytelling Session

During my initial interaction with the Bharwad Community and the children, I had the opportunity to learn about various aspects such as their language, lifestyle, hospitality, and the educational level of the children. It was an insightful experience that allowed me to gain a better understanding of the community's history and traditions. This firsthand interaction proved to be a valuable approach for gathering information about the community's past.



Story Telling Session

5.3.2. Understanding of Letters and Words

The worksheets designed for first-grade students should focus on letters, words, and related topics. The worksheets lacked contextual relevance for the children. Therefore, revisions are necessary to ensure that the worksheets are more engaging and meaningful for the students.

In the activity where the children were filling the line with stones, it could indicate a potential lack of resources within the community. The fact that they were engaged in this task suggests that they may not have access to sufficient educational resources or materials. This could include textbooks, learning materials, or even proper infrastructure for schooling.



Letters through Pebbles

5.3.3. Sketching

The workshop aimed to build bonds and interact with children during migration, engaging them in educational activities. It fostered enthusiasm for learning, active physical participation, and familiarity with the context, enhancing my connection with the participants.

During this session children were confused in identifying the Kukado(Hen) they were relating it to Kabutar, Phanti, Batak etc.

This is a different way of sketch is taken to understand about the children engagement with contextualized materials and motivation while doing this. So student were enjoying while making this.



Sketches of surroundings

5.3.4. Learning by Craft

This probe is designed to understand about the Rigor, Creativity , Expression and Culture of Achievement in children. So children were thinking about the tree and relating this with their family. Similar with the numbers. They are sequencing on hierarchical manner.



Family tree & Number tree Paper Craft



5.3.5. Local Game Documentation :

We have documented the names of games they used to play in the Beda and during migration. We recorded four games, and I participated in one of them. Most of the games are played in a group. These games involve physical activity and use locally made materials; some only require conceptual understanding and adherence to rules. The nature of gameplay changes with migration. In the Beda, they play games like kabaddi, luka-chhipi, hanta kukada, which involve large groups, more physical movement and spatial arrangements. As they begin migration, the nature of gameplay shifts to smaller groups, less physical movement, and can be played in compact areas like under tree shade. Games such as Bhajipala Game, Chor Sipahi Game, etc., are played. We were able to document around 23 games that they play throughout the year. Some of them are listed below:

- हंता कुकड़ा
- कब्बड़ी
- धोड पक्कड़
- लकड़ी लोढ़ा
- छुपा छुपी
- हथौड़ी
- अंधा जोड़ी अंधा कढ़ाई
- JCP गेम
- लूडो
- भाजीपाला गेम
- अक्कड़ बक्कड़ गेम
- तितली उड़ी
- काकड़ा काठी पीने चल
- रेडीस गेम

5.4. Findings: Education in community

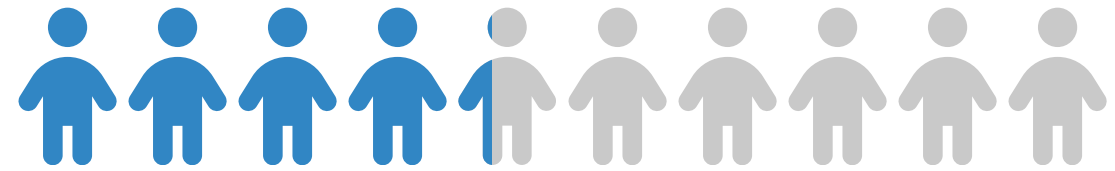
5.4.1. Children Education:

In the Bharwad community, most people live in rural areas near forests or large grazing lands. As these settlements appear temporary, many Bedas lack school facilities. Some children join nearby village government schools. According to various surveys conducted by NGOs, the factual numbers are as follows:

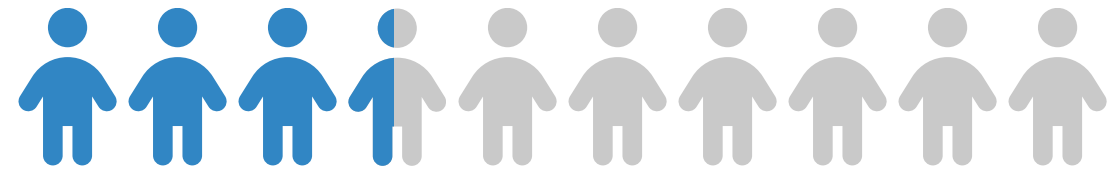
- Number of Bedas: ≈ 70 Bedas
- Number of Families: ≈ 800
- Number of Children: ≈ 1200 (Up to 16 Years Old)

This suggests that many children are not enrolled in any school. Since they are semi-nomadic, their children often struggle to continue their education. They attend school while at the Bada (in the settlement), but as migration starts, their education is hampered. Even those who complete primary schooling are not proficient in speaking and writing Devanagari script.

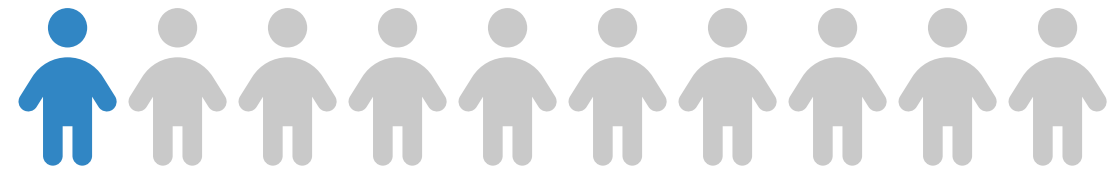
This diagram a visual representation of the educational landscape among the youth in the Bharwad community



Children enrolled in school



Children going to school



Children completing primary education

- Many of the children are not even enrolled in the formal education system.
- they migrate for 3 - 8 months from their village to grass lands, it happen in the radius of 50km to 150km because of that children are not able to continue their schooling.
- Around 34% of children are able to continue their education till th class but they leg in writing and reading Devanagari script.

5.5.1. Why education is important

As things are advancing and reaching rural areas, the Bharwad community is encountering numerous challenges in communication, conducting business, accessing government services, and banking. These challenges can be encapsulated by the following quotations:

“आत्म सम्मान होने के लिए ”

“ये भटकती को बंद करना है ”

“हमारे धंधे में मदद हो जाएगी”

“बस कहा जा रही है पता नहीं चलता है” (Communication)

Financial support / literacy

To livelihood through the jobs Like Police,
Medical, Government jobs, Etc.

5.4.2. Parents Education:

Parents or elders in the family are adept at managing their daily livelihood and engaging in cow herding. Over time, they acquire a grasp of numeric skills and the basics of the Hindi language. However, this learning is need-based, focusing mostly on reading rather than writing. The male members of the family typically learn to write only their names. In contrast, the learning pattern for the opposite gender is more prominent as they seldom engage in writing. As for the parents, their education is defined by this line:

“हम तो स्कूल की एक सीडी भी नहीं चढ़े।”

6.Scope

6.1. Letters & Combination till three letters word

goal is to design tool which will allow children to create three letters combination words without matra.

6.2. Sequencing of learning letters

It is not always that we must start writing letters from Ka-kha-ga and so on it should be start with easy to write words like “Pa”, “Ra”, “Ta” etc. so on so make this achievable we are designing worksheets which are digital and can be printed. it will be scalable for all the Bedas. it will establish a well-structured sequence for learning Devanagari letters.

6.3. Worksheets for Primitives of Devanagari Script

Creating worksheets that guide children and fellows in the fundamental aspects of Devanagari Script writing.

6.4. Materialization of syllabus

also ensuring that all of these ideas must be translated through the well thought material available in the context. also syllabus is effectively translated into tangible and practicable learning aids.

7.Design Considerations

7.1 Resource-Constrained Environment

In this setting, resources such as electricity, paper, educational tools, and market access are limited. The NGO currently serves as a crucial channel for providing essential educational resources like books, pens, pencils, slates, etc.

7.2 Cost-Effectiveness

Education is often not the primary concern for families, making costly tools unaffordable for the community. Ensuring affordability is crucial for accessibility in this resource-constrained environment. The project aims to address these challenges by providing accessible and cost-effective educational tools.

7.3 Durability during the migration

The designed tool has to be in such a way that it can withstand the challenges of migration, ensuring longevity and continued usability. The tool should be resilient in facing the physical demands and environmental changes during migration.

7.4. Physically Operated:

Tools has to ne operated with out ant machinery or electrical connection, to ensure thet it should be used during the migration.

7.5. Engagement with fun and play:

Priority is to make the tool which is engaging and have affordances which allow children to use it in multiple ways. this multiplicity will allow children to play with the tool.

7.6. Self Reliance :

In this context, the tools need to be built, utilized, and sustained by the community without the need for external guidance.

8.Secondary Research

8.1. Language Learning Approach

How children learn the language the first time they encounter letters or text in their surroundings. According to research, there are three dominant methods that children use. First is the **Strategy-choice model** (Robert Siegler, 1986); this says that every time children find a new word, they try to connect it with their existing knowledge; if they don't find it relatable, then they have other strategies like remembering the sounding of a letter or asking for help. These strategies change over time and from children to children. Second is the **whole-language approach** (Goodman, 1986), which says that children should be exposed to the fullness of text instead of the segments of words, such as stories, poems, letters, posters, etc., so I found this is one the most effective ways to make sense of words and remember its use case scenarios. This is effective for children exposed to textual mediums like prints, display text, etc, which exist on tangible artifacts. The third is the **Basic skill approach** (Rayner & Pollatsek, 1989), where children are exposed to the basics of letters, starting from Phonics, written symbols, and recognition of symbols with pronunciation. They should be exposed to complex reading materials when they have mastered them. This method I found relevant to the Bharwad children

8.2. Sociocultural Theory

I believe that growth occurs with the influence of our context and society. Vygotsky asserts that children are active knowledge seekers, but he doesn't view them as solitary agents. According to him, children are social environmental collaborators, shaping cognition in culturally adaptive ways. Many ways in which children seek and absorb knowledge are influenced by their context. As they develop the ability to speak, they participate in social dialogues while engaging in culturally significant tasks. So, it is essential to keep in mind that if the Devanagari script becomes part of their cultural artifact, according to Vygotsky's theory, they will initiate discussions about it. As they are exposed to the Bharwadi dialect through their parents, even though it does not have a proper script, the Zone of Proximal Development comes into play. This zone is where a child interacts with things, and in terms of formal education, it extends beyond self-initiated discovery.(Laura E. Berk, 1997)

8.3. Cooperative Learning

Cooperative learning concept is introduced by the vygotsky in terms of peer learning. in this learning method more knowladgeble peers can lead the children's learning forward, as long as they adjust to help each other. In our context also it a multigrade learning sessions where all children take classes in a

single shade. In these context where parents also taking part in creating education aids and children are also involved in this process. where as fellows will guide them make it possible. where as in cooperative learning it is important factor is structuring of peer groups so that deferent groups can work together to achieve a common goal. also this fenomina is prominent in the these community becouse there are no teaching classes or sessions existed before they completly depenedent on the each other to learn things.

9. Beneficiaries

9.1. Primary End Users: Bharwad Children

Age: 4 to 20 years

- Varied age groups in a multigrade class or session.
- Interested in initiating their education journey or learning Devanagari script.

9.2. Secondary User: Community & Instructor

- NGO fellow who are conducting the learning session by using tools for teaching Devanagari script.
- The approach should be crafted to actively engage the community in generating content for educational materials, enabling Bharwad children to learn the Devanagari script independently, without formal schooling.

9.3. Tertiary User: NGO

- NGOs or similar agencies working in the education domain, primarily in resource-constrained environments, can also adopt these techniques to create localized educational aids.

10. Positioning

10.1. Positioning of My Project

Through this project, our aim is to introduce a contextualized approach to learning the Devanagari script, where active community participation is deemed essential for project success. We believe that when tools are created by the users themselves, there is a greater sense of ownership. Moreover, materials used will be easily accessible to them.

It's important to note that this project does not claim to be a comprehensive solution for teaching Devanagari. Instead, it is a meaningful contribution, akin to a bucket of water in a larger ocean of educational initiatives.



There Craft Work

10.2. Positioning of Final Product:

The final product will be delivered to the NGO for utilization in their classes, forming an integral part of their educational sessions. This product will be crafted using locally sourced materials, empowering the community to not only implement it in the specified Bedas but also replicate the initiative for other Bedas. The immediate focus is on two Bedas where the product can be directly applied, acting as a catalyst for the NGO and the broader society to generate similar products independently.



Currently used techniques

11. Project Outcome

11.1. A physical tool

A physical tool will be designed so fulfil the design considerations,

11.2. Familiarizing the unfamiliar

The tool aims not only to serve as an educational resource but also as a catalyst for the community to envision and extend the utility of their craft. Initially designed as an educational tool, it has the potential to evolve beyond its primary purpose, eventually becoming a source of financial support for the community.

11.3. What will be success?

If the community show the enthusiasm to create similar types of tool for their children and children will be engaging with the tools.

12. Design Exploration

Based on the research number of ideas are generated around the objectives and scope, here are the ideas and concept associated with them:

12.1. Dhagadi ki Varnamala

This concept originates from the community's existing expertise in embroidery, specifically Banjara embroidery with mirror work. The idea is to leverage this craftsmanship in the realm of education. Women from the community could contribute to crafting locally made Devanagari Varnamala (alphabet), providing them with an opportunity to learn while creating educational materials. The tool is designed to be contextual, durable, and involves high community participation. Additionally, it is cost-effective for the community since it aligns with their existing skills and readily available materials.

Keywords:

Contextual

Durable

Parents and Community involvement

Experiential Learning

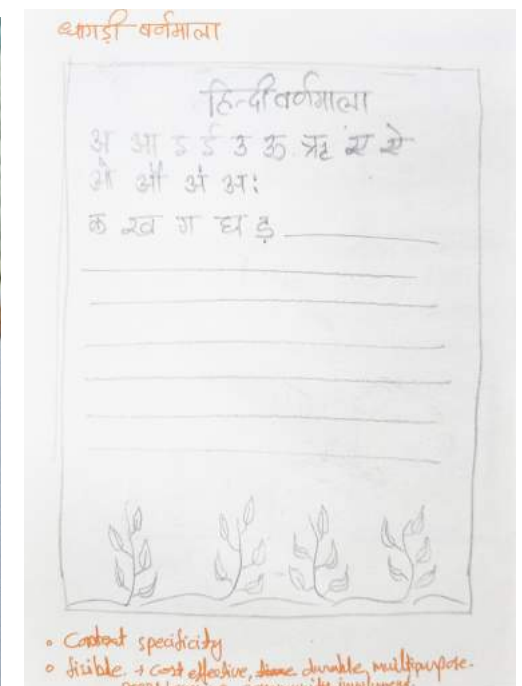
Cost Effective



Existing embroidery work



Conceptual Prototype



12.2. Aksharo Ki Kitab

The community's expertise in appliqué, a unique cloth-stitching technique, can be harnessed to create an innovative educational tool. By stitching two cloths together, interesting patterns can be formed to construct a book of letters. This book, designed using the appliqué skill, would be washable, durable, and locally made. It offers a tactile experience for children as they touch and feel the letters, and they can further engage by tracing the letters or creating word combinations on paper. This approach not only incorporates the community's traditional skills but also provides an interactive and sensory learning experience for the children.

Keywords:

Contextual

Durable

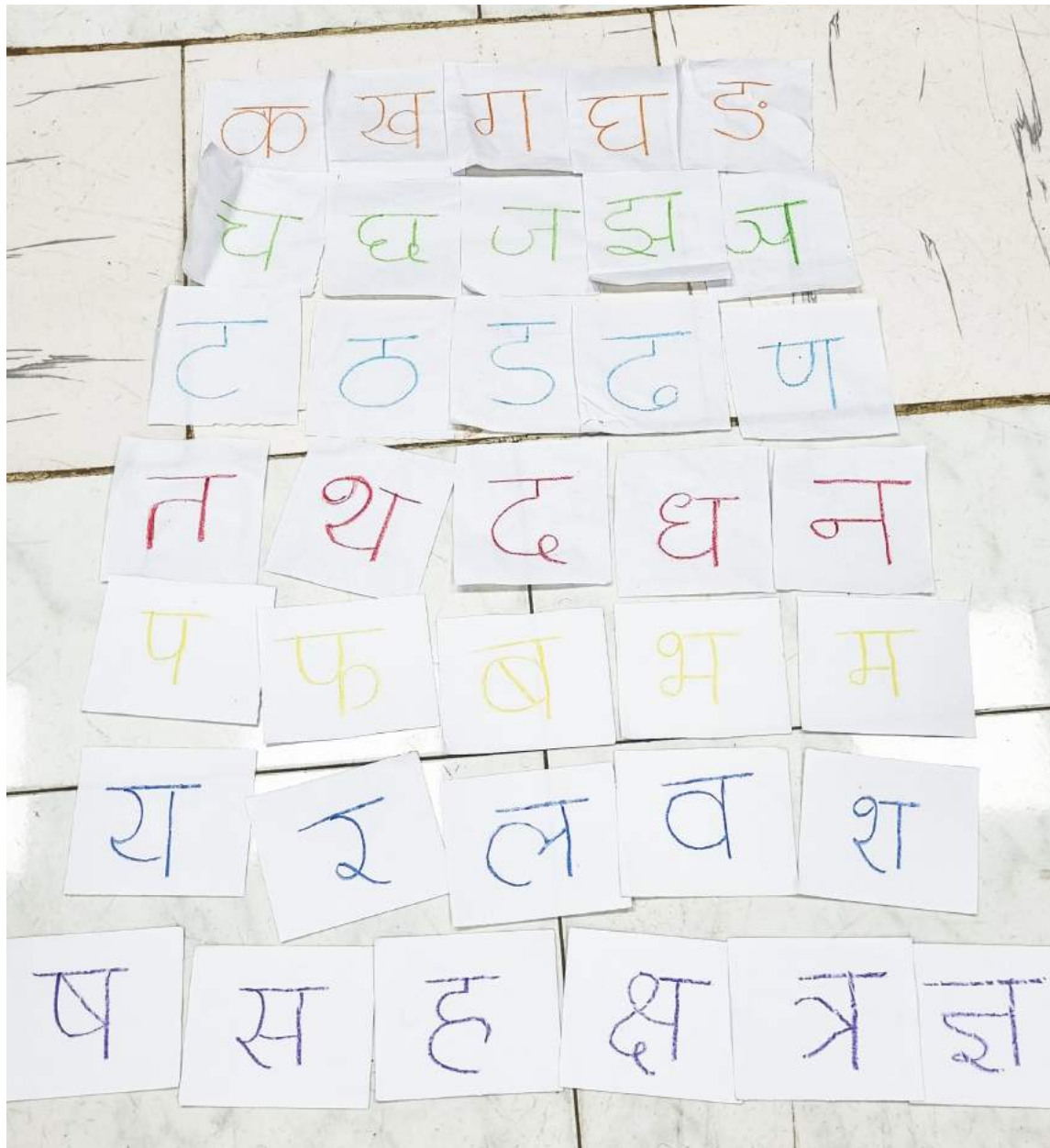
Parents and Community involvement

Experiential Learning

Cost Effective



Existing Appliqué Skill



Paper Prototype



Existing Cloth Book



Many cloth books are available in the market with themes and stories. Most of these books are manufactured in industries using highly equipped machinery. The materials used in these books are often expensive and thick, requiring specialized training for production. The cost of these books typically ranges from approximately 500 to 600 INR per book. If any part is lost or damaged, there is a limited chance of recreating a similar item.

12.3. Akshar Gadi

Children in the Beda predominantly play with tires and wheel-based locally made toys. The concept is to incorporate educational elements into these toys. By engraving letters on the wheel's surface, when children play with the toy on sand or wet surfaces, it creates interesting patterns and impressions of the letters. This not only transforms playtime into a learning experience but also utilizes the community's familiar and easily accessible play materials.

Keywords:

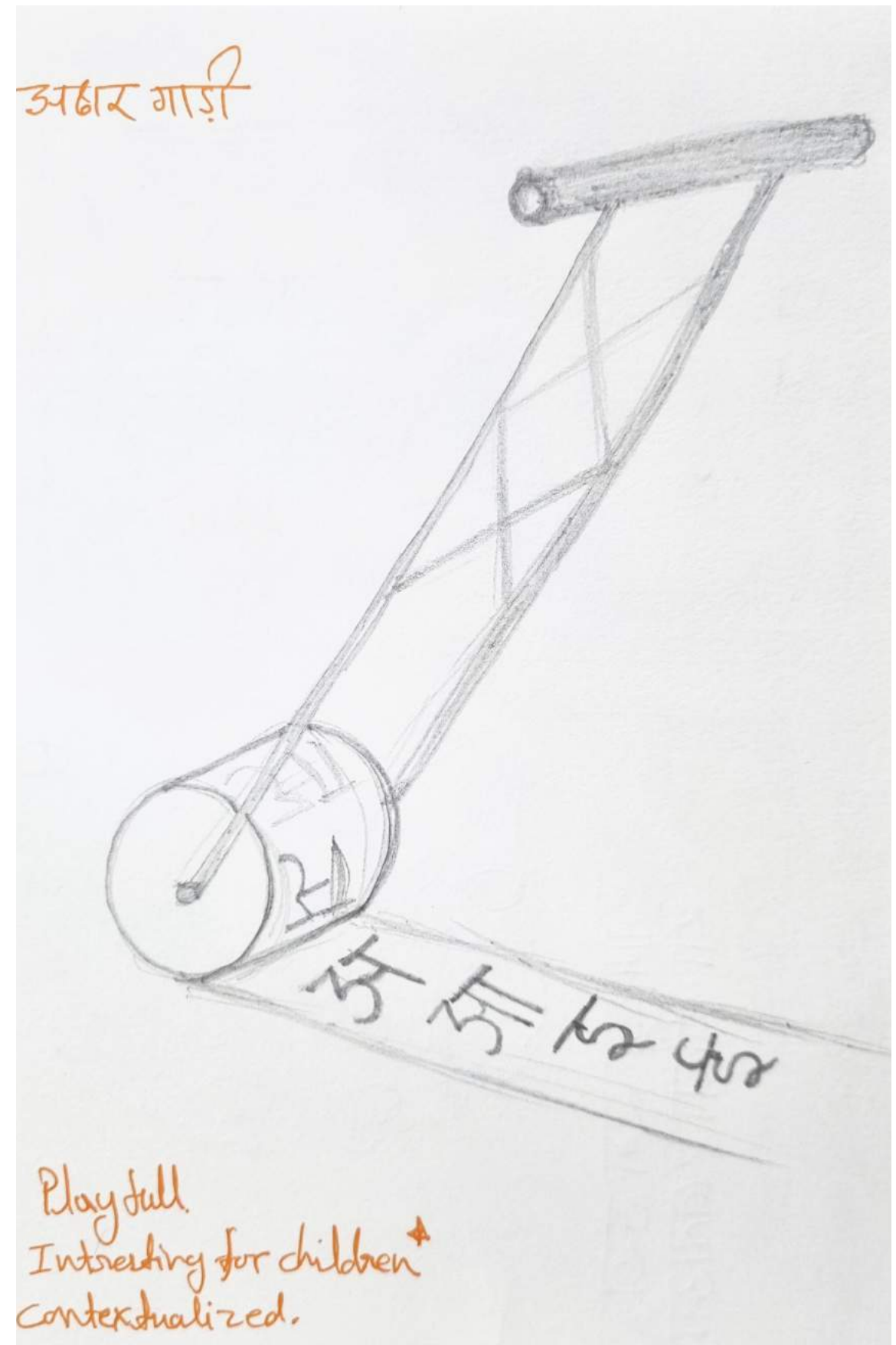
Engaging and playfully

Durable

Cost Effective

Contextual

Time Taking



Concept sketch

12.4. Contextualization of Varnamala

The current Varnamala (alphabet) is often filled with unfamiliar artifacts or metaphors for letters. The idea is to craft a new Varnamala that is created from the local context, incorporating elements and symbols familiar to the community. This approach ensures that the educational content is relatable and resonates with the daily experiences of the children, making the learning process more engaging and meaningful.

Keywords:

More relatable to children

Children involvement

Long term effects

Cost Effective

Contextual



Single Page story for each letter.

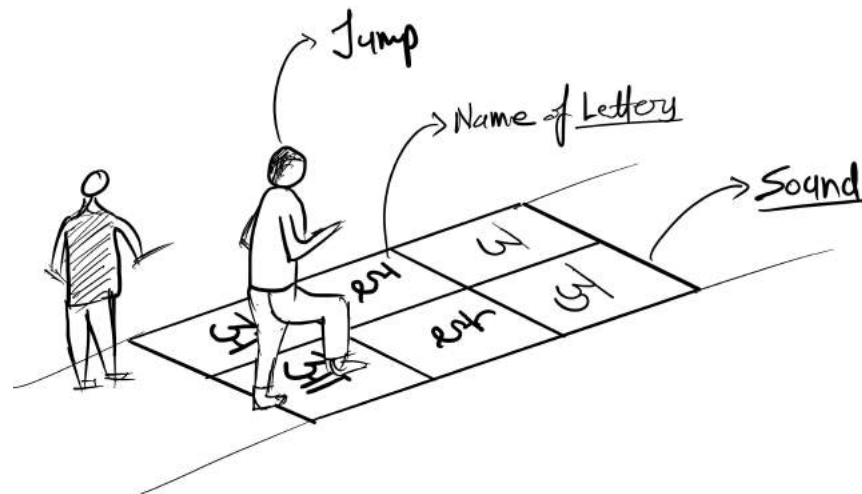
अ - अनार	क - ककतूर, कलम, कमल	द - दूधकरी	ल -
आ - आम	ख - खरगोश, खम्बा, खाट	ग -	व -
ई - इमली	ग - गाय, गन्त	त - तकत, तरबूज, तनस	श -
ई -	घ - घर, घड़ी	घ - घन	ष -
उ -	ङ -	ङ - डाढ़ी, जगड़ी	स -
ऊ - ऊँट	च - चम्मच	च - चान	ह -
ऋ - ऋषि	छ - चापल, छल्ला	न - नल	झ -
ए -	ज - जंगल, जल, जमीन	प -	त्र -
ऐ -	झ - झंडा	फ - फल	ब -
औ -	म -	ब - बकरी	भ - भन्ना
ओ -	ट - टमाटर, टेकरी, टोपी	म - मकान	म - मर
अं - अंगूर	ठ - ठेकर, ठेकेवा	र -	र - रस्सी
अः -	ड - डमरू		

Contextualizing the Letters

12.5. Jumping Game

This is a two-player game where one player is on the grid, and the other player gives tasks to complete, such as jumping on "U" and then jumping on "AA," etc. This game can expand in all four directions, and more players can be added.

A future enhancement to this game could involve incorporating sound when a player jumps on a particular tile, making it a more sensorial experience. However, it's important to note that as electronic elements are introduced, there may be a need for electrical expertise, and the game's accessibility might be limited to spaces with electricity, potentially increasing dependency on experts.



Keywords:

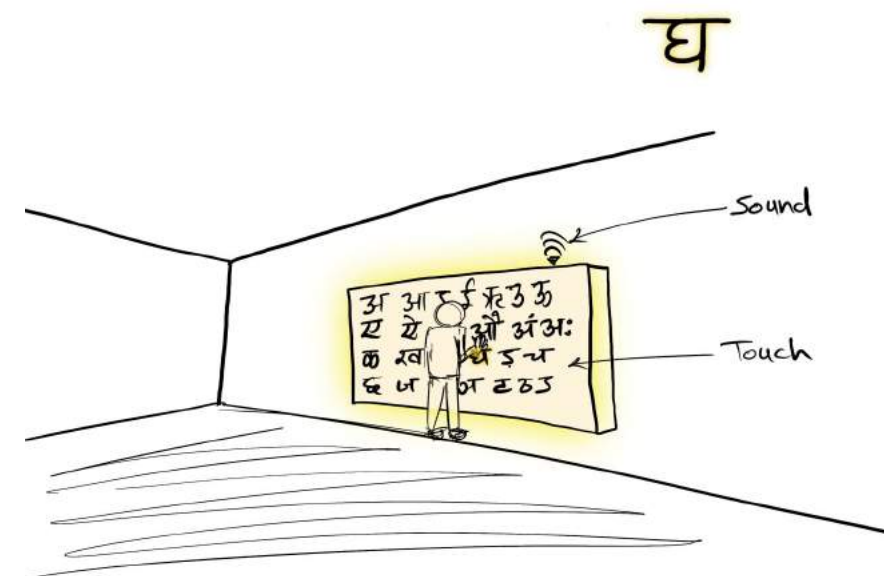
Children involvement

Long term effects

Cost Effective

12.6. Speaking Varnamala

This is a board of Varnamal where as children touch any of the letter it will pronounce and make light in the background.



Keywords:

Interactive, Newness for the context

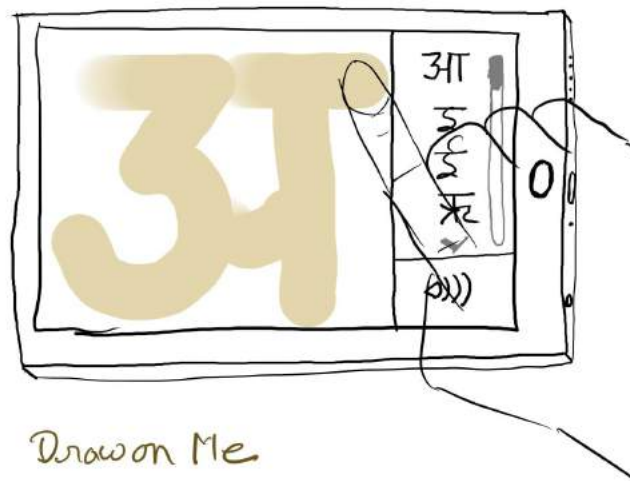
High cost

Stationary

12.7. DrawME

This is a somewhat tech-oriented idea that evolved from existing tracing techniques. What makes it special is the contextualization of technology and material. As seen in one of the options which children interact with, so this is one of the ideas with mobile application, this can be converted into tangible interaction where drawing a letter or word can be recognized and pronounced.

However, we did not proceed with this idea because similar apps are already available, and mobile phones are not readily accessible to children.



Keywords:

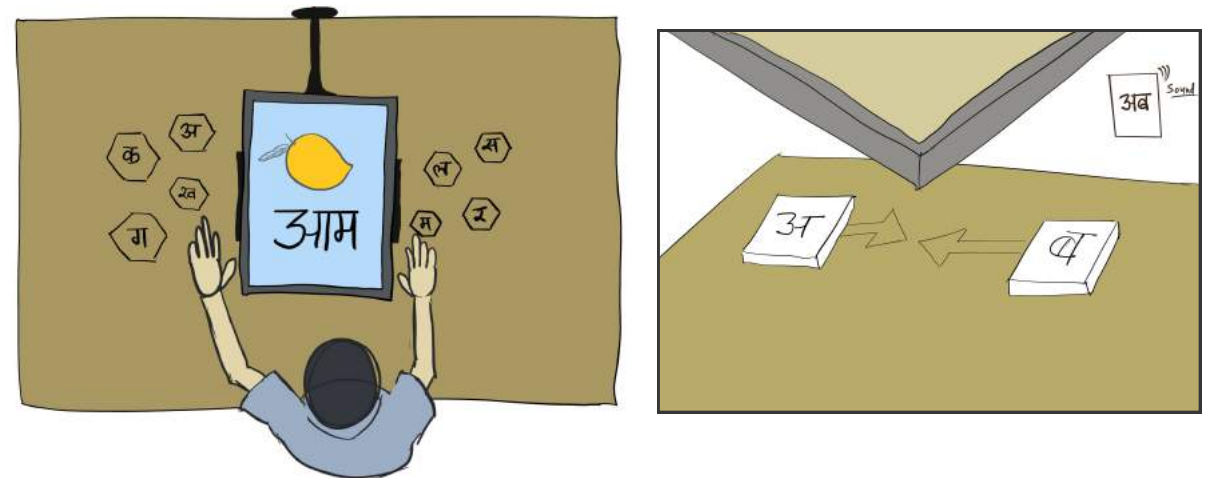
Tech-oriented, Scalable

No limitation of letters drawing

High - cost

12.8. AR word Combination

The idea involves using Augmented Reality (AR) in a game where children can combine two cards to create a word. Once the cards are joined, the AR application displays an associated illustration or visual representation of that particular word. This not only enhances the learning experience by combining physical and digital elements but also provides a visual context to aid in understanding the meaning of the word.



Keywords:

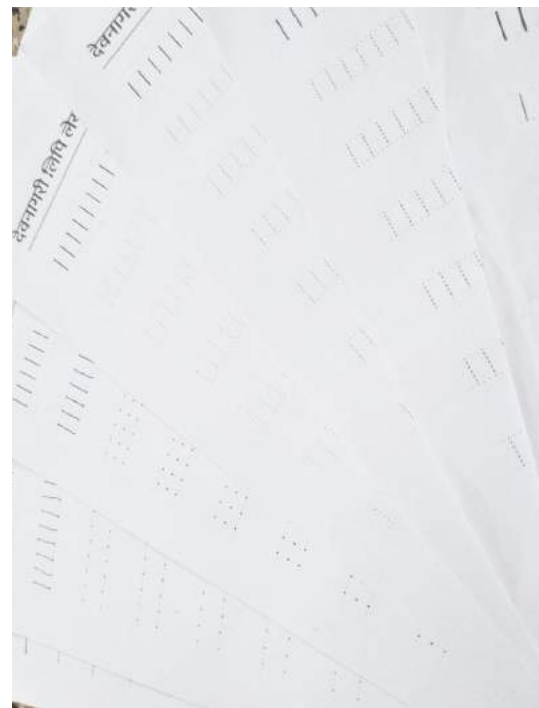
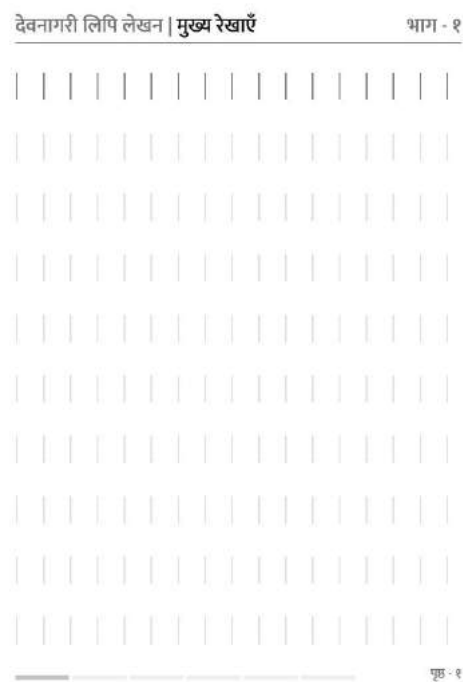
Interactive, Newness for the context

High cost

Stationary

12.9. Primitives Worksheet

If we examine the letters of the Devanagari script, they are formed from basic lines, curves, and circles. In the current practice of letter writing, we typically begin directly with the letters. The idea here is to create worksheets for primitive practice before starting to write letters. These worksheets are designed on A4 paper in black and white.



Keywords:

Scalability

easy to distribute

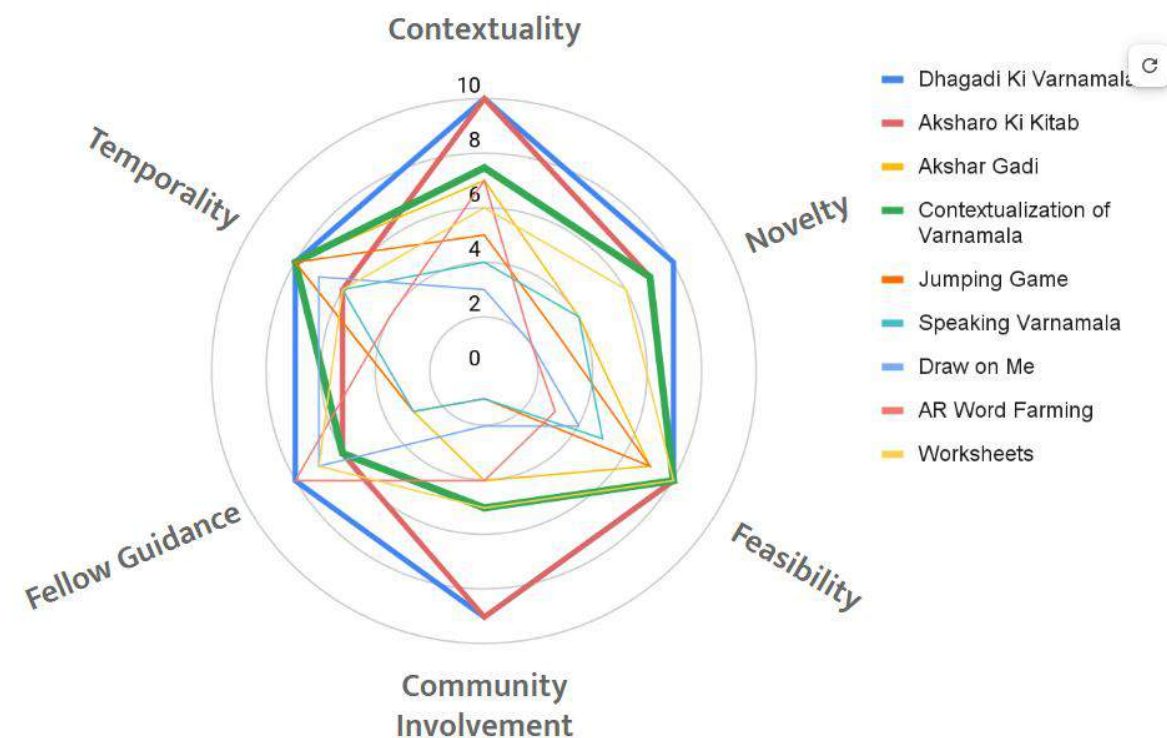
less instruction needed

13. Idea Evaluation



Idea Evaluation

Ideas are evaluated based on feasibility and context specificity, with priority given to highly feasible and context-specific ideas. In the above chart, "Dhagadi ki Varnamala," "Aksharo ki Kitab," and "Worksheets" have received high ratings. Therefore, we have chosen to further develop these ideas.



14. Design Detail

As we finalized the 3 design ideas for the detailing. in these process we again did the brainstorming to generate multiple ideas bases on these similar direction of thought, in this process we have developed small scale prototypes for each design and quickly tested witht eh convinianve users and discussed with the experts. in this provess ideas got more refined and nuanced to build those the more detail.

14.1. Dhagadi ki Varnamala

Initially, we started with the vowels "A" and "AA" on a small piece of cloth, using a double line with a thicker structural mass. We also experimented with single and double thread embroidery patterns. Through this process, we observed that the double thread is more clearly visible, and the touch and feel are better than the single thread. However, adding mass to the structure was making it a bit more complex in terms of physical work and visual appearance.

Idea Evaluation

Here, we have evaluated the ideas based on six parameters. The similar ideas that we have chosen cover the highest area on the graph. Therefore, we are taking forward the "Dhagadi ki Varnamala," "Aksharo ki Kitab," and "Worksheet" ideas for developing a detailed prototype.

From other ideas we have picked up some elements like engraving from Akshar Gadi and think a loud from Speaking Varnamala.



Embroidery work



Lo-fi Prototype

14.2. Aksharo Ki Kitab

In this prototype, we used the local stitching method to develop an exact replica of what it is going to look like in the field. We experimented with different colors and types of cloth to assess the visual and tactile aspects.

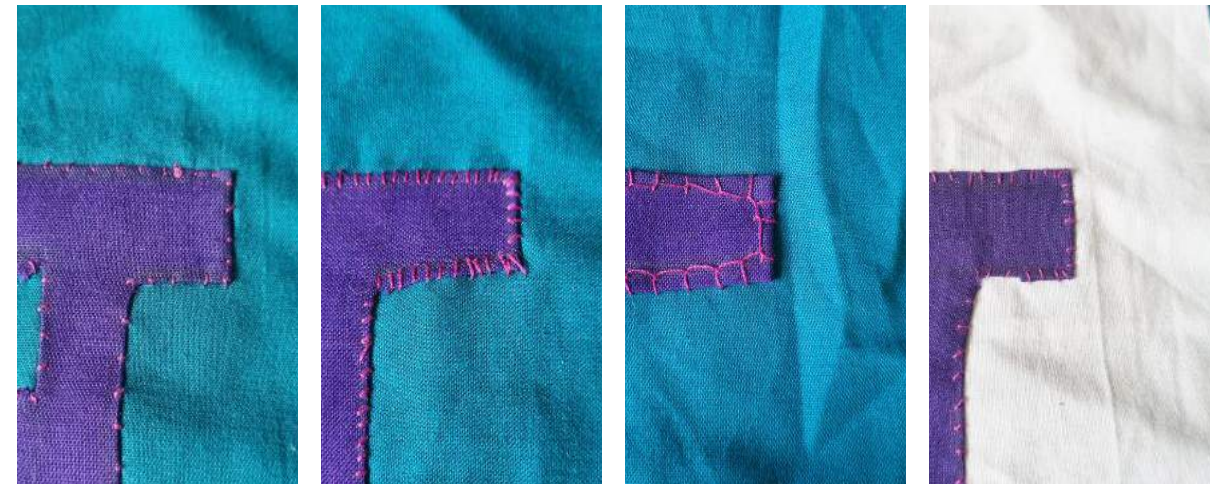


Embroidery work

These are the two types of pages that were stitched. The first one was done with a dark color, which won't get dirty easily but has low contrast. The second one has high contrast but requires high maintenance.



Cloth Book



Stitching Patterns

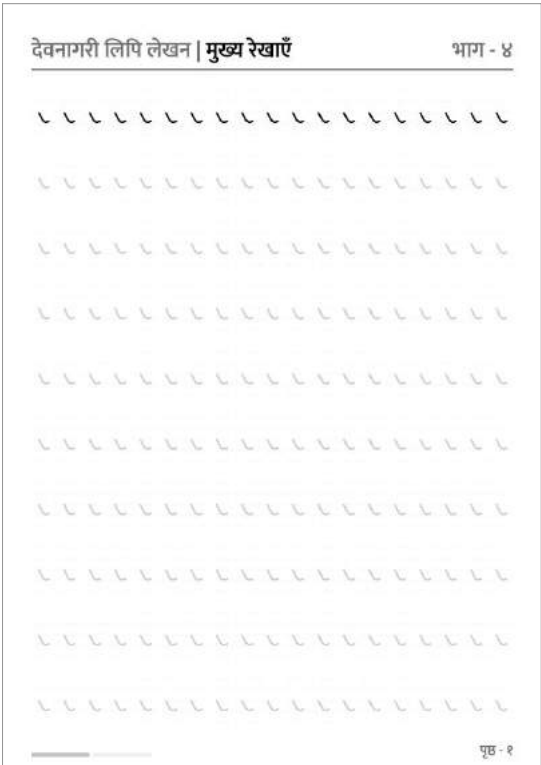
During this exploration, we tried three types of stitching based on the durability, visual, and tactile feel of the letter. We finalized the first stitching pattern for the rest of the design.



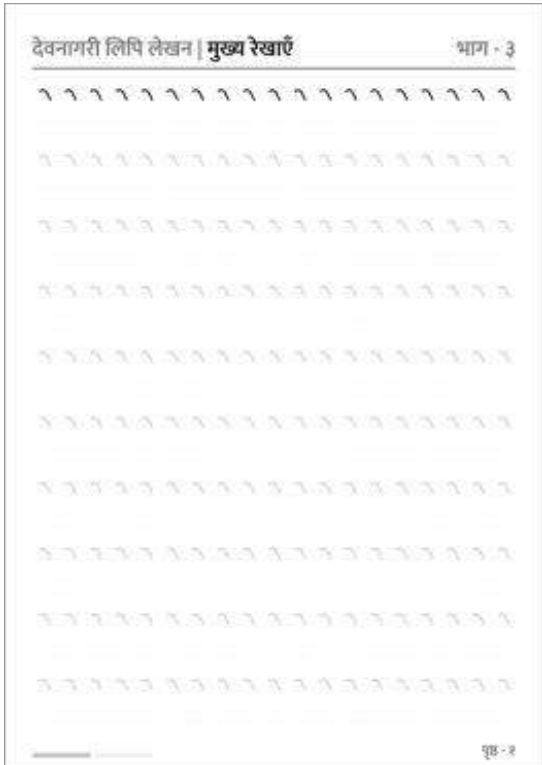
Cloth Book Pages

14.3. Primitives Worksheet

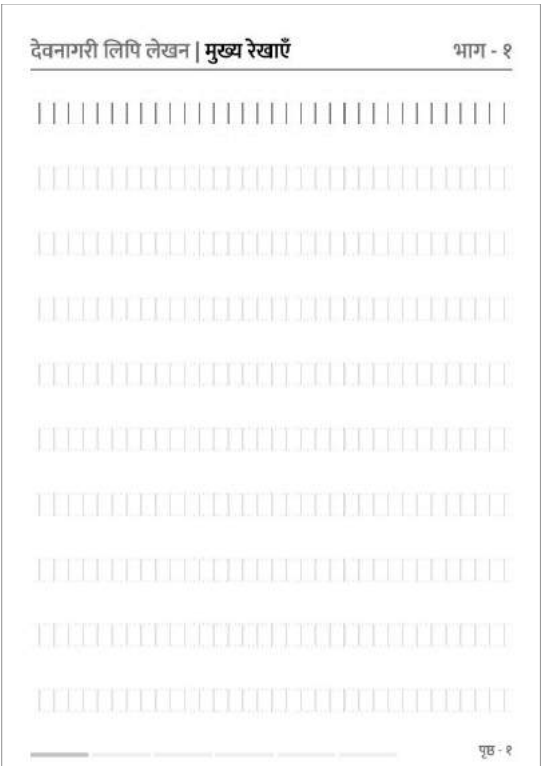
For the practice of primitives in Devanagari script writing, we have identified five types of lines based on the Aksharaya book, where Devanagari writing is studied and documented sequentially. We picked up these primitives and developed five types of worksheets, each with six stages to complete the practice.



Worksheet 3



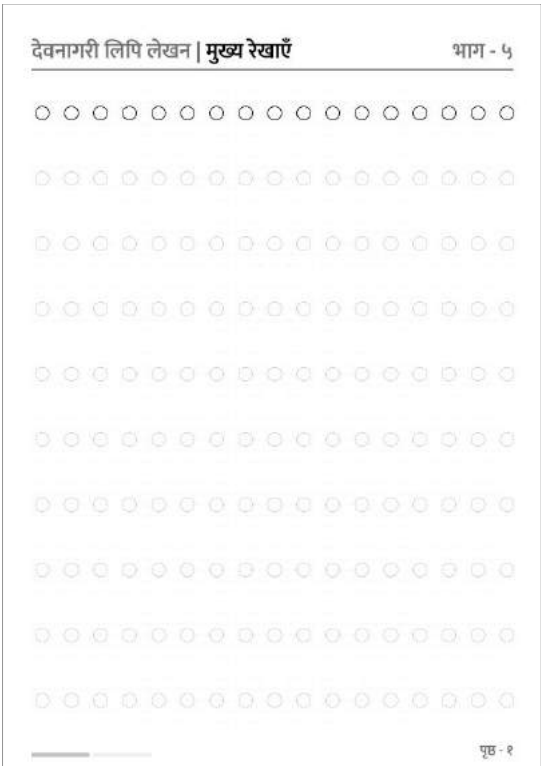
Worksheet 4



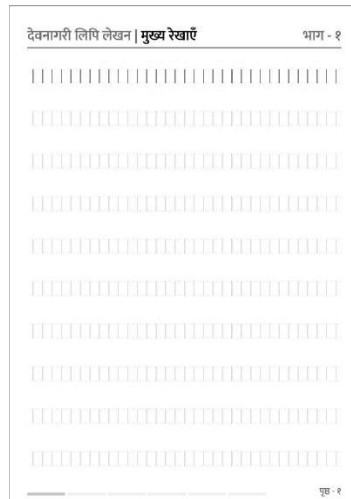
Worksheet 1



Worksheet 2



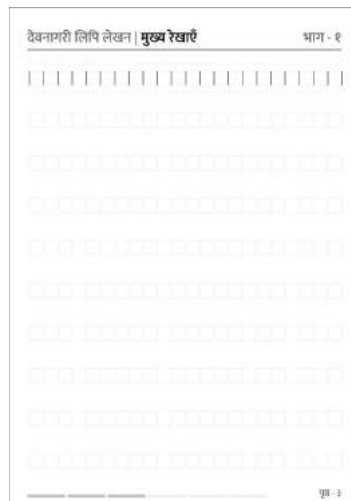
Worksheet 5



Worksheet 1.1



Worksheet 1.2



Worksheet 1.3



Worksheet 1.4



Worksheet 1.5

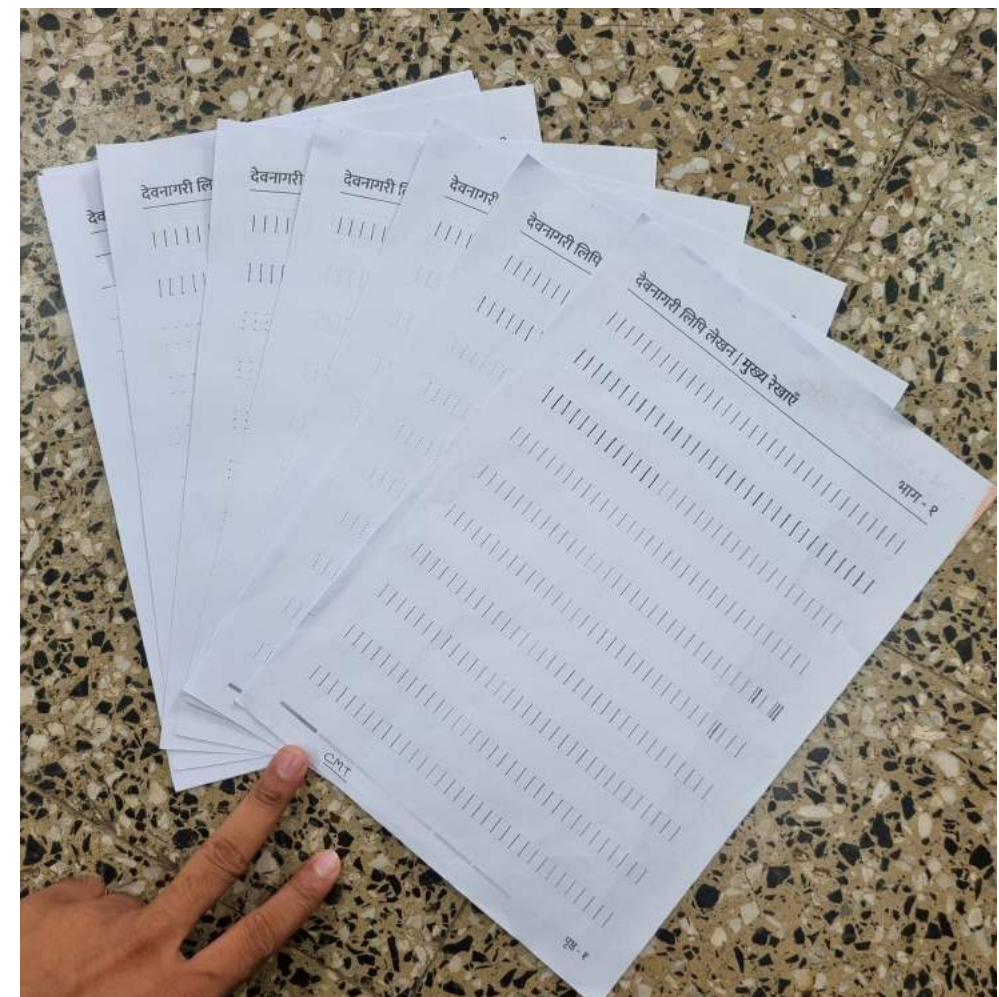


Worksheet 1.6

These are the five type of worksheets where

1. Worksheet 1- Straight Vertical Line
2. Worksheet 2- Straight Horizontal Line
3. 45° line -1
4. 45° line -2
5. Circles

These are the five type of worksheets have another 6 level of practice sheets as shown above. it starts with solid straight line to 2 dot line where children have to connect those dots.

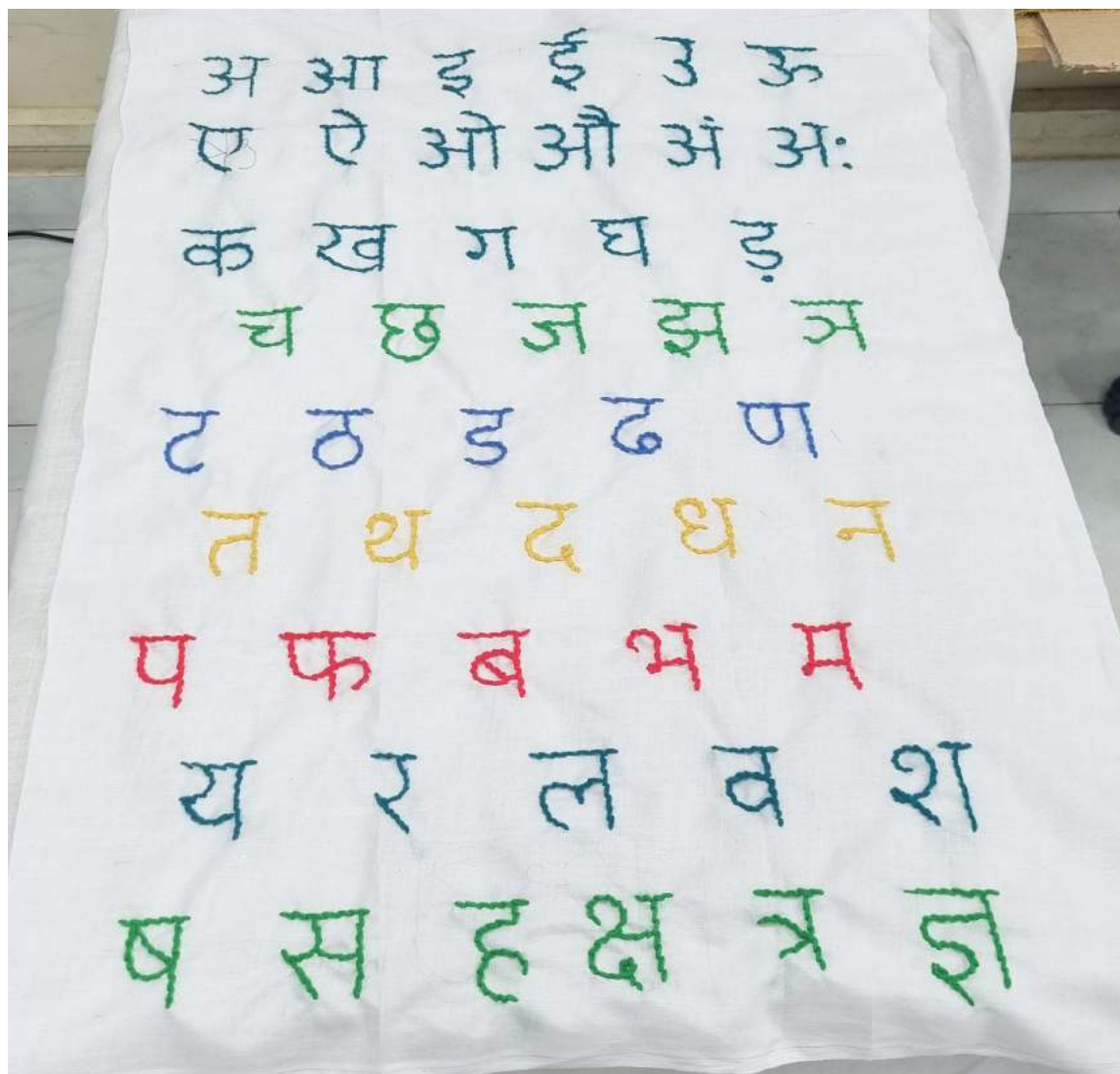


Worksheets

15. Final Design

15.1. Dhagadi ki Varnamala

After evaluating the previous prototypes, we gained insights suggesting that single-line letters would be more visible with less clutter. This approach is also easier to stitch and aligns well with their current embroidery practices.



Final Dhagadi ki Varnamala



Making of Varnamala

Also, on the backside, we have stitched a plain cloth to prevent it from mingling with other objects.

15.2. Aksharo ke Kitab - Card

In the process of testing the concepts with both children and experts, we obtained valuable insights. To enhance the interactive and playful aspects, we introduced various features. These included the ability to join different elements, a tactile feel to enhance the sensory experience, thoughtful color combinations, clear guidance on how to join components, and the flexibility of being foldable. These affordances were incorporated to provide versatility, allowing users to engage with the tool in diverse and creative ways.



Final Dhagadi ki Varanamala



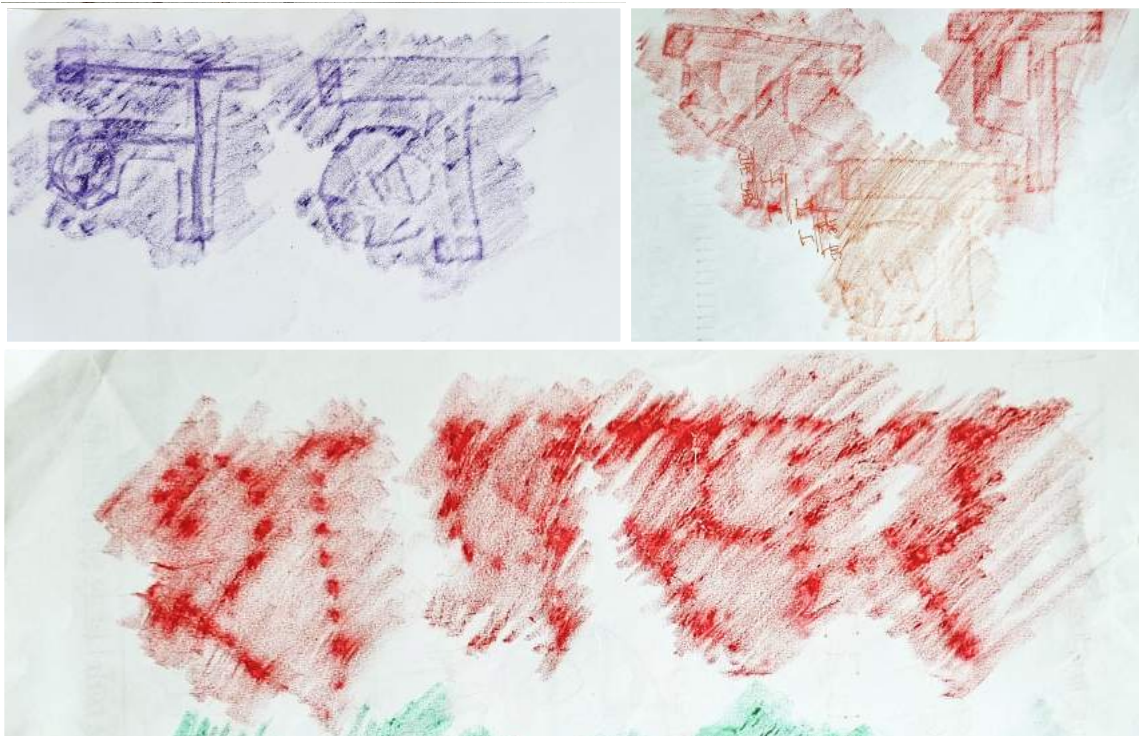
Process of making



Attaching Tuch Pin

15.3. Combination of Ideas

One of the benefit using cloth is that we get the emboss, which can be used for tracing activity. here are some of the example of word tracing. In this activity children for now can make words without matra.



Word Tracing

Activity Description:

The activity involves using specially designed cards to guide children in highlighting words. Dhagadi Fellows, who are mentors or educators, can use these cards during the learning sessions. Each card would contain a word or a set of words written in Devanagari script.



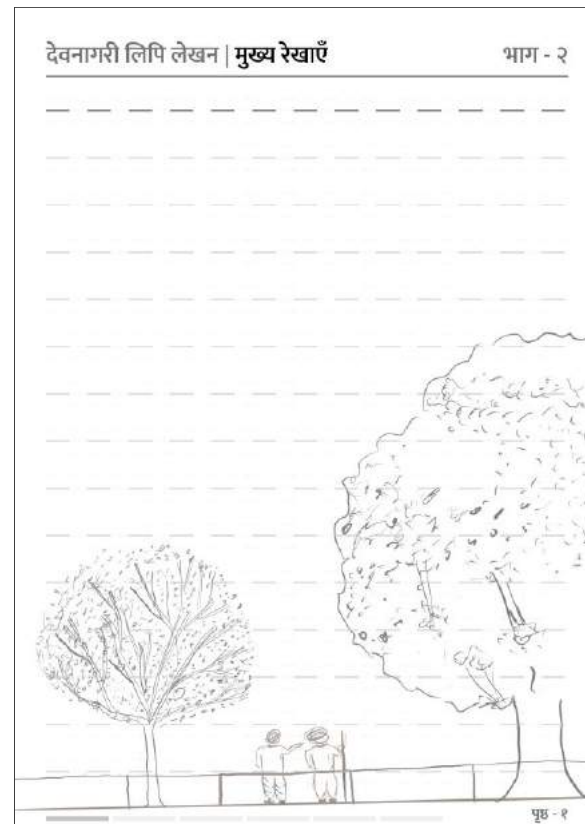
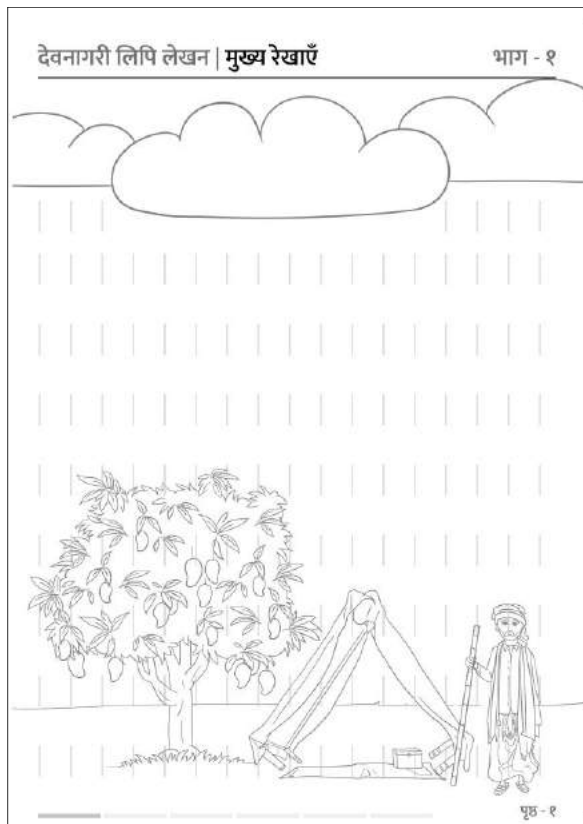
Highlight the word

Porpose:

The purpose of this activity is to reinforce the spatial understanding of word placement and structure in the Devanagari script. By physically engaging with the cards, children get a hands-on experience that goes beyond conventional rote learning.

15.4. Primitive Worksheets

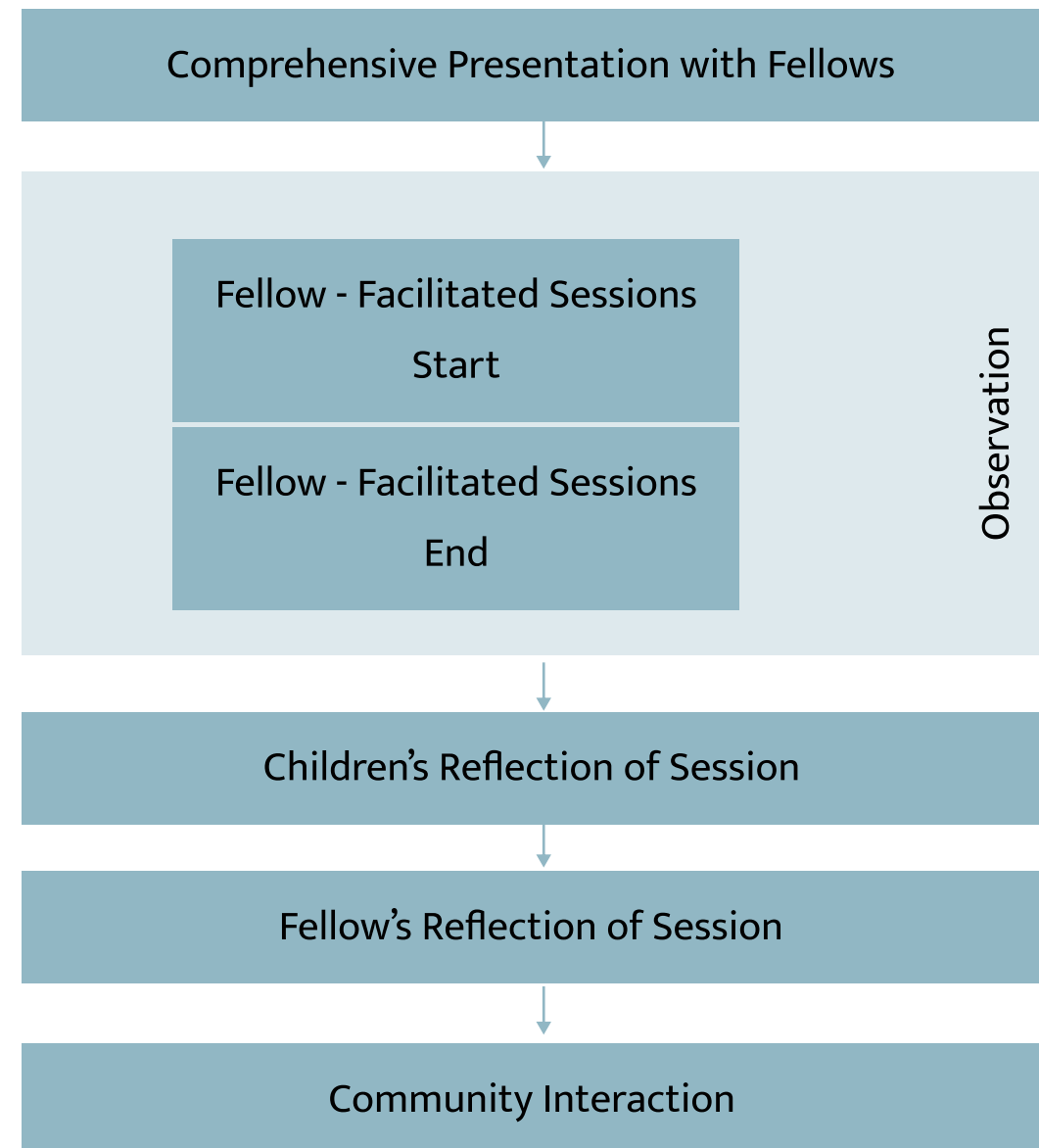
In the testing phase, we observed that redrawing the lines could be time-consuming, and it led to a loss of interest among children. To address this, we reduced the length of the lines by 50%. Additionally, to make the activity more engaging, we incorporated contextual scenery in the background. Rather than simply drawing lines, children now perceive it as completing a picture. For instance, if the task involves drawing vertical lines, we provide a rainy season scene, and the children's task is to make it look like rain by drawing vertical lines. Similar approaches are applied for other types of lines.



16. User Testing

16.1. Evaluation Plan

For the design evaluation, I have outlined a structured approach involving sessions with both NGO fellows and Bharwad children. The plan is to present the activities comprehensively to the NGO and fellows initially. Subsequently, fellows will independently facilitate the activities in Beda with the Bharwad children, utilizing the provided tools. This evaluation encompasses both non-participant and participant observation, where I will be present to observe the tool interactions.



16.1.1. Evaluation with children

Here is the outline for evaluation of fellow's interaction with Bharwad Children:

1. Fellow's Understanding: Assessing how effectively fellows comprehend and grasp the activities.

2. Activity Duration: Measuring the time taken for each activity to gauge efficiency and engagement.
3. Tool Interaction Mode: Observing the fellows' modes of interaction with the tools during the sessions.
4. Space Utilization: Evaluating the spatial requirements for conducting each activity in the Beda.
5. Innovative Approaches: Identifying any novel approaches adopted by fellows to explain the activities.
6. Children's Engagement: Assessing the level of engagement demonstrated by Bharwad children during the activities.
7. Points of Disinterest: Pinpointing instances where children lose interest and exploring the reasons.
8. Affordances Discovery: Identifying interesting affordances that children discover while using the tools.
9. Fellow's Clarity: Assessing the clarity of fellows in delivering instructions and facilitating activities.
10. Multigrade Class Response: Examining how the multigrade class responds to the activities and the level of interaction across different grades.
11. Tool Durability: Did the tools withstand the wear and tear of usage during the sessions? Were there any instances of wear or breakage?

16.1.2. Evaluation with Community

In the Beda, I engaged with both male and female members of the community to gather their responses and opinions about the tools, assessing the feasibility of their creation and use. The following key points were considered to understand community responses:

1. First Reaction to the Tool: Gauging the initial reactions of community members upon encountering the tools for the first time.
2. Close Observation and Feasibility: Observing closely to determine if the community finds it feasible to create and use these tools.
3. Time Required for Making: Inquiring about the estimated time it would take for the community to create these tools.
4. Usage Contexts: Understanding where and how these types of Dhagadi are currently used within the community.
5. Integration into Cultural Artifacts: Exploring potential ways in which these tools could be embedded into cultural artifacts within the community.

16.2. Deployment

16.2.1. Interaction with NGO and Fellow

Firstly I interacted with NGO and demonstrated tool and explained how to use it and prepared day-plan for that day. Along with me one NGO contain creator also joined to observe the session.

16.2.2.Interaction Children - Activities

16.2.2.1. Dhagadi Ki Varnamala



Foldable Letters

The older children were enthusiastic because they were familiar with their parents' day-to-day activities. One child started folding and creating interesting transformations, such as turning "A" into "3" and "AA" into "A". Younger children were curious to guess the letters based on these transformations. This sparked the idea that a larger chart could be more interactive for conducting this activity, so I proceeded with it.



Letter Recognition

Affordances which allowed to do this activity:

Foldability of cloth

Wear and tear free

Letter embroidery



Children interaction with Dhagadi

16.2.2.2. Word Formation

Different letters can be randomly joined to form words, with some words suggested by children. It was fun for children because it's a kind of surprise for them to guess the word coming next.



16.2.2.3. Akshar Ki Pahchan

This was an elder children-driven activity, discovered by the children themselves where two children were holding it, and one was pointing to the letter, while the other children were recognizing it.



16.2.2.4. Aksharo ke Card

In this activity, all the cards were placed in the center of the children's group. In the first Beda, children started this activity all together. As they found they have the next word, they came and placed it in sequence. It was fun to see all of them playing as a team to complete the Varnamala. Once completed, they read it aloud. Then, they started making word combinations.

In the second Beda, the fellow gathered all the students in a circle, then explained the activity. Cards were kept at the center, and children had to come one by one to complete the Varnamala. Initially, they followed the rule, but later stages saw all of them taking cards randomly to form words.

The children were eager to get the cards, creating a bit of competition as they tried to put the next card. Since these cards were made out of cloth, there was no harm, and it added to the lively atmosphere.

Affordances which allowed this activity -

Wear and tear free

Deferent color

joining directionality

Group activity

tactility



Children's sorting the card based on color



Started sequencing



Completed Varnamala



Children's sorting the card based on color - Second Bada



Started sequencing - Second Bada



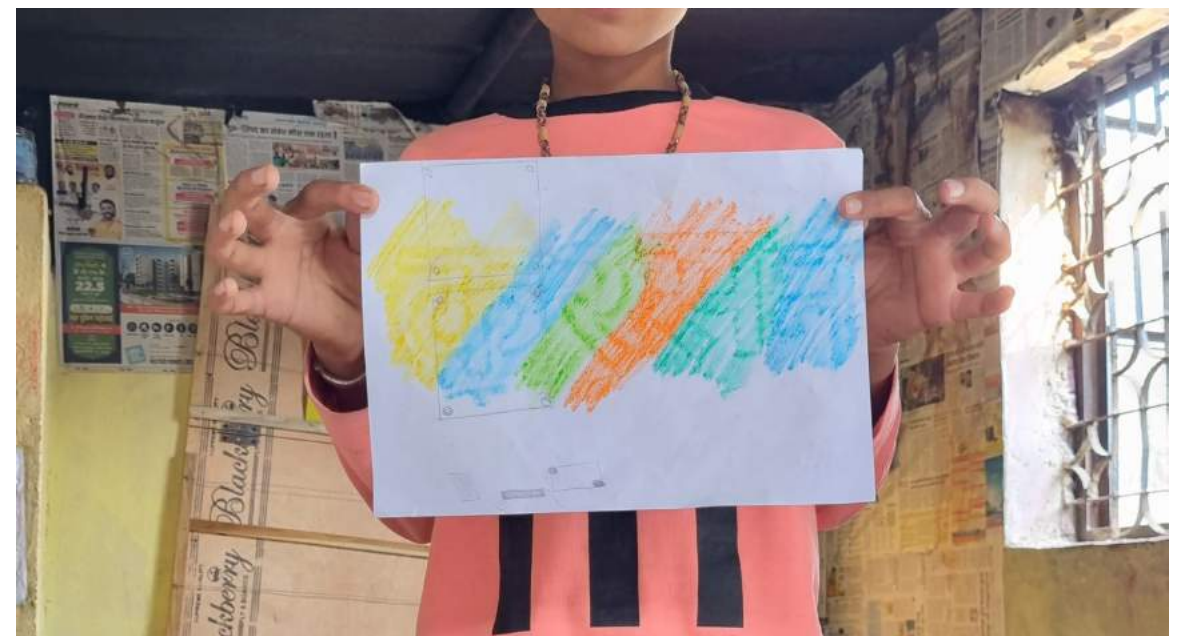
Completed Varnamala - Second Beda

16.2.2.5. Aksharo ke Card - Letter Tracing

In this activity, children have to place the letter beneath a paper and trace it using crayon colors. The embossing of the paper helped in tracing. It was a fun activity for them, and during this, they also drew their names.



Letter tracing



Farming Words

16.2.3. Community Interaction

After completing the activities, we interacted with the community, and they were surprised to see their style of art being used in creating educational tools. This experience helped broaden their imagination for the art they engage in, and they expressed excitement about making similar kinds of aids.



Community Interaction

After discussing with the community, they shared ideas about how these tools could be used as cultural artifacts, potentially becoming meaningful gifts within their culture. If incorporated into their cultural practices, these artifacts could be helpful in facilitating a faster grasp of learning the Devanagari script.



As a daily used objects

During my interactions, I discovered that the community already has artifacts where they write names. This revelation opened up the possibility of creating similar objects, aligning with their existing practices and artifacts. The idea is to integrate educational tools seamlessly into their cultural context, making them more relatable and accessible.



Bichane ke Dhagadiya (children)

This Dhagadi, traditionally used for children's sleeping bedsheets, holds significant cultural value. Typically gifted to daughters during marriage or childbirth, it serves as a cherished gift item. Community members suggested the idea of crafting a Dhagadi Ki Varnamala, seeing it as a positive symbol of educational awareness. This proposal not only aligns with their cultural practices but also adds a new dimension by incorporating educational elements into their traditional artifacts.



Dhagadi

This particular Dhagadi is a versatile piece commonly utilized for various activities such as sleeping, shading, and covering objects. During discussions, community members suggested incorporating the Dhagadi Ki Varnamala on the border of this multipurpose cloth. They expressed interest in learning basic drawing on the cloth or someone do that to facilitate the make these educational artifact. This collaboration between traditional crafts and educational elements highlights the potential for cultural integration in learning tools.



Chumar

This Chumar is commonly used for carrying water buckets on the head. It features a flap on the back that they traditionally decorate with embroidery. The suggestion is to create similar flaps or "pataka" for each letter. Additionally, they use "pataka" at the entrance of their houses as a decorative element. The idea is to incorporate similar objects for each letter, adding a decorative touch, and hang them on the bamboo in the next picture. This way, these items can serve as daily, visually engaging aids for children, facilitating a better understanding of letters.



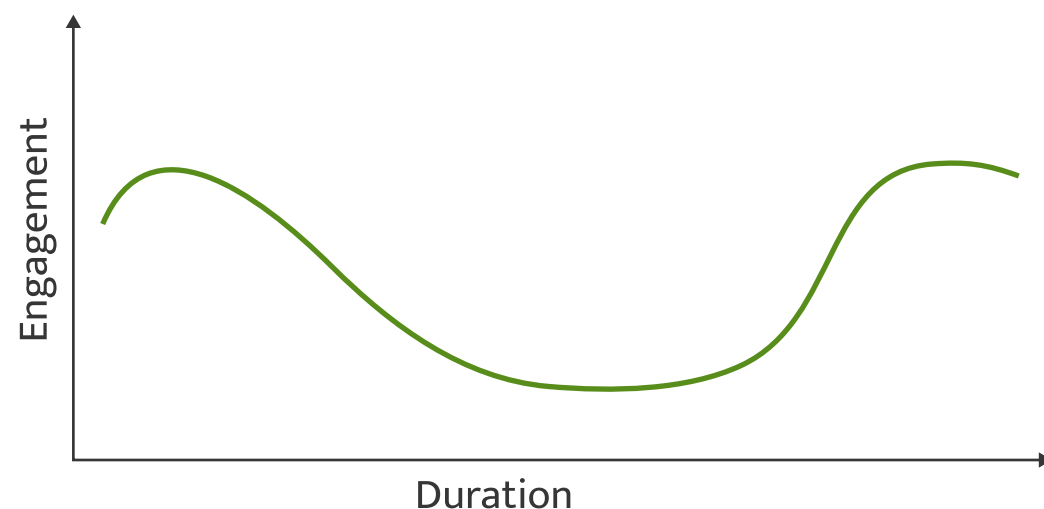
Bamboo Structural Member

17. Observations

Tools were introduced to children and parents, and the observations revealed that these tools not only expanded their imaginations in terms of their craft but also provided a sense of relatability, given their alignment with day-to-day life experiences.

17.1. On Site Observation

1. Engagement level: The multiple affordances in the tool created a playful learning interaction for the students. These activities were more engaging for the children who were starting to learn Devanagari script because, for them, it was a new thing to do. However, the children who already knew reading and writing found it interesting at the beginning, but they were looking for more and more.



2. Multi-Grade Approach: In the activity, most of the children were engaged, but the elder children were specifically interested in Matra-based letters and word formation.
3. Contextualized Learning: The tools created are contextualized, but the strokes used in embroidery were not familiar to them, so they expressed that they might not be able to replicate it exactly. Nevertheless, they appreciated the idea and were willing to incorporate it into their culture.
4. Community Involvement in Education: The engagement of the community in creating tools will enhance the educational ecosystem. Females in the community showed interest in making these types of artifacts, and they actively participated in creating them. This suggests that this involvement is likely to continue.

17.2. Long Term Observation

In the long-term observation, fellows and the community together expanded this activity to include numeracy and name writing. They are still actively creating similar tools for other purposes.



Cards created for the Numbers



Community created Dhagadi Ki Varnamala



Nameplate created by community

18. Future Work

These aids can be further developed to explore more educational tools for the Bharwad community. Not restricting their use to the Bharwad community, these types of tools can be created by communities in resource-constrained environments. They can utilize their own materials like used sarees, clothing, or good bags to craft similar aids.

The cards can be employed as AR markers for an application that informs users about the word they have created, facilitating self-evaluation.

These aids could also be transformed into a business venture as educational aids. As suggested by Prof. Anirudh Joshi, creating nameplates in Banjara embroidery or decorative wall paintings using embroidery can be pursued.

19. Discussion

In the course of this project, we delved into the intricate lifestyle of a semi-nomadic community deeply intertwined with the rhythms of cow herding. The community, spending hot summers outdoors without shelter, exhibits a lifestyle where education and related activities seem distant. Yet, the evolving societal structure insists on the necessity of at least basic education for meaningful participation.

The NGO is actively working to introduce fundamental education in this community. Our project, in turn, endeavors to contribute meaningfully to these efforts by providing tools that are not only impactful but also deeply rooted in the context of the community's unique lifestyle.

The tools we've designed serve as conversation starters within the community and the NGO. They are not just educational aids but symbols of empowerment, bridging the gap between traditional practices and the need for contemporary learning. It will help to incorporate cultural activities in education and how we can add education to our culture so that it will become an integral part of it.

20. Conclusion

This project is a unique endeavor where the community actively participates in creating content, forming a crucial element for its success. The community's involvement becomes pivotal as the success of the project hinges on their ability to replicate similar works. The NGO's commitment to incorporating these tools into their educational programs adds another layer to the project's sustainability.

Beyond being a means to teach Devanagari script, these tools evolve into instruments for the community to express their creativity. The initial impact is evident as the design of the tools helps familiarize them with previously unfamiliar concepts. It acts as a spark, encouraging the community to engage in activities in novel ways, deviating from their usual practices. The examples they have created stand as a testament to this transformative potential, marking the beginning of a journey where community creativity is celebrated and expressed through education.

21. Learning

Many things have evolved through the project, as this project is started with the motivation that do some work which will help someone. That time i was unaware of processes how to approach thing which are organic in nature such as field work nothing in the control, so i learned that how to negotiate this and be the part of it. Also the tools which used in the research such as interview, field visit, field diary, community interaction and improved a bit in articulation.

22. References

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