

Learning game for teaching Devanagari Conjuncts to Children



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Current scenario

- 96.7% of children are enrolled in rural India. 71% of enrolled students are attending schools (Age 6 to 14 years)
- Reading problems – Only 23.6% of 3rd grade students and 48.1% of 5th grade students can read the text of 2nd grade (or higher)
- Reading levels – Faces problem in reading letters, Words and long sentences
- Reading level in government schools is declining year by year

Need

- Basic learning is important
- Reading requires understanding of – Basic letters and words
- Without reading child can not go ahead
- Reading is required for writing

Why Conjuncts

- Learning conjuncts is important to read the Devanagari scripts
- It helps to form words in language, mostly used in singular and plural form
- Difficult to understand for child how conjuncts are formed
- Has various forms, styles, pronunciation

Curriculum and teaching methods

- Before conjuncts, students are introduced to basic letters including vowels and consonants
- Students are introduced to conjuncts in 1st standard in second half of the academic year.
- Conjuncts are taught to children once they get basic knowledge about letters and matras associated with them
- The sequence of teaching Marathi is always sequential

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Letters ——— Words — Sentences

क म ल

कमल शाळा

कमल शाळेत जाते

Conjuncts

When two or more consonants comes together they form a conjunct

त् + स = त्स

म् + ह = म्ह

- There are two methods of writing conjuncts
- Horizontal Conjuncts for e.g. - क् + क = क्क
- Vertical Conjuncts for e.g. - ठ् + ठ = ठ्ठ

Conjuncts

Types of Conjuncts based on consonants

Consonants with vertical line in it

For e.g. - घ् + य = घ्य

Consonant without vertical line in it

For e.g. - ट् + य = ट्य

Conjuncts

Marathi conjuncts can be written in multiple ways, but some are written often than others.

- For e.g. –

क् + त = क्त

द् + य = द्य

श् + र = श्र

द् + ध = द्ध



सदूने गाढवाच्या पाठीवरील सगळे ओझे काढले. गाढव धडपडत उठले. सदूने गाढवाच्या पाठीवरचे ते ओझे घोड्याच्या पाठीवर ठेवले.

आता घोडा-गाढव हळूहळू चालू लागले. ओझ्याने घोडाही दमून गेला. घोड्याने गाढवाचे म्हणणे आधीच ऐकले असते तर.....

- वाचा. लिहा.

गोष्ट	घोड्याची	त्याच्या	रस्त्यात	दुर्लक्ष
.....				
.....				

गारगार पाणी बादली भरून,
हसत घ्यायची अंघोळ करून.

चांगले धुतले कपडे घातले,
मन आनंदी होईल आपले.

- विठ्ठल बाघ



घ्यायची

घ्या

घ्य ा

घ

य

घ्य

- ऐका. म्हणा. वाचा.

सर्व	सम्राट	पत्र	वर्ग	ट्रक
मित्र	शेतकऱ्याला	वाऱ्यावर	क्रमांक	राष्ट्र

'र' ची रूपे	'र' ची जोडाक्षरे	'र'च्या जोडाक्षरांचे शब्द
र		
र्		
्र		
ॠ		

Overview

Pros

- Different practice exercises are given after every chapter
- Word association with Illustration and pictures
- Step by step explanation given

Overview

Cons

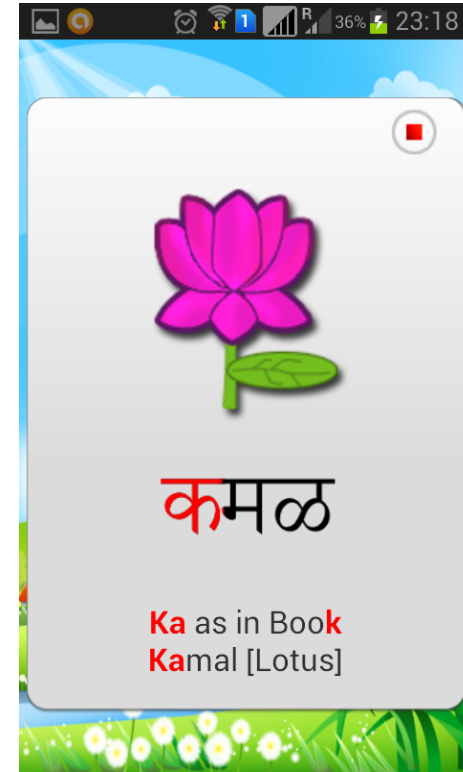
- No explanation about pronunciation
- Conjuncts which take different forms after joining are not explained in books. For e.g. – विद्या, विद्वान
- No classification given for different combinations of conjuncts

For e.g.- Vertical arrangement

Horizontal arrangement

Conjuncts with र or र्

Overview of existing products



Literature Survey

Learning Theories

Preoperational Stage

Insights from Literature review

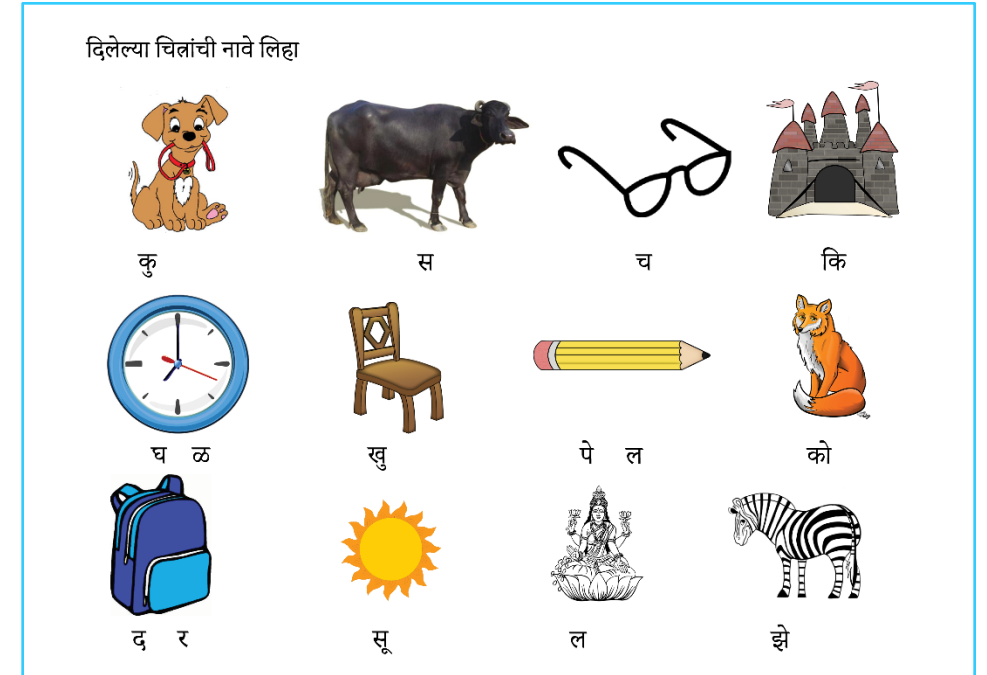
- At early stage of learning, the child is not able to process the logic behind the formation and different combination of conjuncts.
- Child gets involved easily in dynamic activities like game play etc.
- Collaborative play tend to motive other players and learn effectively.
- Providing a fun and engaging experience while teaching is important in learning process.

User Studies

Target user – 1st std and 2nd std, Tirandaj Village School, Powai

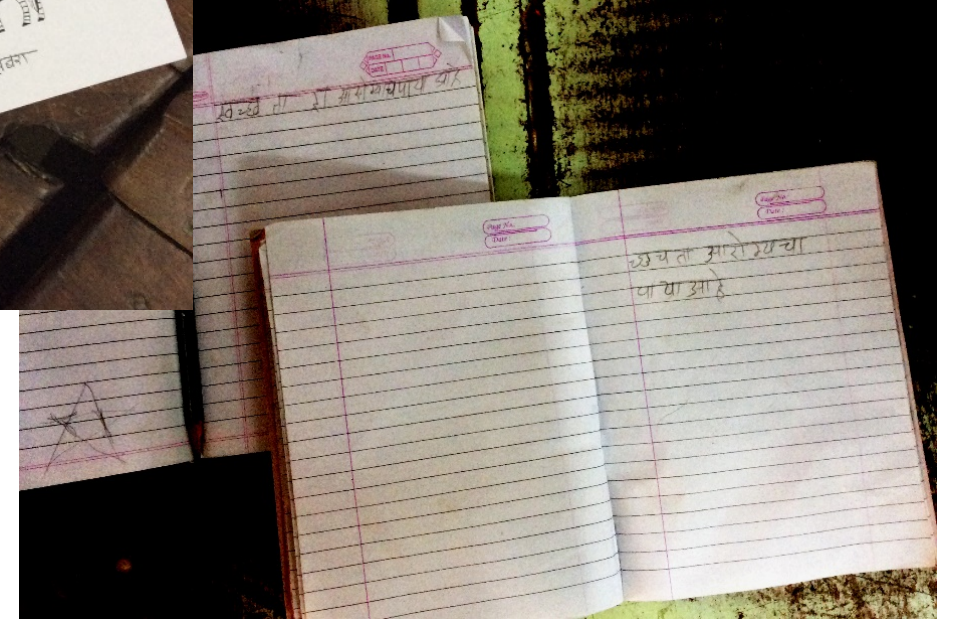
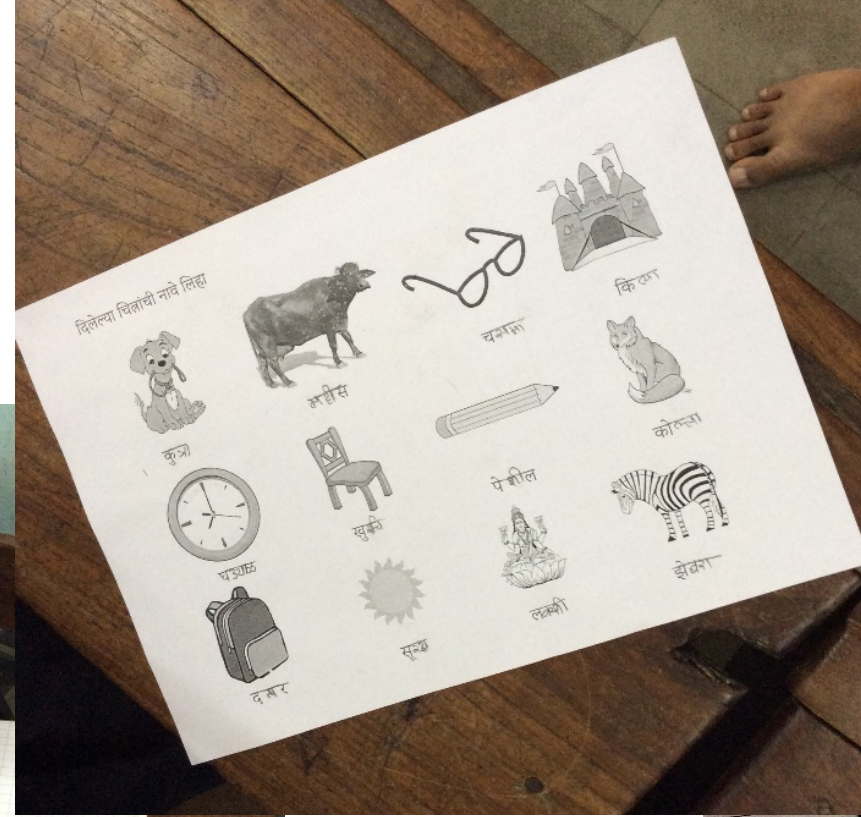
Activities given to children

- Write words on worksheet
- Read and write conjuncts



User Studies





Insights from User Studies

- No introductory level or information for teaching basic of conjuncts
- No emphasis on pronunciation (sound) of conjuncts
- No practice of rare and difficult conjuncts
- While reading conjuncts students read the characters included in conjuncts separately instead of reading it as combined letter.

For e.g. – Students read म्हैस as महिस which is wrong.

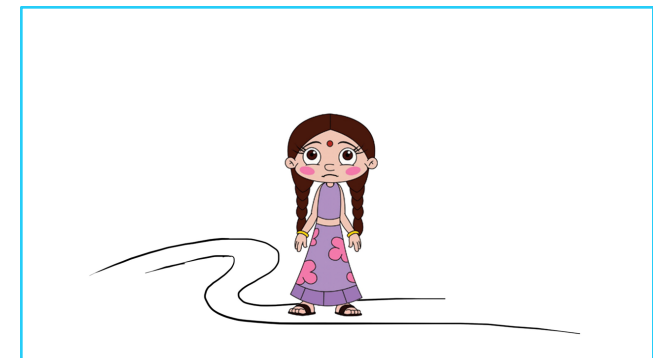
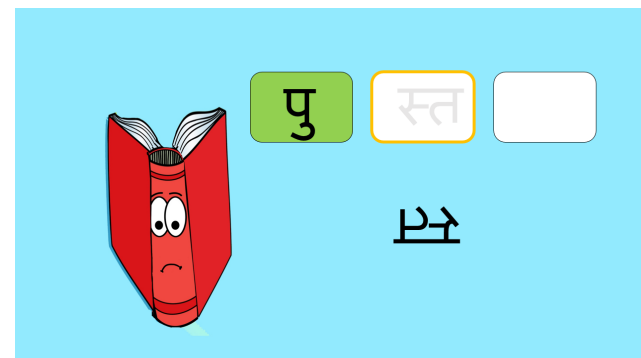
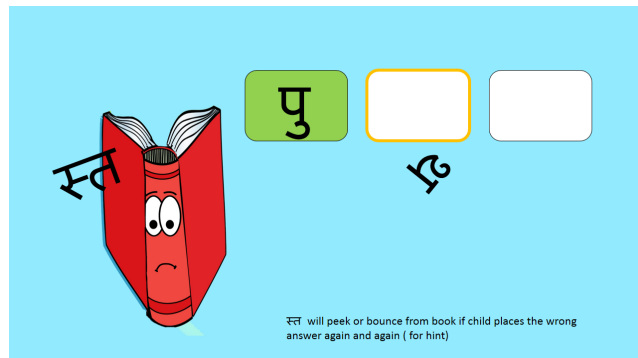
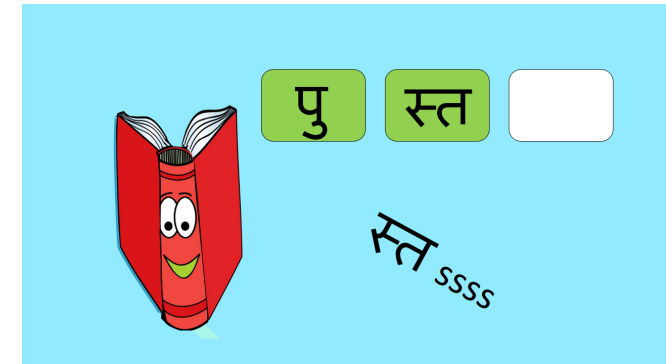
- No detail explanation about different forms of र and र् conjuncts
- Influence of spoken language
- Skip the word while reading

Redefined Goals

- To provide a learning toy to make user understand sequencing of letters formation, recognition and pronunciation of conjuncts

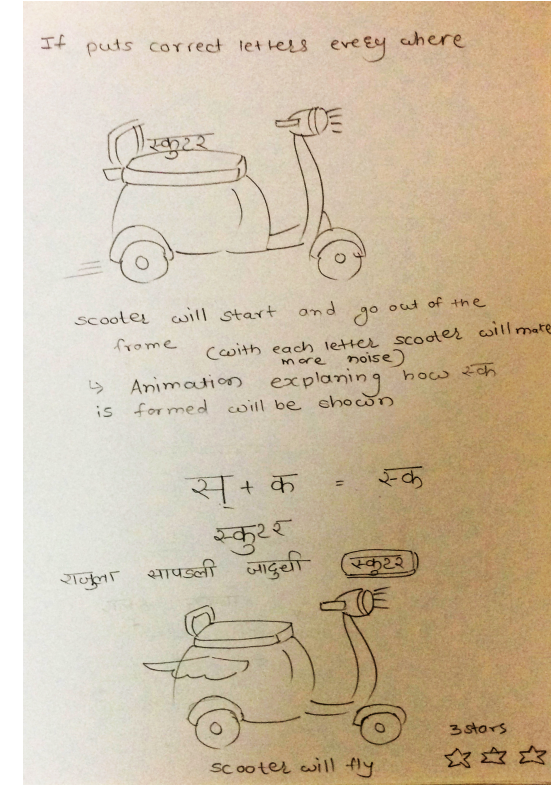
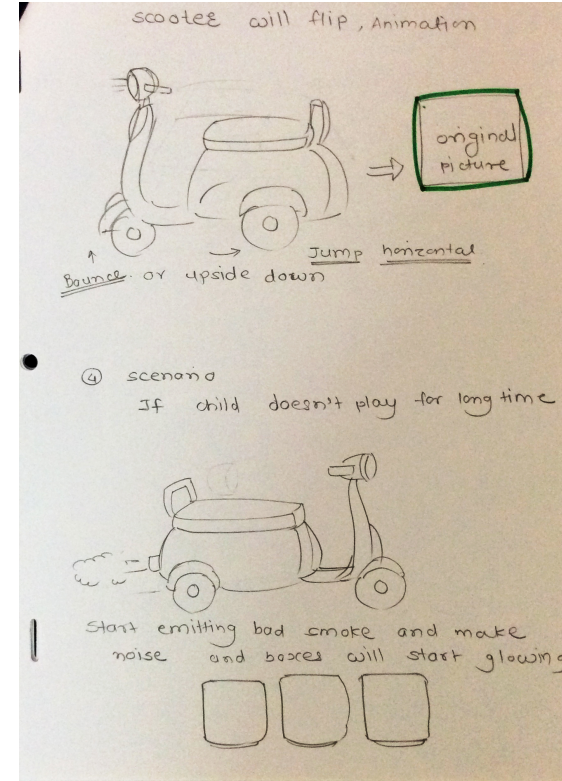
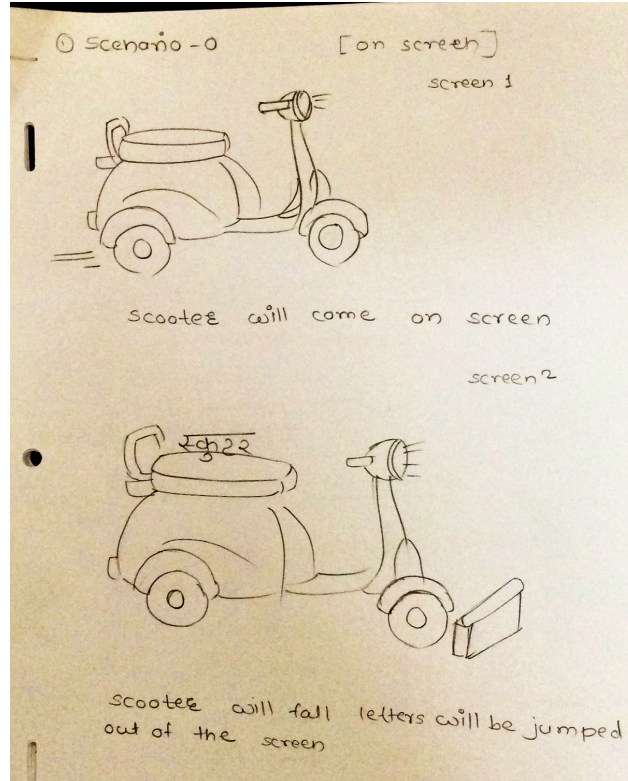
Initial Concepts

Concept 1



Initial Concepts

Concept 2



Initial Concepts

Concept 3

				End
				
				
				
Start				

 1	शु+र 6 रु+ह	रु+र 3 शु+व	 2	End 5
रु+छ 2 रु+ष	 5	कु+र 4 पु+र	रु+घ 6 तु+र	 1
मु+ह 4 वु+घ	धु+व 1 मु+घ	 3	 1	बु+घ 2 नु+म
सु+क 6 कु+घ	चु+घ 1 छु+घ	तु+स 4 लु+ह	पु+त 2 वु+घ	 6
Start	सु+त 4 सु+प	कु+क 1 गु+न	 5	चु+घ 1 गु+घ

Initial Concepts

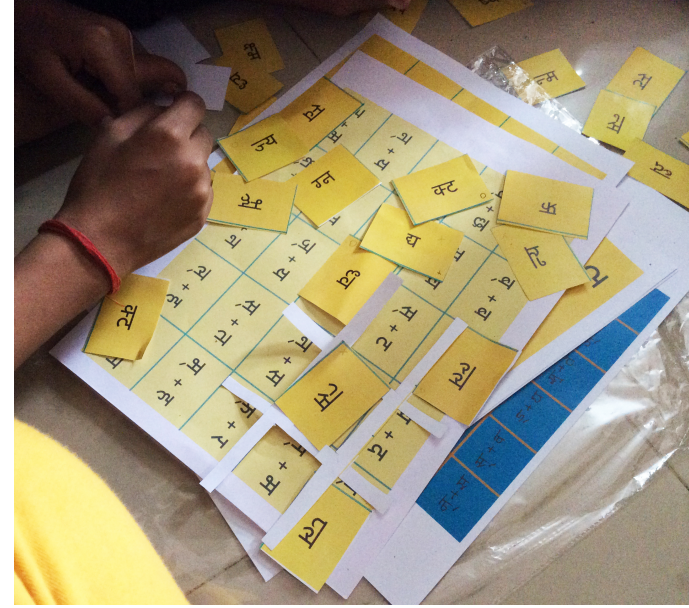
Concept 4 Run the Wheel



Initial Concepts

Concept 5 - Tic Tac Toe

क् + ट	ब् + ब	ल् + ल	ब् + द	प् + ल
च् + छ	स् + व	स् + ट	त् + स	न् + म
ध् + य	द् + य	ध् + व	न् + स	फ् + र
न् + य	ष् + य	ज् + य	स् + त	म् + ह
त् + ह	क्ष् + म	ग् + न	ल् + ह	त् + त



Initial Concepts

Concept 6 Card Game

- No of players - 2 players
- Objective of the Game To make given pair of conjuncts from given set of cards.
- Strategy - While playing the game children should try to build their own set of pairs of conjuncts; at the same time they should stop their opponent to form their pair.
- The game consists of 4 puzzle, 2 puzzles are given to one player. The puzzle contains conjunct given on the card. Player will be given halant cards and consonant cards. Player has to take halant cards and consonant cards turn by turn to form a given conjunct. The player who finishes his/her pair first wins the game.

Player 1

Puzzle Cards
with conjunct

म्हैस

त् क

उत्सव

स् व

Bonus Cards

तुझ्या

तिच्या

Puzzle Cards
with conjunct

Player 2

गुच्छ

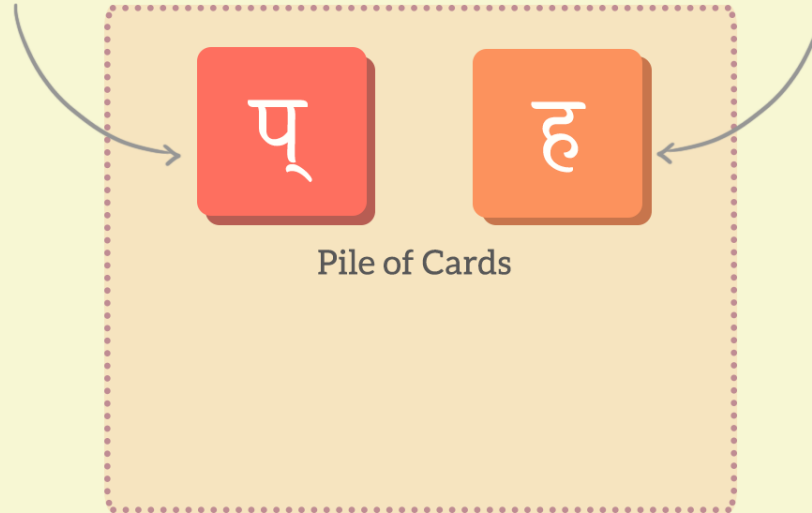
ल् च

बाल्य

ग् न

Halant Cards

Consonant Cards



Player 1

Puzzle Cards
with conjunct

म्हैस

त् क

उत्सव

स् व

Bonus Cards

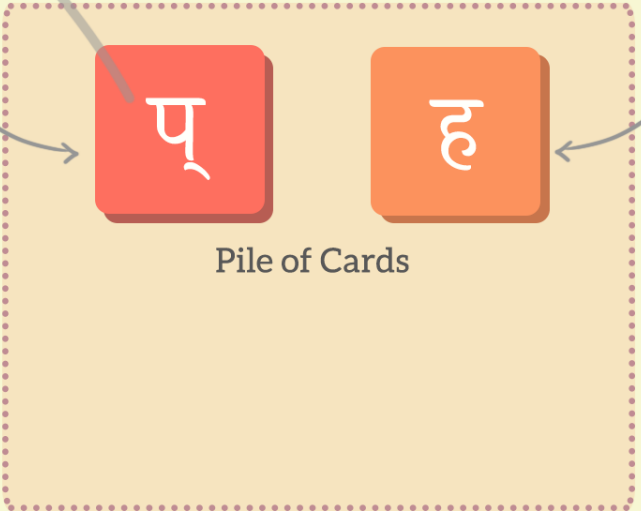
तुझ्या

तिच्या

Halant Cards

Consonant Cards

Pile of Cards



Player 2

Puzzle Cards
with conjunct

गुच्छ

ल् च

बाल्य

ग् न

Player 1

Puzzle Cards
with conjunct

म्हैस

प् क

उत्सव

स् व

Bonus Cards

तुझ्या

तिच्या

Puzzle Cards
with conjunct

Player 2

गुच्छ

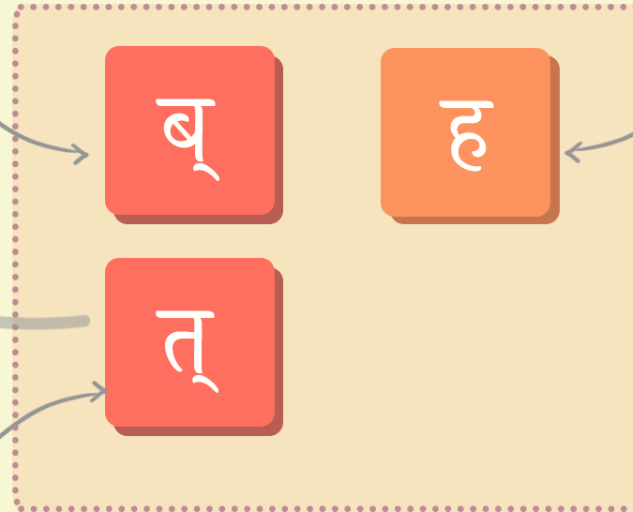
ल् च

बाल्य

ग् न

Halant Cards

Consonant Cards



Discarded
Halant Cards

Player 1

Puzzle Cards
with conjunct

म्हैस

प् क

उत्सव

स् व

Bonus Cards

तुझ्या

तिच्या

Puzzle Cards
with conjunct

Player 2

गुच्छ

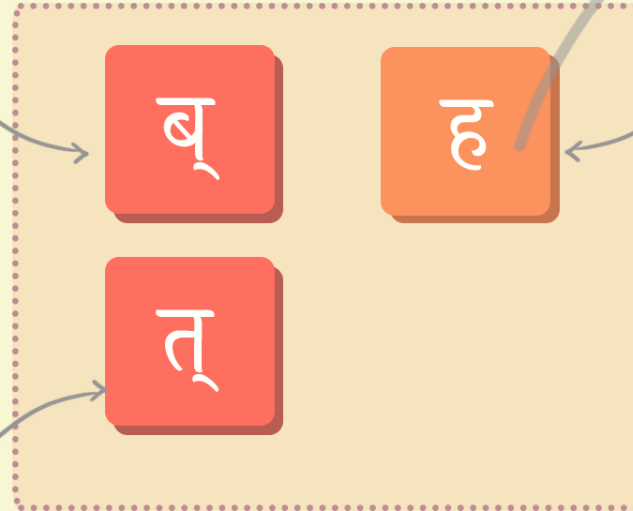
ल् च

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Halant Cards

Consonant Cards



Discarded
Halant Cards

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Halant Cards

Consonant Cards

Discarded
Halant Cards

Discarded
Consonant Cards



Player 1

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तिच्या

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Puzzle Cards
with conjunct

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ल् ह

Halant Cards

Consonant Cards

उत्सव

स् व

ब् द
त् च

बाल्य

ग् न

Discarded
Halant Cards

Discarded
Consonant Cards

Player 1

Puzzle Cards
with conjunct

म्हैस

प् च

उत्सव

स् व

Bonus Cards

तुझ्या

तिच्या

Halant Cards

Discarded
Halant Cards

Consonant Cards

Puzzle Cards
with conjunct

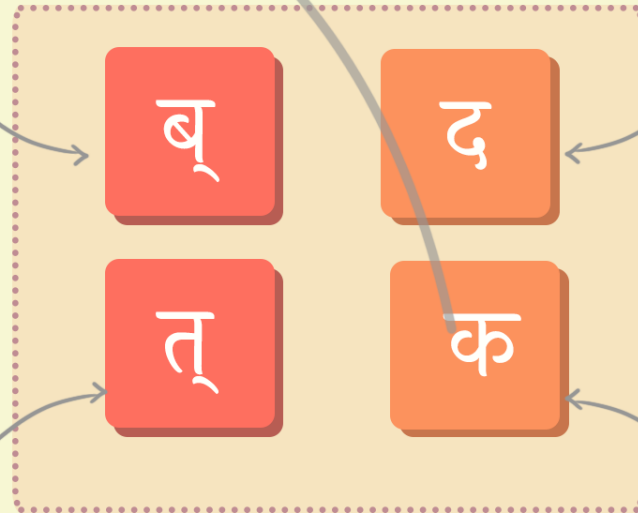
Player 2

गुच्छ

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Player 1

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Bonus Cards

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तिच्या

Puzzle Cards
with conjunct

Player 2

गुच्छ

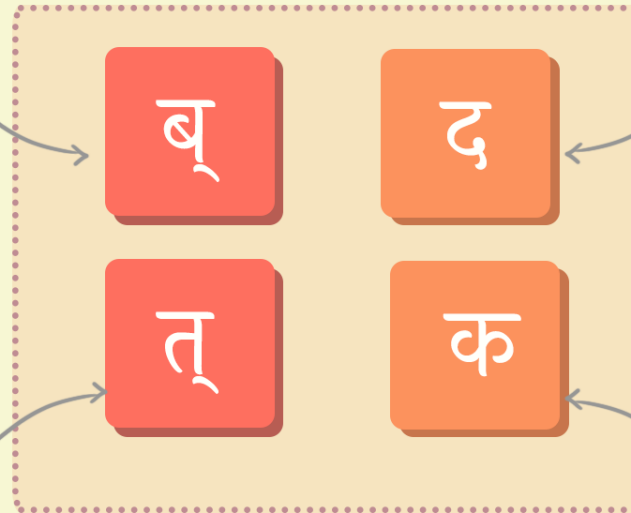
च् ह

Halant Cards

Consonant Cards

उत्सव

त् स



Discarded
Halant Cards

Discarded
Consonant Cards

बाल्य

ल् य

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Bonus Cards

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Halant Cards

ब् द
त् क

Discarded
Consonant Cards

बाल्य

ल् य

Testing



Pros and Cons

Pros

- While playing the game children were keeping track of opponents and try to understand their pair of conjuncts
- Exchanging of cards was making the game more interesting and fun
- Strategy was involved in game to block the opponent
- Luck involved in game was creating uncertainty in game play to keep the game play exciting
- Different levels can be introduced in the game play to increase difficulty level in the game

Pros and Cons

Cons

- It was confusing for children to understand where to keep discarded card and which card to pick from four cards
- The horizontal arrangement of the cards were confusing for children to understand sequence of halant and consonant cards
- Children were taking too much of time while choosing or discarding the card which was making the game lengthy

Finalizing the Concept

Main parameters taken into consideration while deciding the final concept

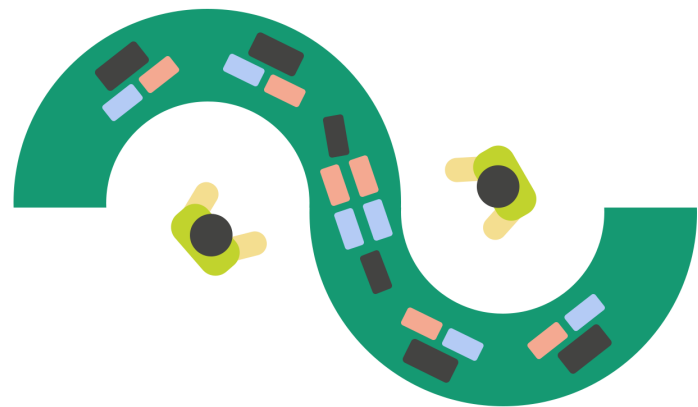
- Social Dynamics
- Manufacturing cost
- Engagment
- Effective learning
- Fun and excitment

Layout for Board Game

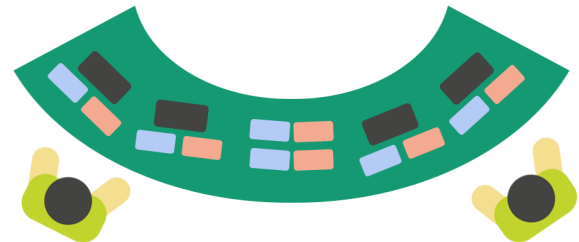
While designing the layout of the board game few factors were taken into consideration

- Ergonomics
- Area of reach
- Visibility of the players and opponents play area
- Arrangement of cards on game board
- Area to move

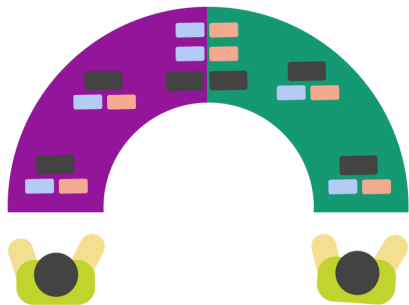
S layout



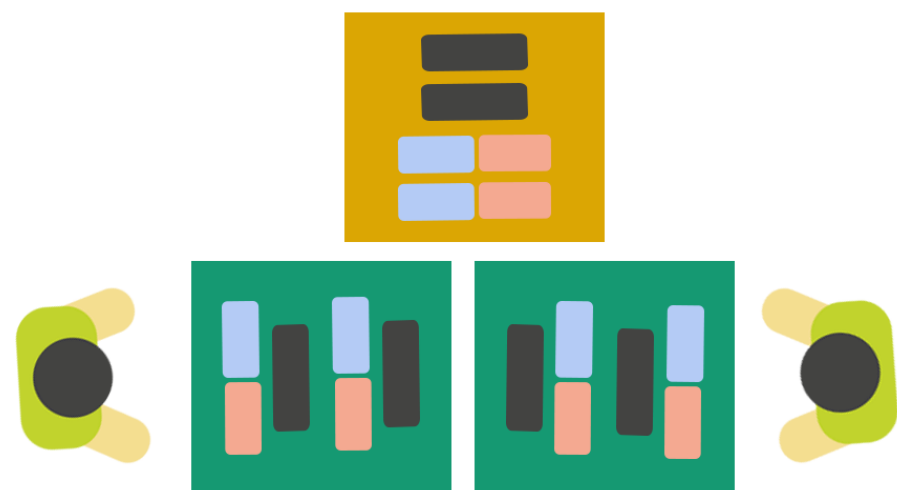
Arc layout

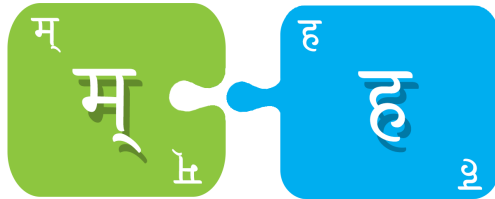


Arc layout 2

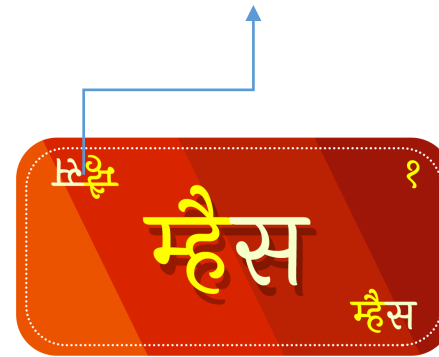


Square Layout





Upside down text



Hint at the back of the card

Levels of the game

- Level 1
Simple conjuncts without any form change for e.g. - म्हैस, बाल्य
- Level 2
Simple conjuncts with vertical and horizontal arrangements for e.g. - पक्का, विठ्ठल
- Level 3
Simple conjuncts with halant without any vertical line for e.g. - मोळ्या, ऐवढ्या
- Level 4
Conjuncts with form change for e.g. - भक्त, विद्या
- Level 5
Conjuncts with र at end for e.g. - प्रकाश, ग्रहण
- Level 6
Conjuncts having र at the start for e.g. - मर्द, हर्ष

Prototype for testing



Prototype for testing



Testing



Findings

- Children were unable to recognize the conjuncts with र कार (where pronunciation is very important) and conjuncts with different form like भक्त, पद्म
- There was no feedback if the child was not playing the game for long time
- Sometimes, while picking up the card children were mixing up halant and consonant cards.
- Even though children were able to make correct pair they were unable to understand how the exact formation of the conjunct happened

Digital Prototype

- To add interactivity in the game and observations drawn from the pilot evaluation Digital prototype of the board game was designed.

Demo

Evaluation

- Total users – 6
- 2 levels of the game were evaluated consisting of simple conjuncts, conjuncts with different form and with τ at start

Pretest

Children were asked to read words with conjuncts from simple to difficult

Post test

Children were asked to read conjuncts given on puzzle card and words with same conjuncts

Observation

Lengthy game play for first time

Difficulty in conjuncts with different form

Hint and sound was helpful to understand conjunct

Animation and digital interactivity added more engagement in game play

Thank You