PROJECT 3 | FINAL PRESENTATION

Design Intervention in Play and Learning Techniques for Children

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Guided by:
Prof. Ravi Poovaiah

Introduction

- Traditional Approach of Learning - Student should focus and **absorb Ideas** from **Teachers and Textbook**.
- Mathematics and Criticism - **Less relevant** of what taught in **day to day life examples**.
- Abstract Concept in Mathematics- **Not all** students can **cope** with with mathematics in **day to day life** at an adequate level .
- Play and Learning- there is a need for **introducing concrete experiences** with interactive content, exploration, and experience to reduce the level of abstract concepts in mathematics.

Mathematics Classroom

Objectives

- Making learning playful for secondary students.
- To be able to design a digital application toolkit for Mathematical concept to be used in a classroom setting for children ages 8-10.
-

Goals

- Enable children to identify and understand operation of Fraction.
- To make children aware daily uses of fraction concepts in day to day life.
-

Scope

- Exploratory Design project.
- Design intervention of intuitive and digital app toolkit.
- Making digital App toolkit for repeatedly playing and interacting with will enhance the knowledge of Fraction and children will be able to do operations on Fraction in less time.

How, What, and Who...

The three questions..

How do children learn?

- Most children learn in schools today, the teaching methods were designed for book reading, paper-and-pencil methods and somewhat small experiments- projects.

What do children learn?

- Textbooks and chapters developed by State government or Central government education body.

Who do children learn with?

- Children learn with the help of teachers (a formal way of teaching)
- In-home with parents and siblings.
- Collaborative projects, assignments with friends, classmates mainly in school hours, social places like parks or playgrounds or study hours.

Literature review

Literature review

Piaget's Theory of Cognitive Development

- Learning is active process.
- Learning occurs in children through the process of adaptation.
- Children construct knowledge structures through experience and interaction with their environment.
- four factors affect the development process of children
  - Maturation
  - Experience
  - Social Interaction
  - Emotions and Motivation

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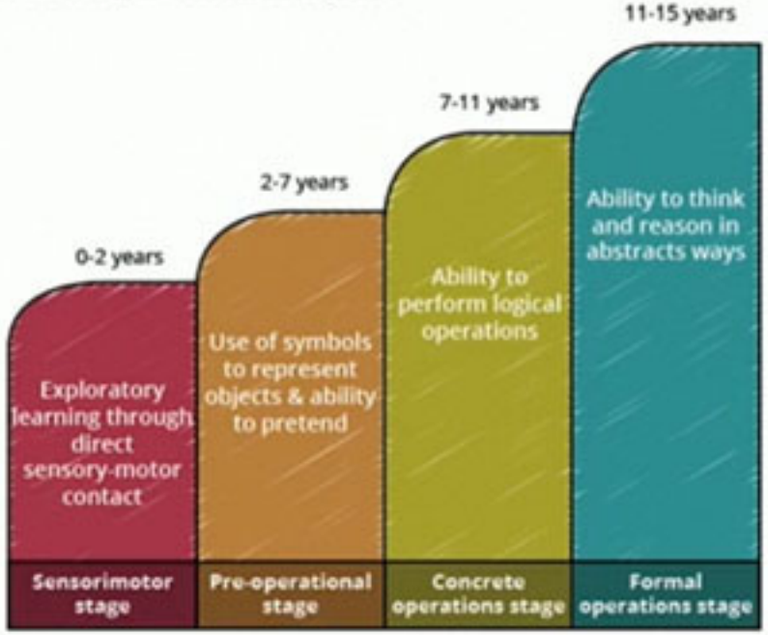
Piaget's theory suggests the identification of developmental stages.



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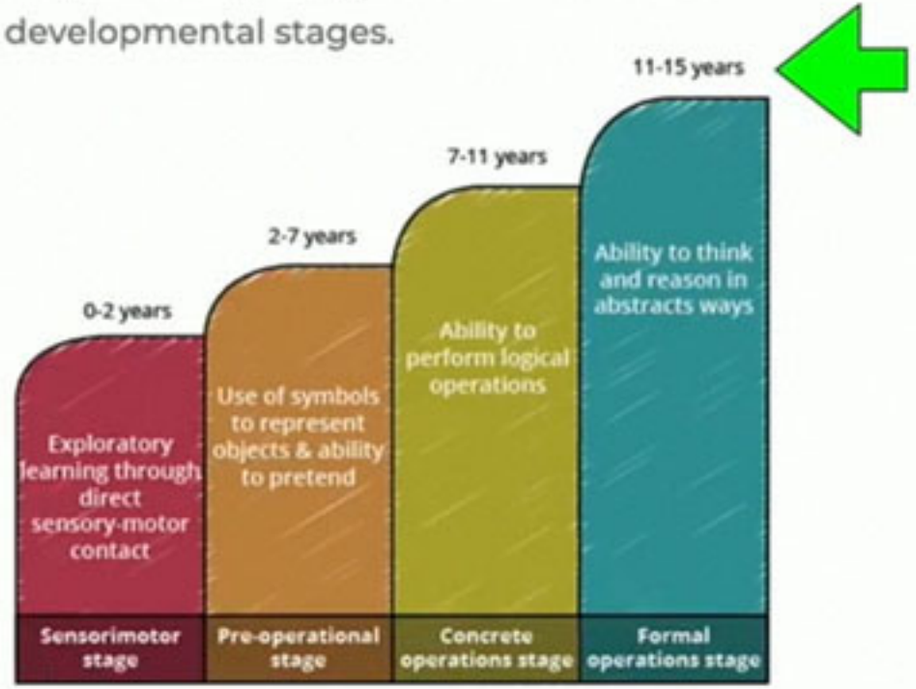

Children with formal operational stage are able to understand the learning applications which involve abstract concepts like deductive reasoning and logically analyzing options.

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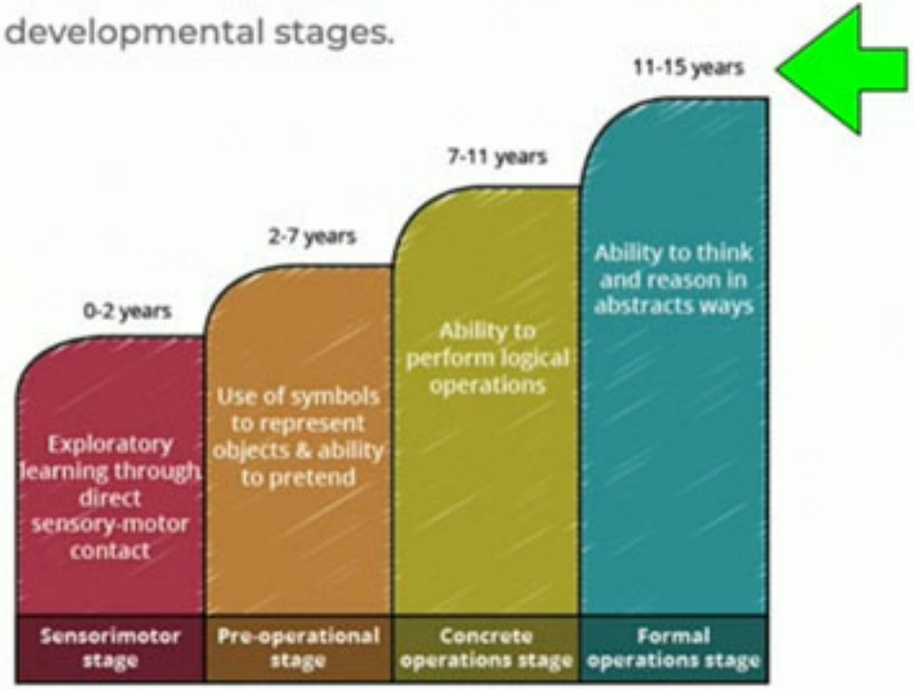

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USER GROUP

Literature review

Vygotsky's Sociocultural Theory of Development

Appropriate social supports and external tools can have a significant effect on aiding learning and augmenting cognition in children.

- Zone of proximal development
    - Knowledge should situated in a context for easier understanding and retention - ZPD

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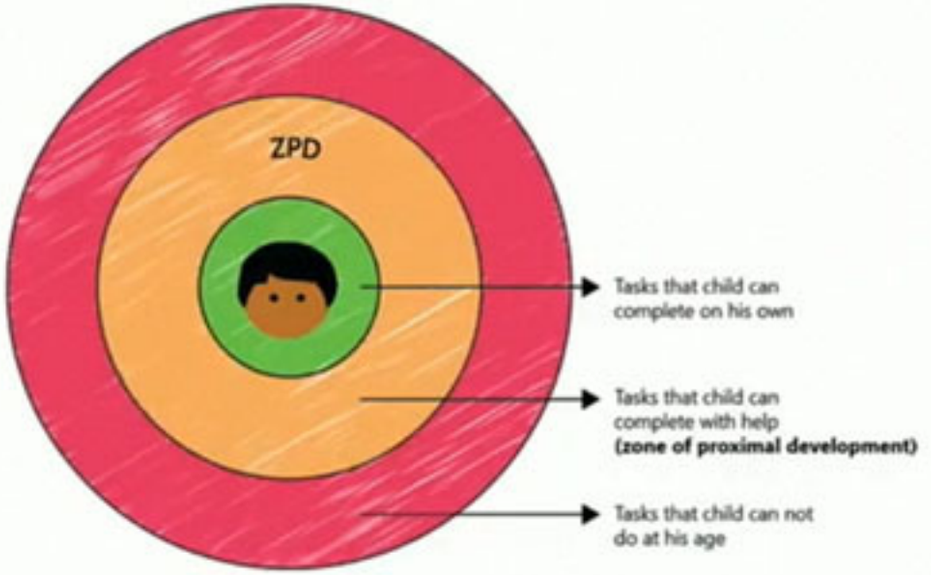

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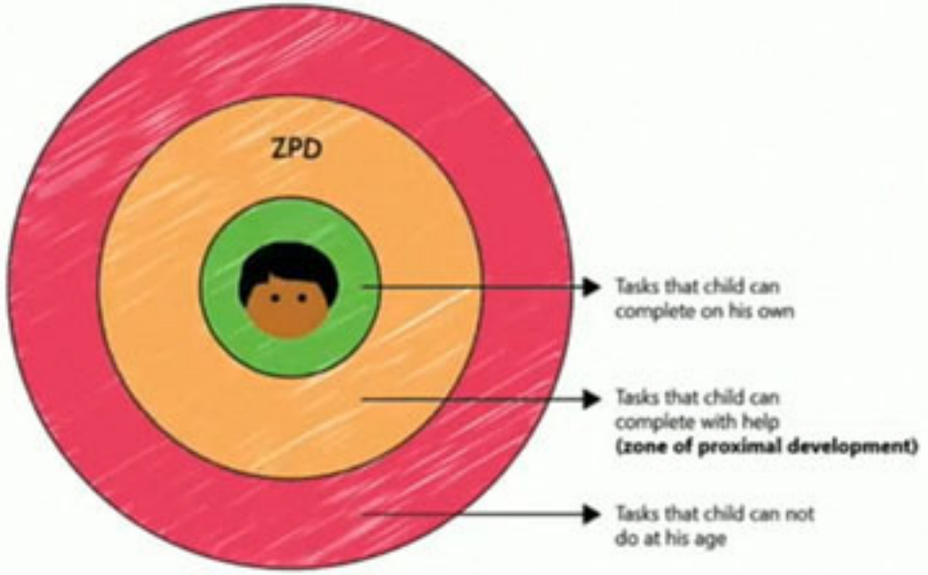
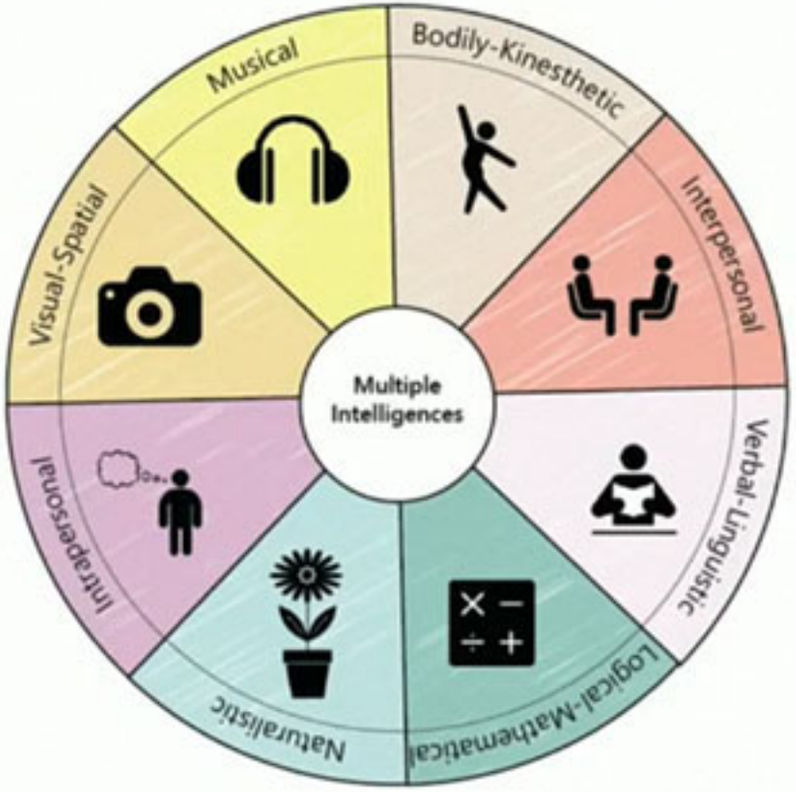


Content for Product

Literature review

Gardner’s Theory of Multiple Intelligences

Suggests using sensory and media interaction education content can enhance the play with learning for children.



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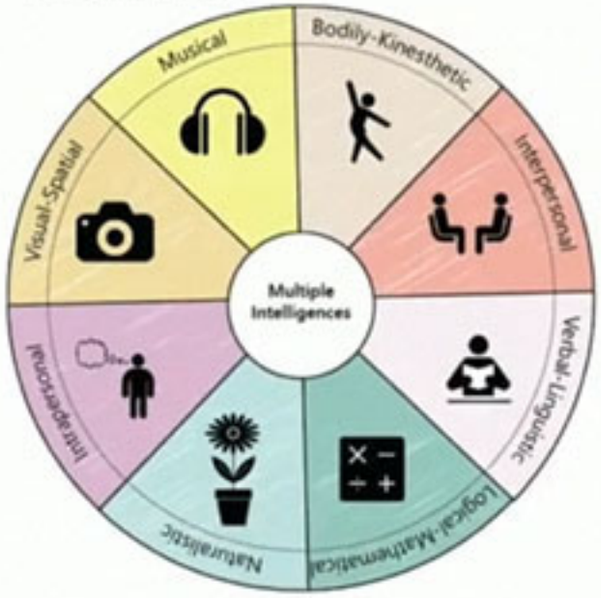
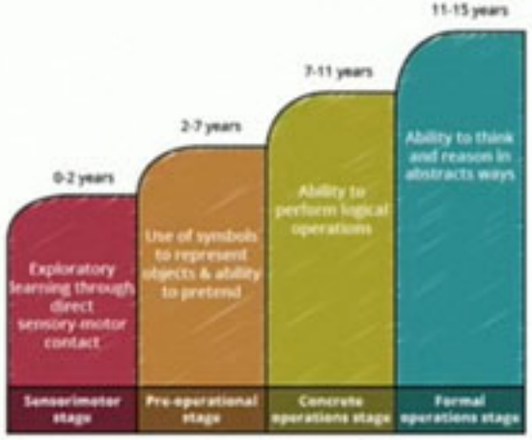


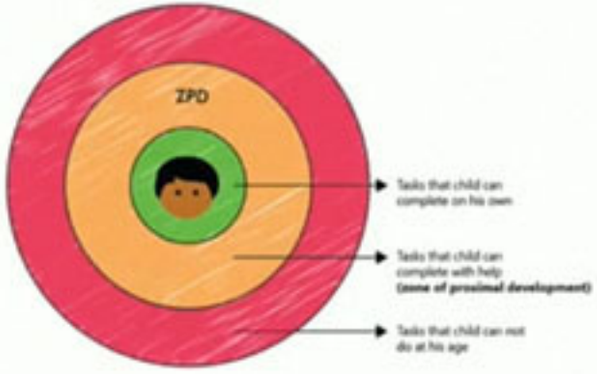
Interaction's tool

Conclusion of

Literature review



User Group (4th 5th class)



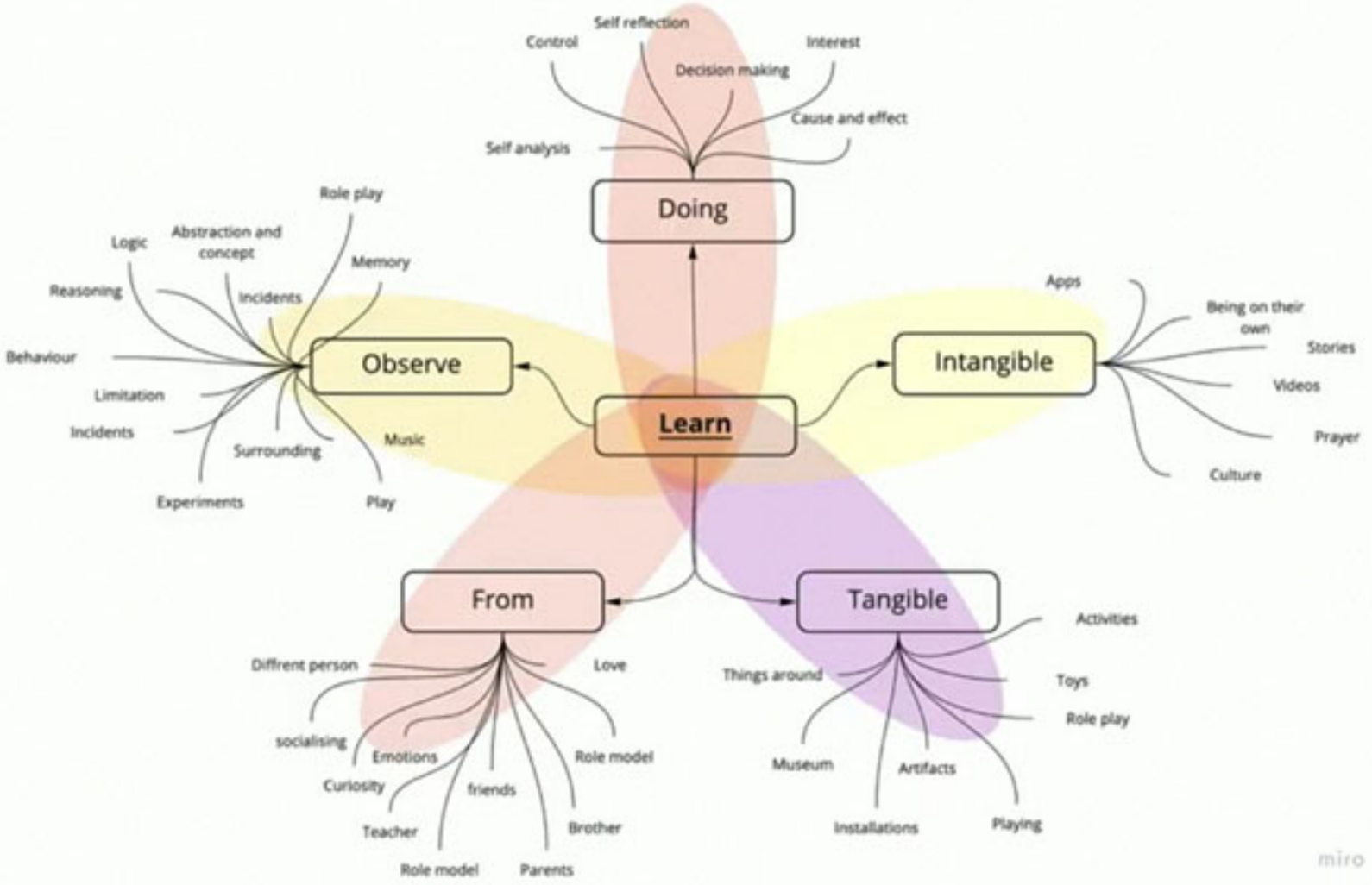
Content for Project (Fraction Syllabus)

Tool of digital interaction

Primary Research

Primary Research

Understanding how children learn



Primary Research

Interaction with Children, Teachers, and School Visit.

Place	Campus school of IIT Bombay	Navnirmati visit	Maths exhibition in Govt. school No 3,4 Kalwa	Z.P School in Ramtek, Nagpur
Description	Interaction with students, Teachers and attended maths class	Various Tangible toys related to maths exercise.	Visited exhibitors and got insight from students and teachers	Interaction with students, Teachers and attended maths class
User Group	Students of (4th -5th class)		Students of (4th -5th class)	Students of (4th -5th class)

Primary Research

Interaction with Children, Teachers, and School Visit.

Observations

- Children get influenced and start with **textbook methods**.
- They are always learning from the environment and surrounding students.
- They perform textbook exercises but still can't solve real-life based problems.
- Student do errors related to ordering in fractions and errors related to showing fractions on the number line
- Student Errors Related to Addition and Subtraction with Fraction.
- Students can not visualize fraction and comparison two fractions

Primary Research

Navnirmati foundation visit

Navnirmiti is dedicated to creating low-cost learning products to teach children science and mathematics concepts

- Most toys were designed as 'learning aid' for teachers in the classroom environment.
- As math is difficult to visualize because it is in abstract concept and one cannot see it. It is difficult to understand, to overcome they have made tangible toys.
- Children did not pick education games at all whereas parents wanted to invest on only educational games.
- The concepts were adapted on the existing toys.
- Did not observed any games which involved strategy and rules.

Secondary Research

Secondary Research

Market study

DIY Kits

Fun based as well as learning. Based on various concept of science mainly chemistry, electrical making things, etc.

It is engaging and fun, it is still a one time activity hence not preferred by parents but loved by children

Card Game

Traditional.
but still famous if it is in the context of children ex. cartoons, super hero character on cards can attract children to play so.
children think collecting cards and cards game is prestigious things between friend circle.

Board Game

Board games mainly based on various theme and concepts.
mostly based on some task and fun.
board games seemed to play and learn elements well and were found to popular in any age group ex. monopoly and scrabble

Teaching aids in classrooms

Teaching aids or teaching kits helps in exploring certain abstract concept or simply engage children into classroom.
mainly focus on group activities.
Pure syllabus content to give better understanding of abstract.

Constructive games

This kind of games includes of variety of blocks with some instruction or rule for game play. this type of games more into giving freedom. children can create whatever they feel like to create.

Educational

They tend to be direct and related to classroom syllabus.
teachers and parents prefer this category of educational games as direct aid to children's studies.
educational game can be played independently or in group.

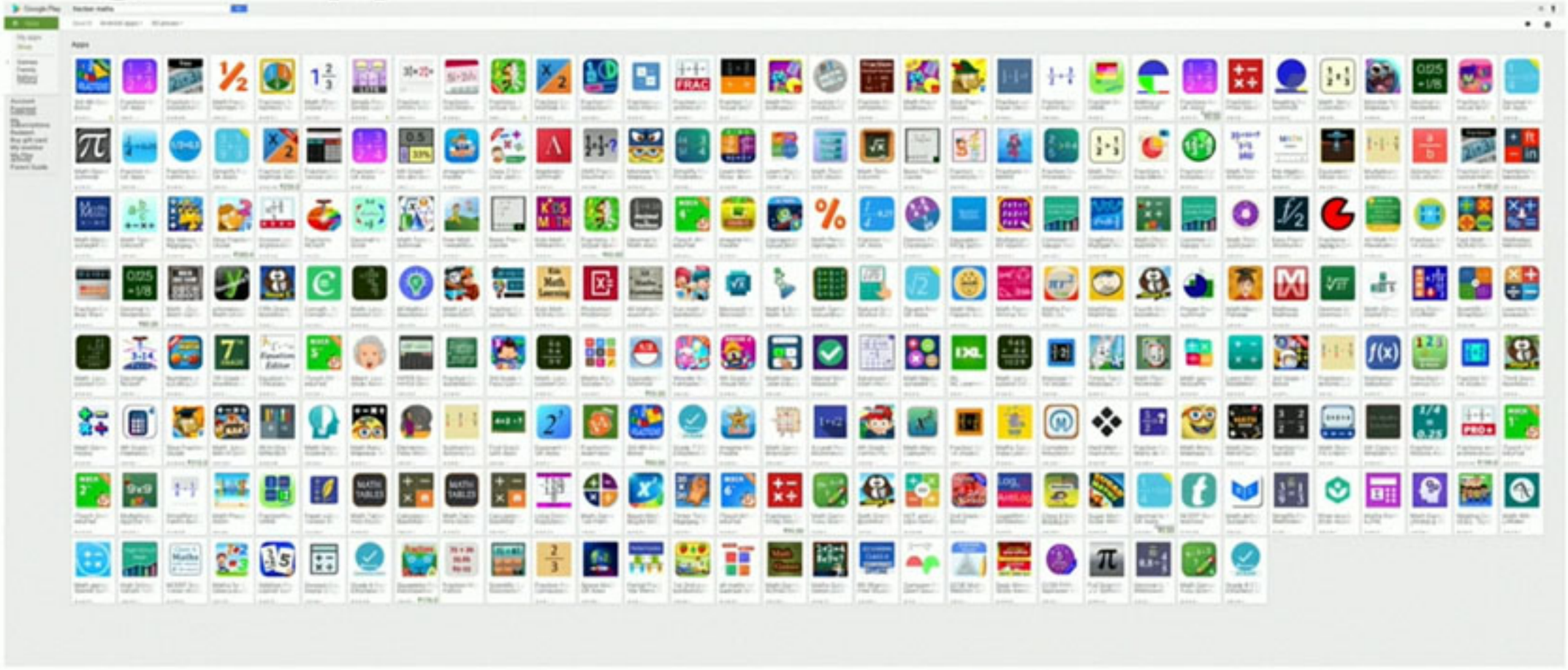
Secondary Research

Market study

- Mostly DIY kits are popular in stores.
- I did not observe popular learn+fun games.
- High selling was still the classics - scrabble, monopoly, etc
- Parents prefer educational games that end up teaching a child something.
- Children's games are a market where the users don't really choose what they want or buy what they like.
- Parents prefer educational games Children enjoy fun games.

Secondary Research

Digital Application



Secondary Research

Digital Application

- Simple activity-based game.
- Students need pre-required knowledge of Fraction.
- Most of them are just another version of the class workbook in digital form.
- Most of the Games are built on using concepts of fractions and building upon that.
- Only few apps are teaching fraction concepts.
- Games are based on western cultural theme and elements.
- There is need to introduce Indian-ness theme into Faction app.

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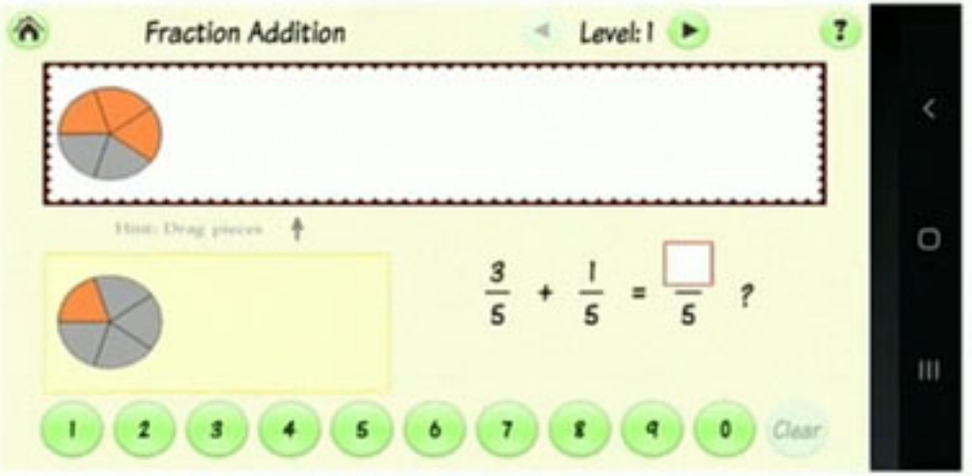


Secondary Research. + Primary Research = **Problem Redefinition**

Problem Redefinition

To design a **digital App** mainly intuitive toolkit that makes the learning of operation on Fraction playful for 10-12 year age group students.

Ideations Phase 1

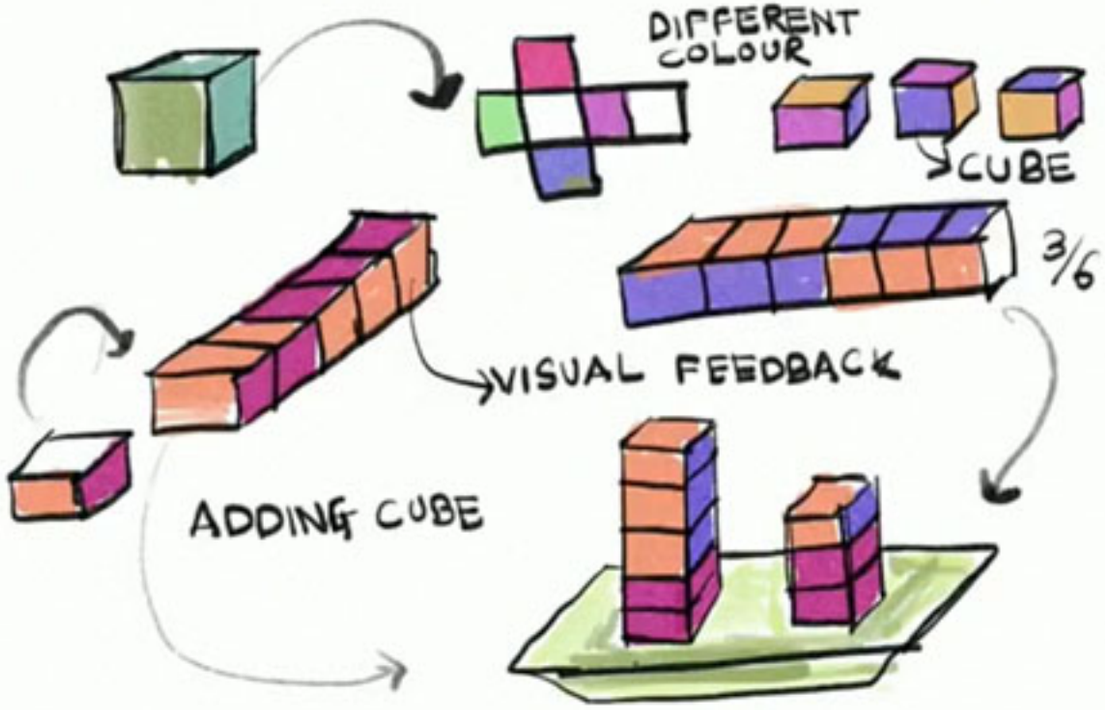
Ideations Phase 1

Fraction Cards

- Two or more players.
- Complete the shape game.
- Addition and subtraction.
- Sensory and visual feedbac
- Can use to play Addition, subtraction and equivalent fraction
- Can be present as weight scale (balance concept)

Ideations Phase 1

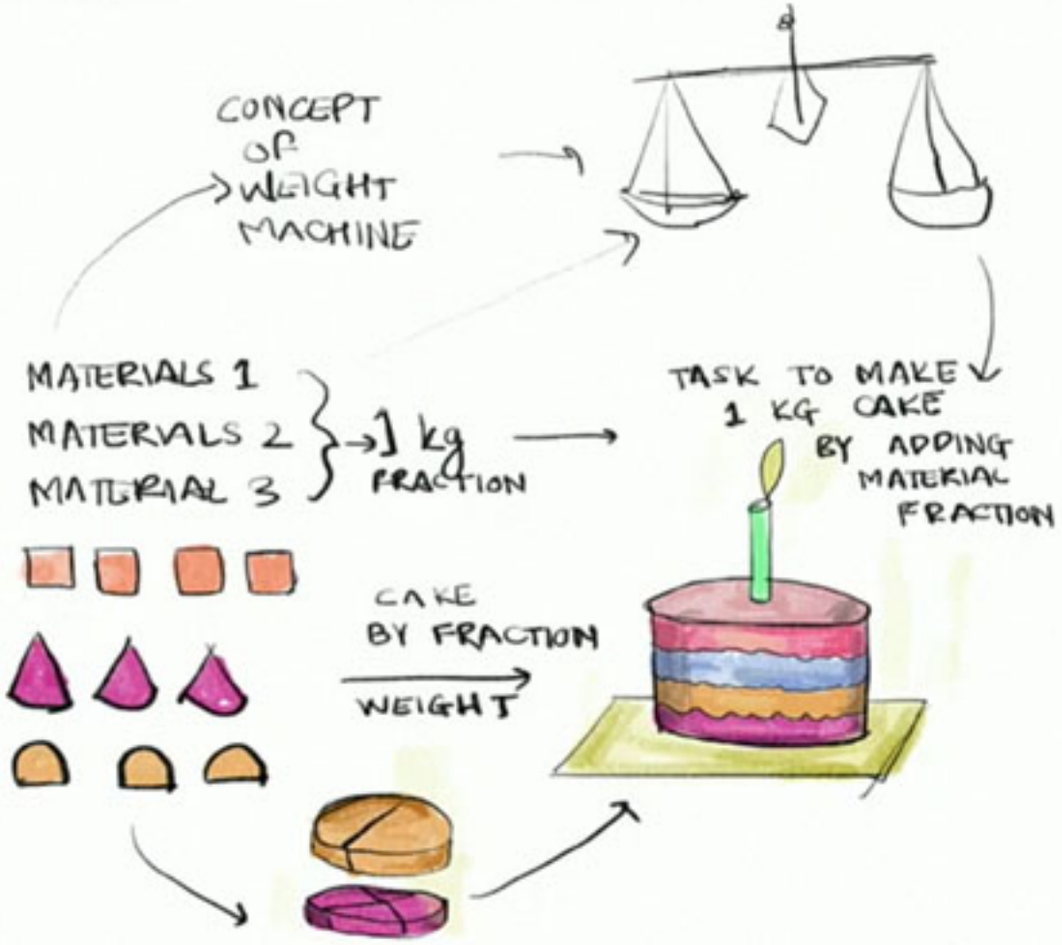
Equivalent Fraction Cubes



- One student arranges a few cubes
- The other student has to add a set of cubes to it maintaining the same fraction.
- Visual and sensory feedback
- Addition and subtraction is too easy
- Only suitable to demo equivalent fraction

Ideations Phase 1

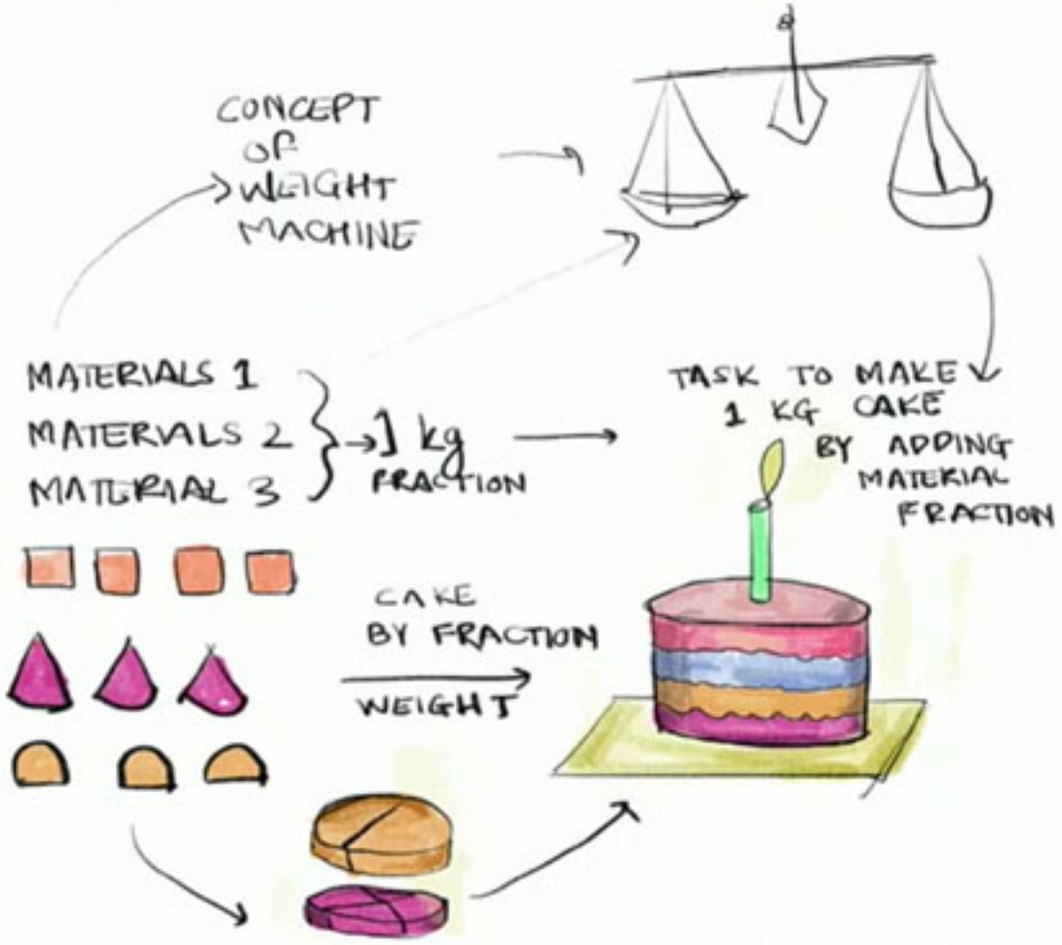
Fraction Cake



- Student has to make 1kg cake
- adding some ingredients of the cake in fraction.
- Visual and sensory feedback
- Final image of cake as output.
- Cake is not good representation as it is ingredient is dissolving
- Complex mechanism
- User friendly as cake making is known concept

Ideations Phase 1

Fraction Cake



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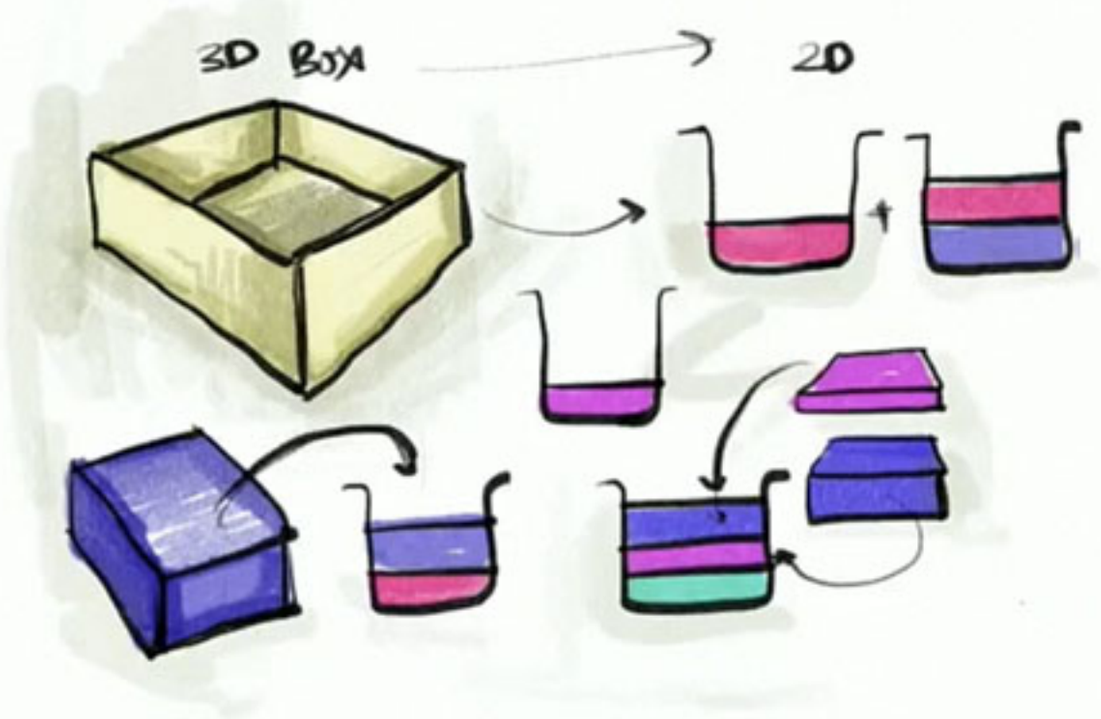
Ideations Phase 1

Fraction addition box



- Boxes and Blocks
- box will work as denominator and blocks will work as fraction part.
- fraction can be demonstrated through the relationship between the volumes of the block and box.
- Addition and subtraction of fraction
- Can demonstrate addition, subtraction and equivalent fraction.
- Not very exciting or experience giving

Ideations Phase 2

After having feedback from peers and self evaluation of concepts shown above we decided to further work on Fraction addition box

Ideations Phase 2 (Box Fraction)

wire framing testing

- Students was playing it, but did not seem to understand some part of the Fraction concept.
- medium or interactions to show and explain Fraction is still in the abstract phase.
- We think there is need to add day-today example to explain fractions.
- we understand that there is a need to use some day-to-day life examples and elements to teach Fraction in our toolkit.

Lets Learn Fraction- a final toolkit

Introduction

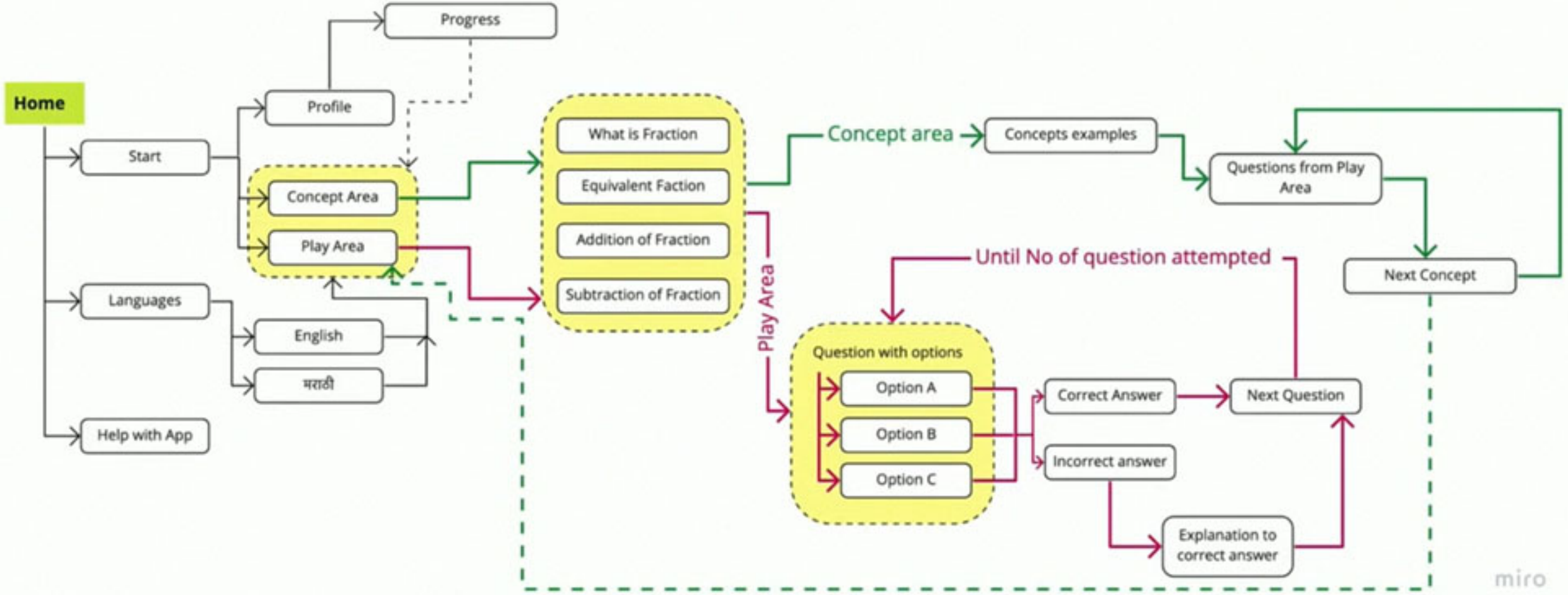
Lets Learn Fraction is an interactive fraction teaching toolkit, which will introduce the various concept and operations on Fraction by using day to day live examples and doing interactive Play and Learn exercise in between the concepts.

Content Coverage of Digital App

- What is Fraction and its examples?
- Equivalent Fraction, its example
- Addition of Fraction and its procedure
- Subtraction of Fraction and its procedure
- play and learn activity based on the operation of Fraction (addi-tion, subtraction, equivalent of Fraction)

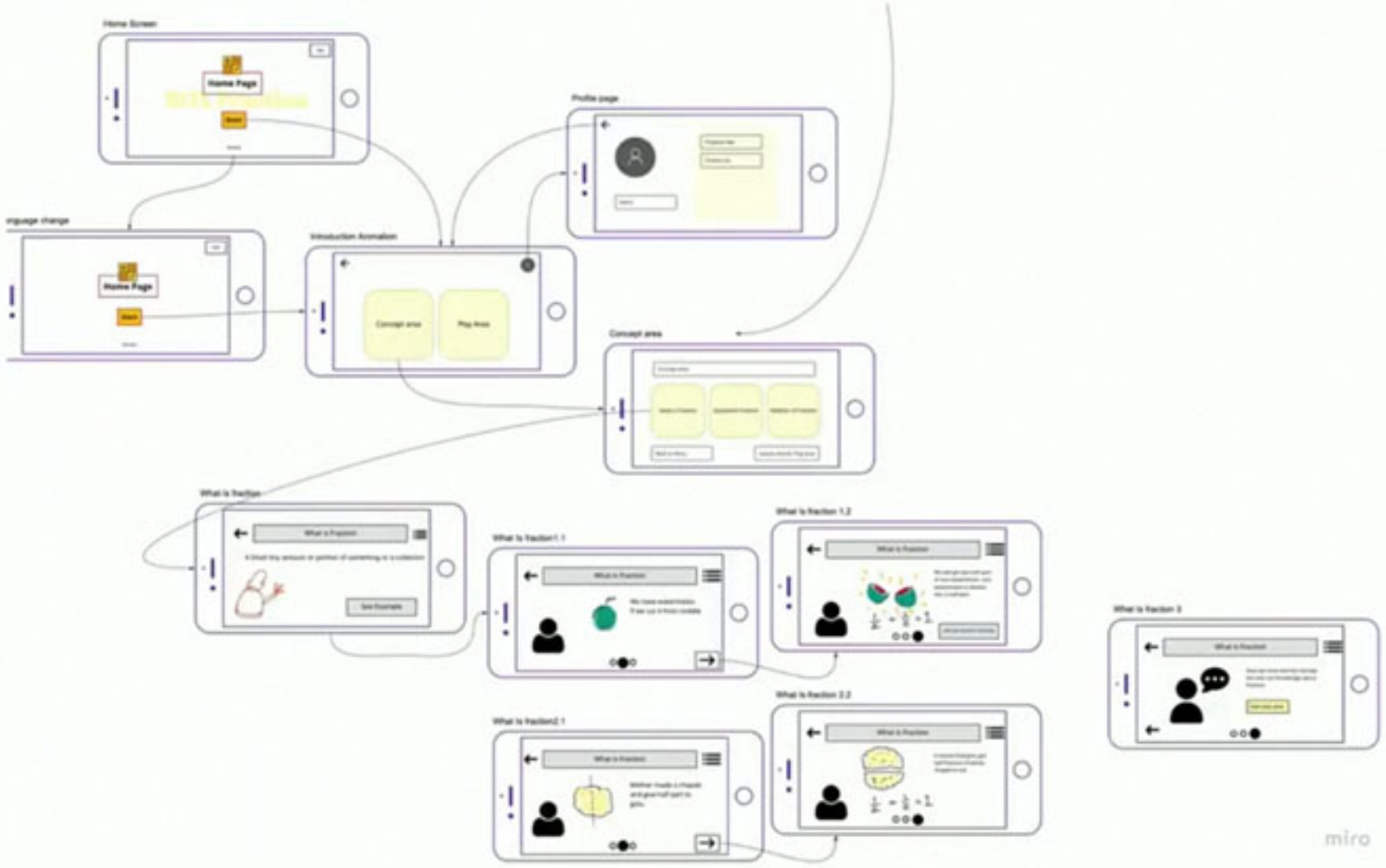
Lets Learn Fraction- a final toolkit

Information Architecture



Lets Learn Fraction- a final toolkit

Wireframes



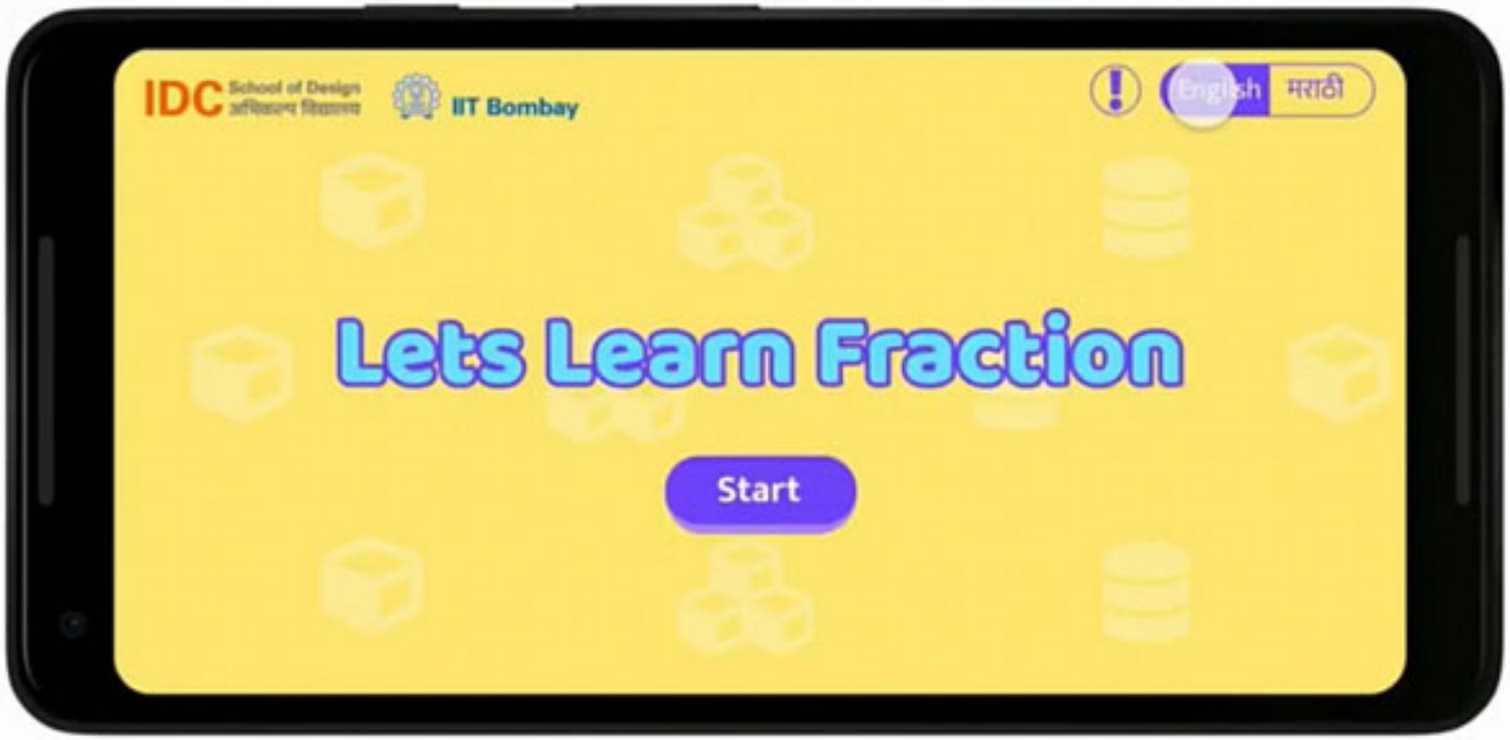
Lets Learn Fraction- a final toolkit

High Fidelity components of App

The 'Let's learn Fraction' Toolkit App consists of Two main activities

- Concept area
- Play area

Play Area of this toolkit app is consis based questions on Fractions.



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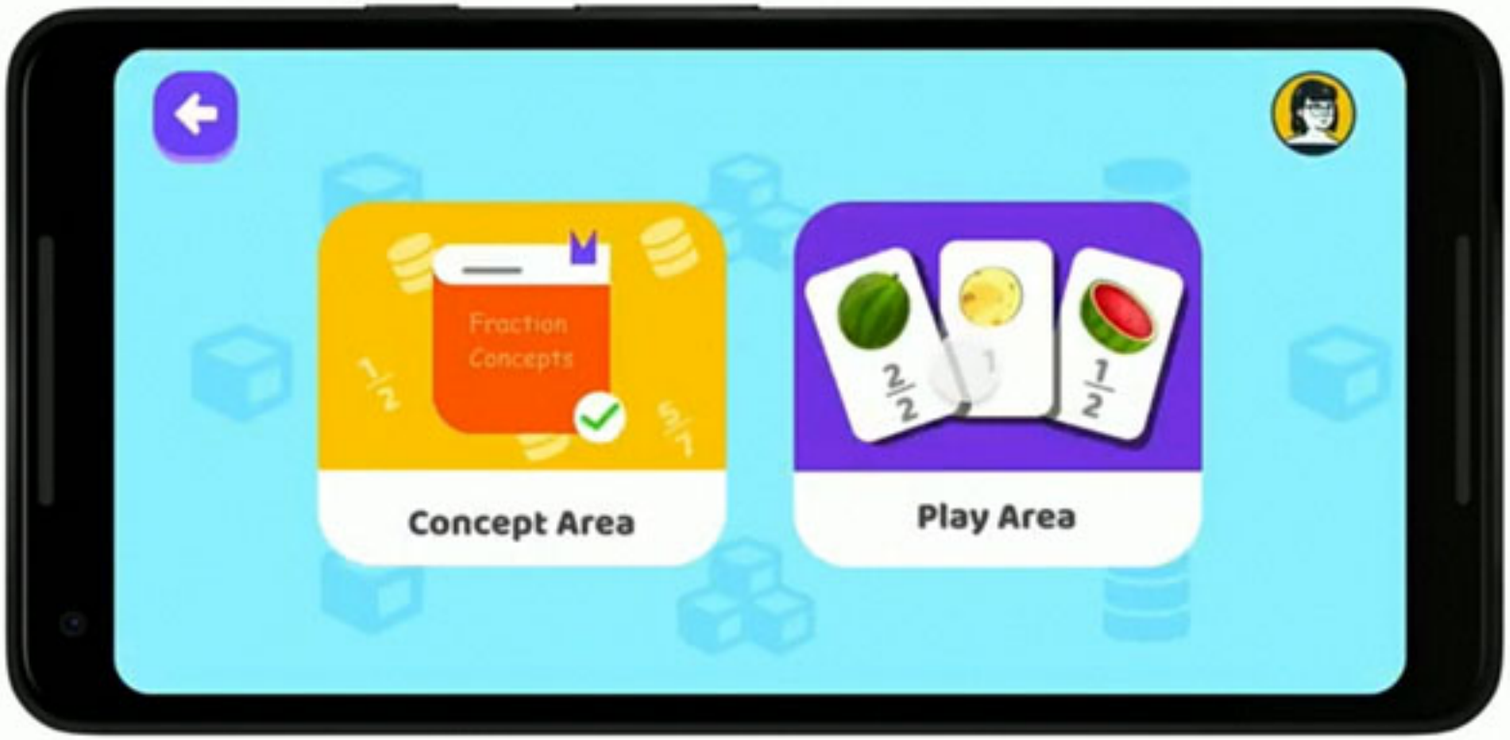

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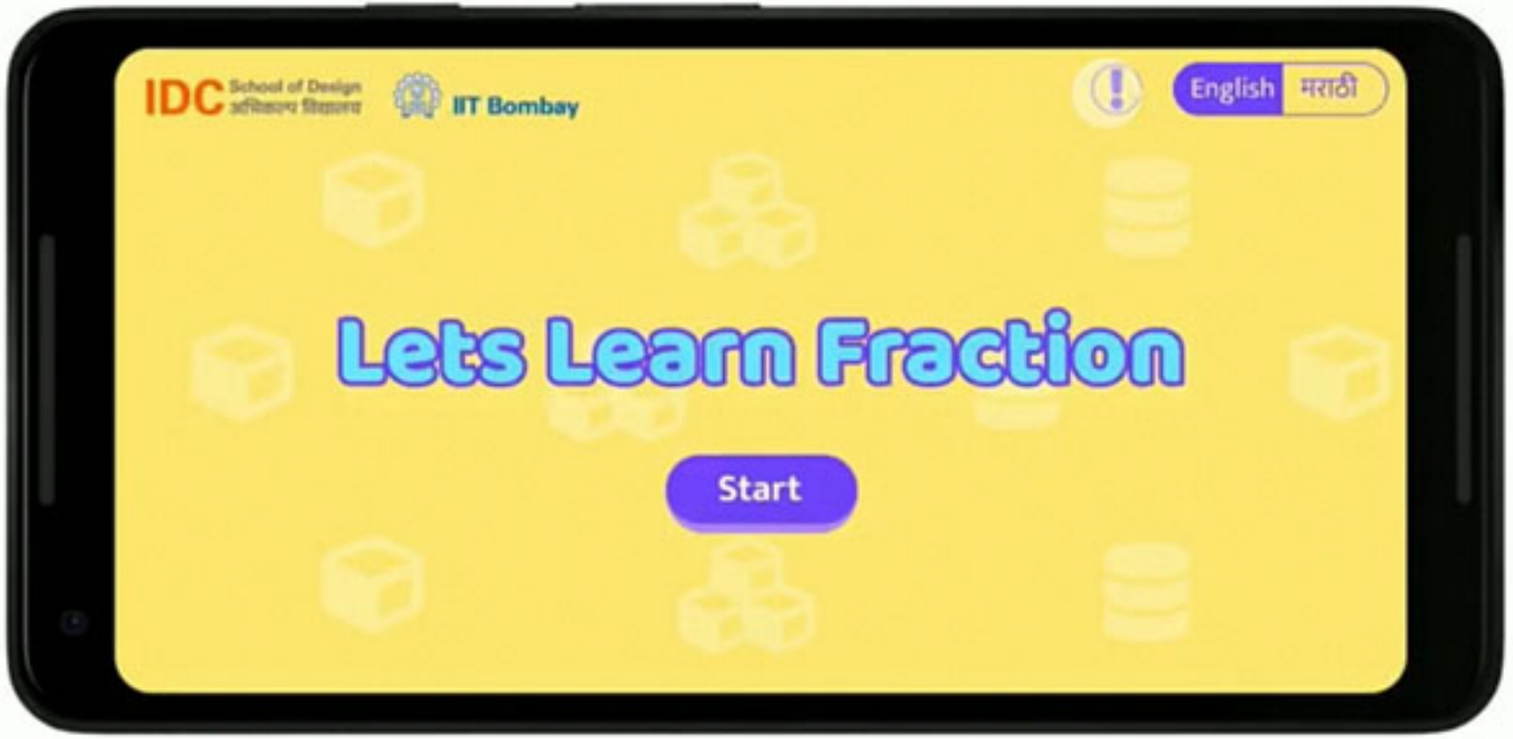

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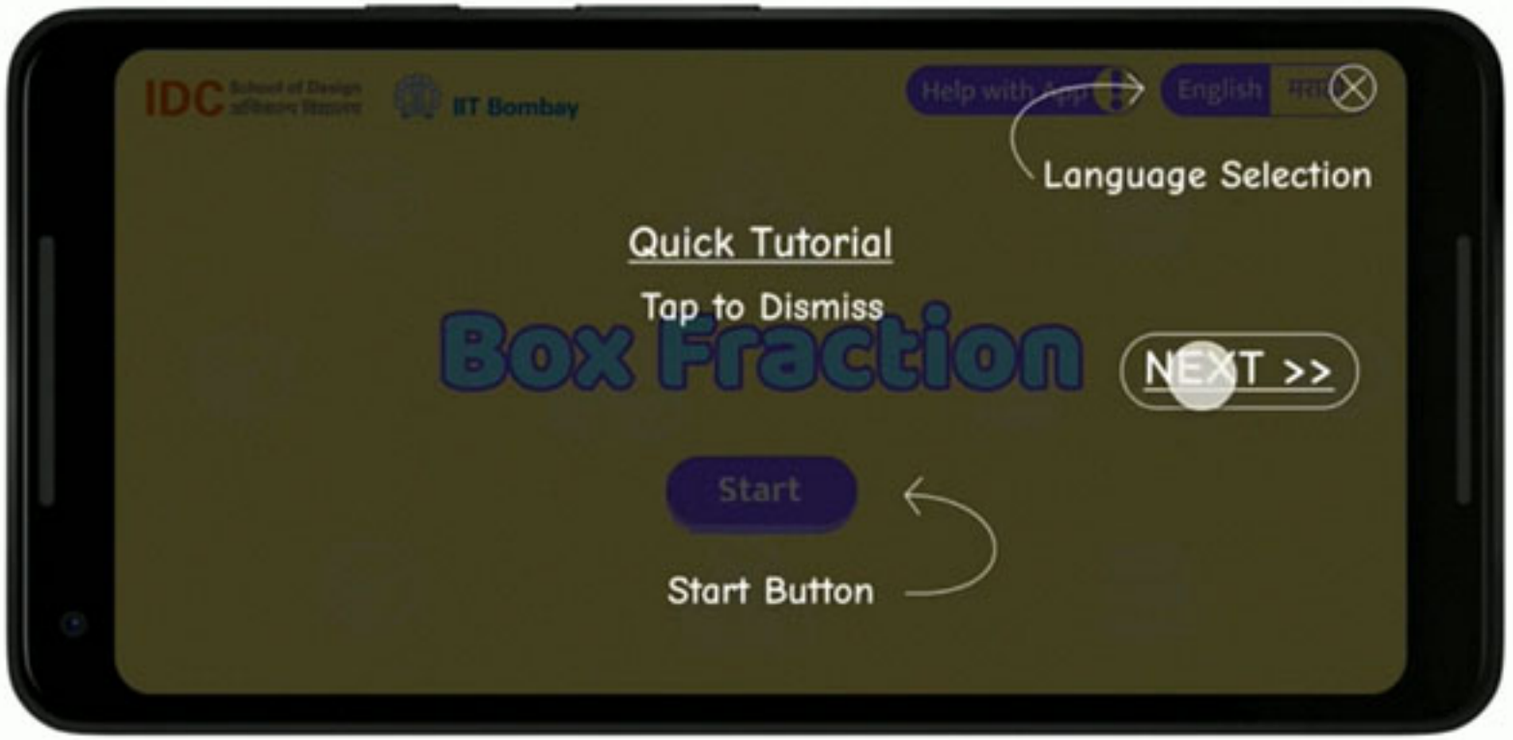

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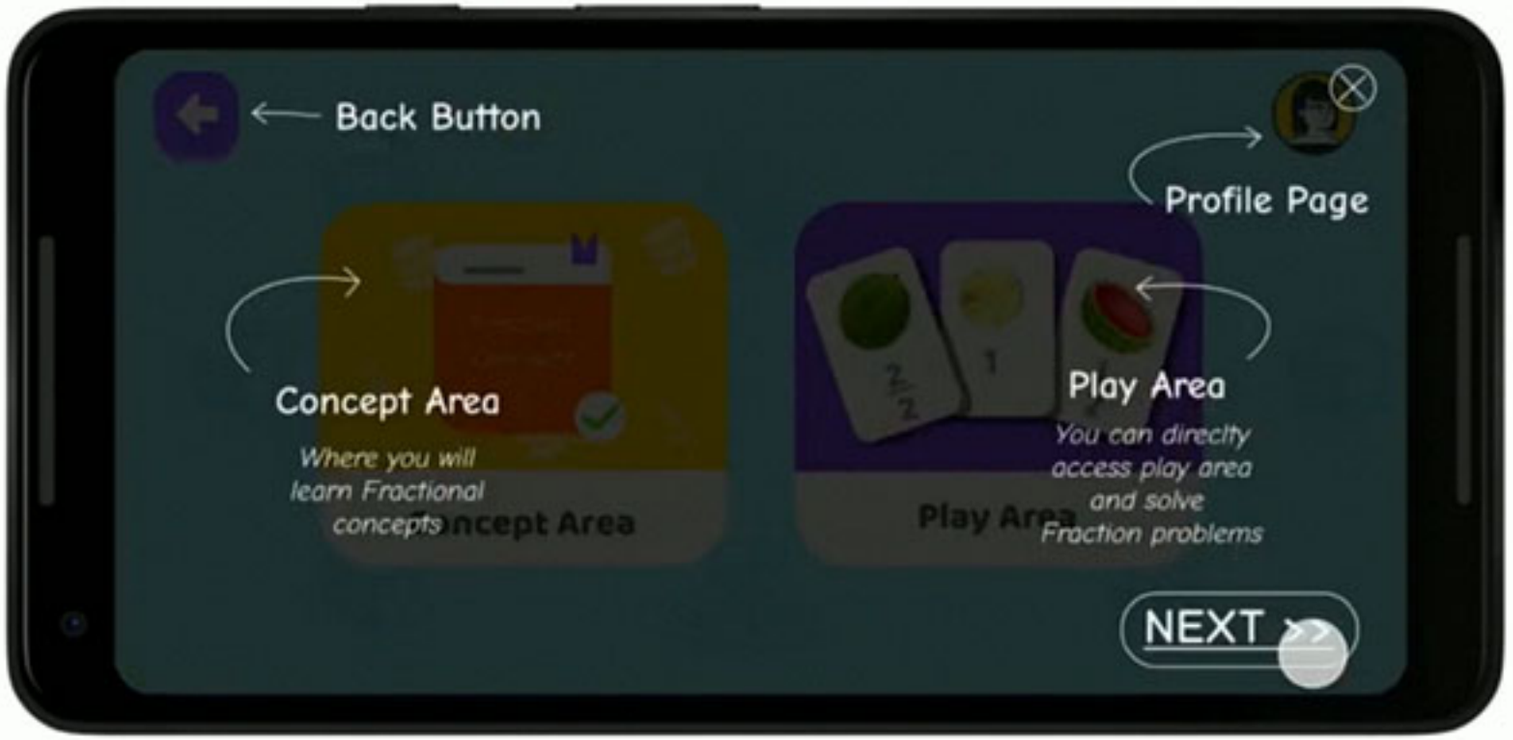

Lets Learn Fraction- a final toolkit

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Lets Learn Fraction- a final toolkit

High Fidelity components of App

The Concept Area activity User Interface

- Voice Narrations
- Sound Feedback
- Animation and MicroInteractions

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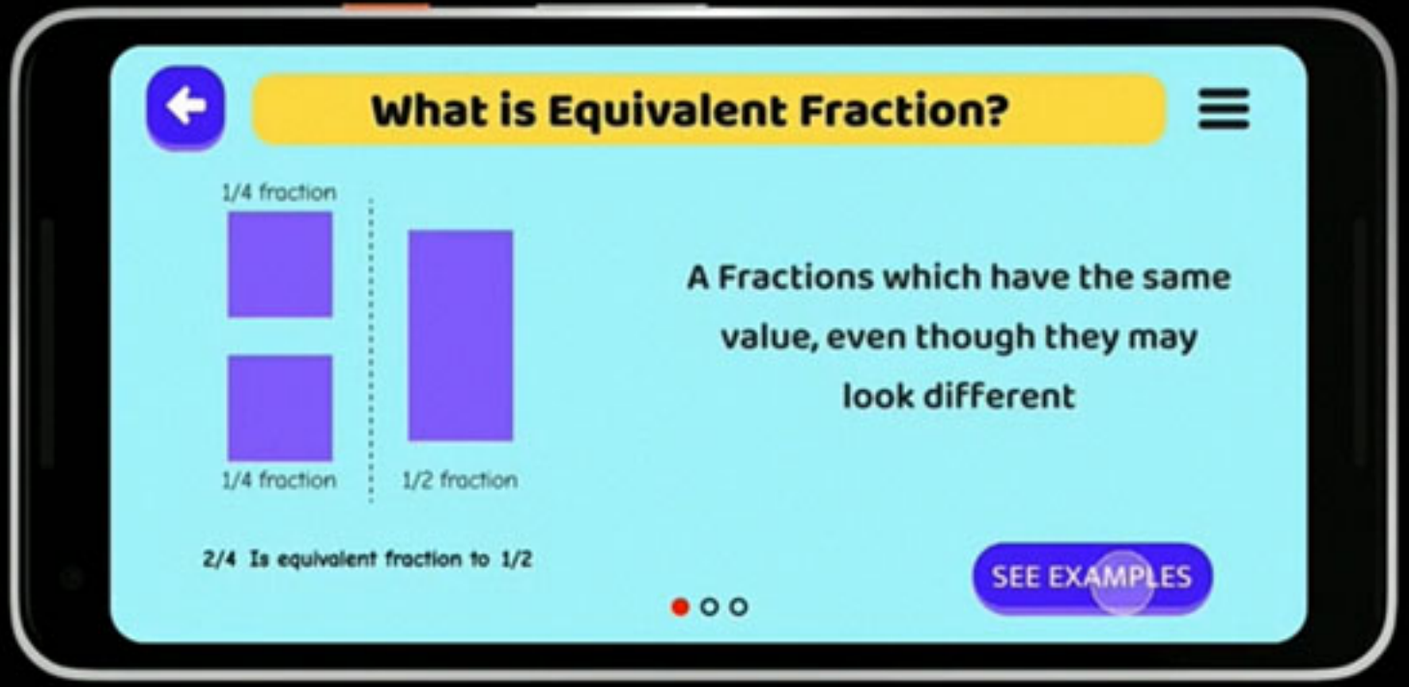

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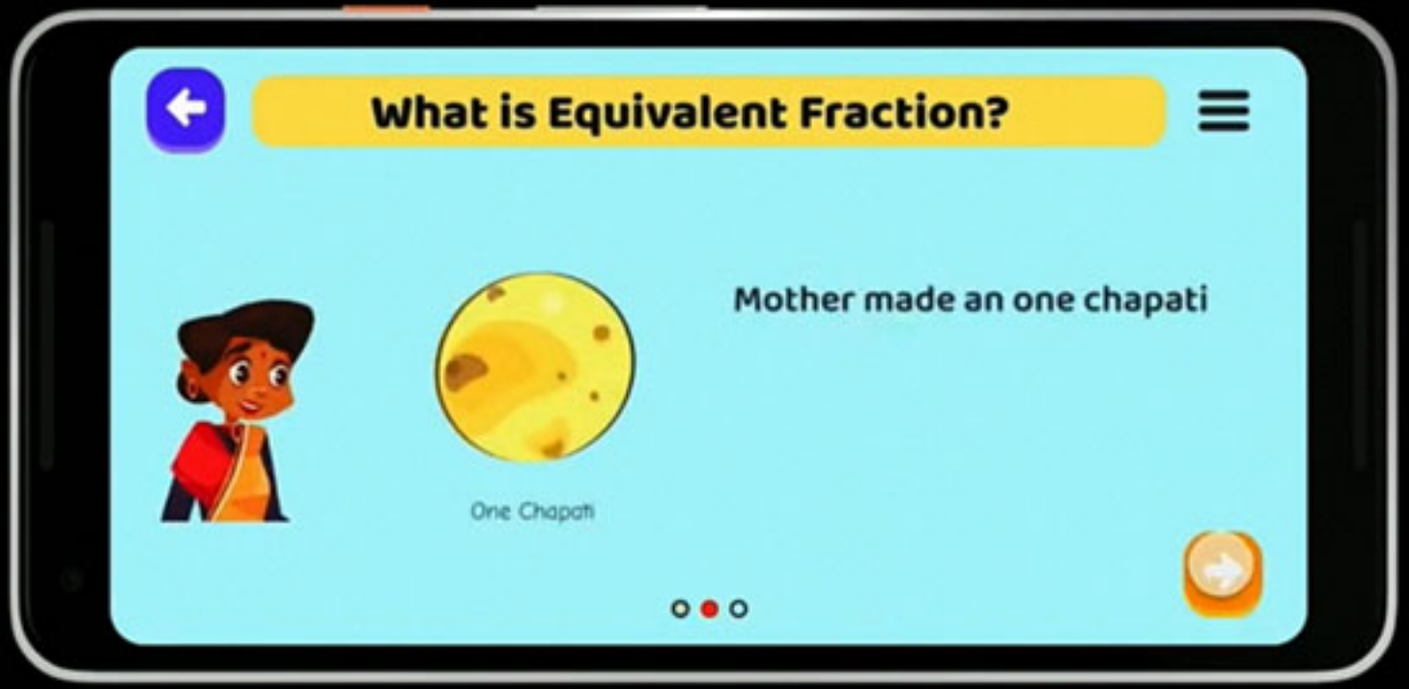

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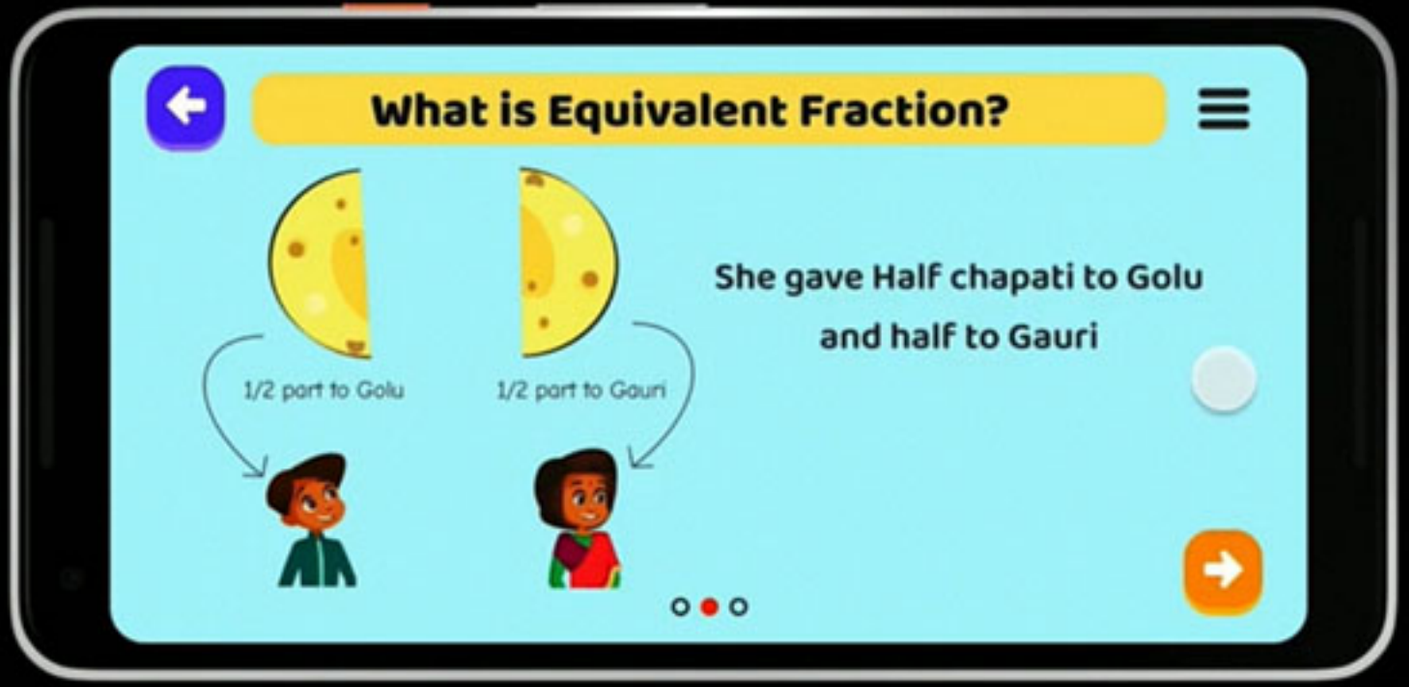

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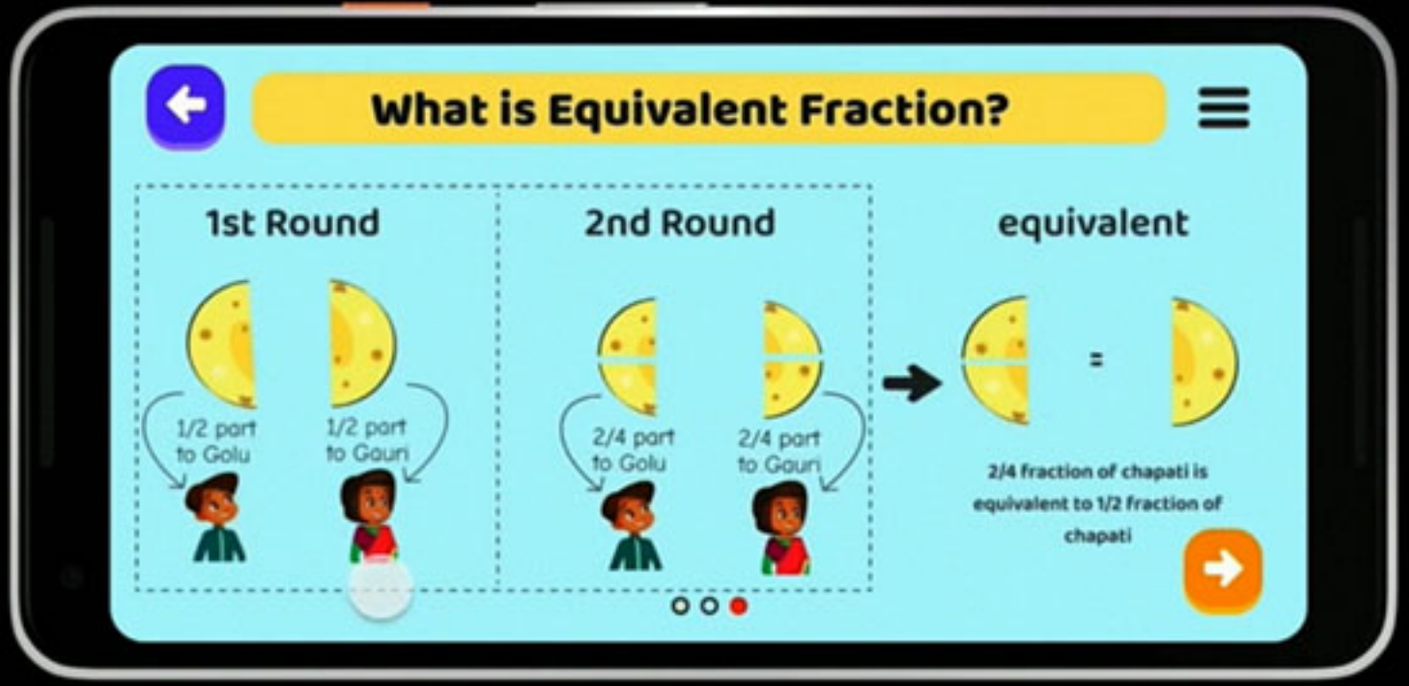

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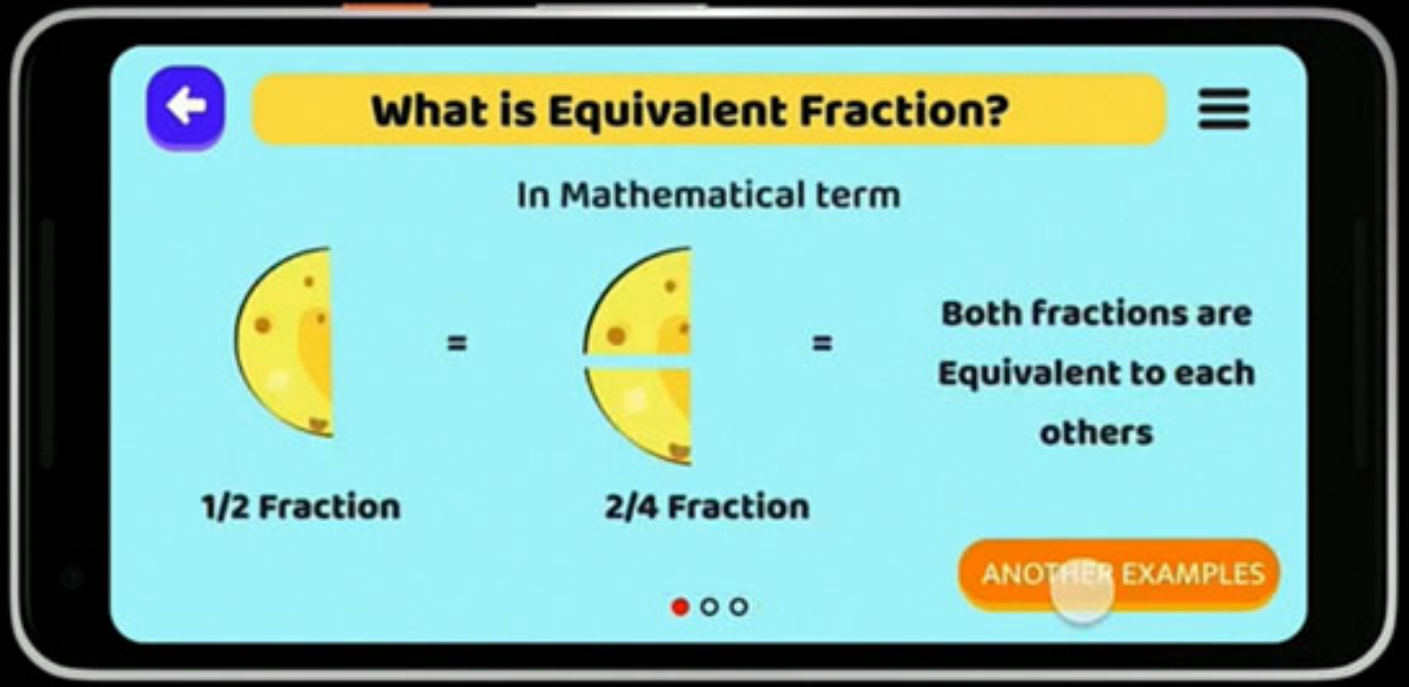

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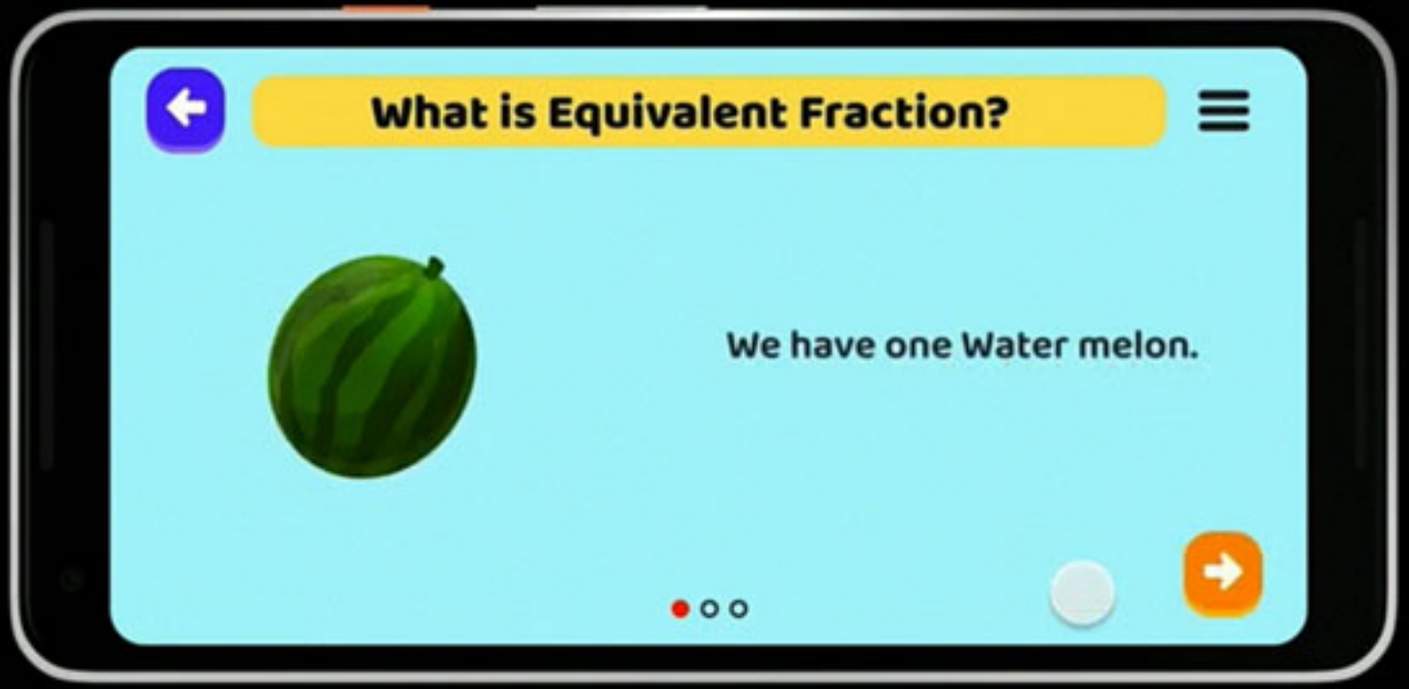

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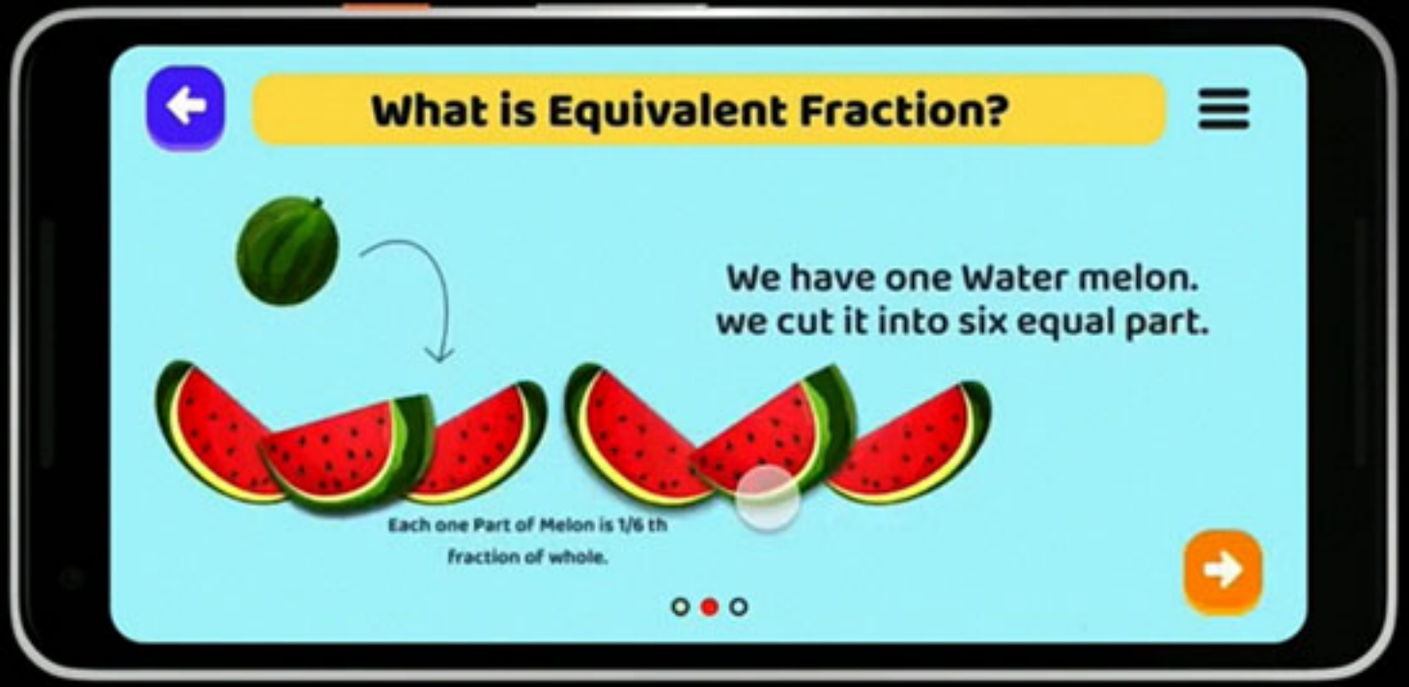

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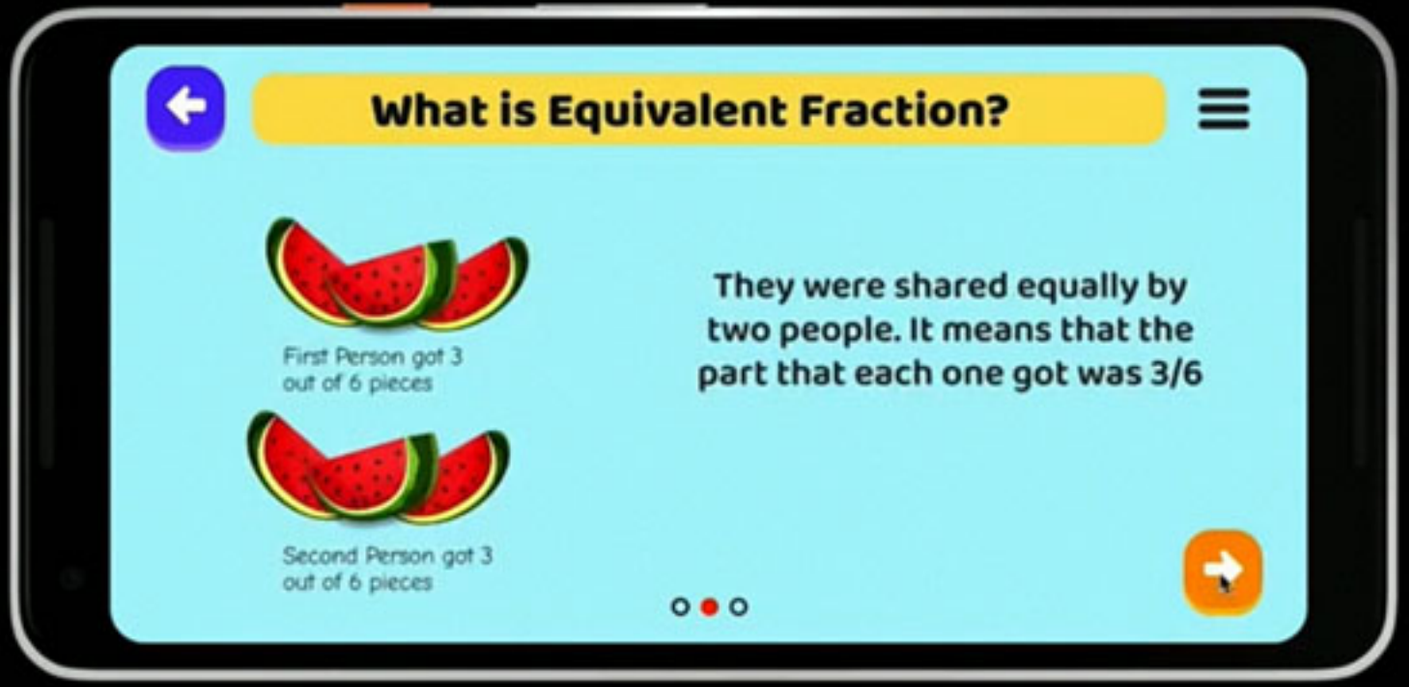

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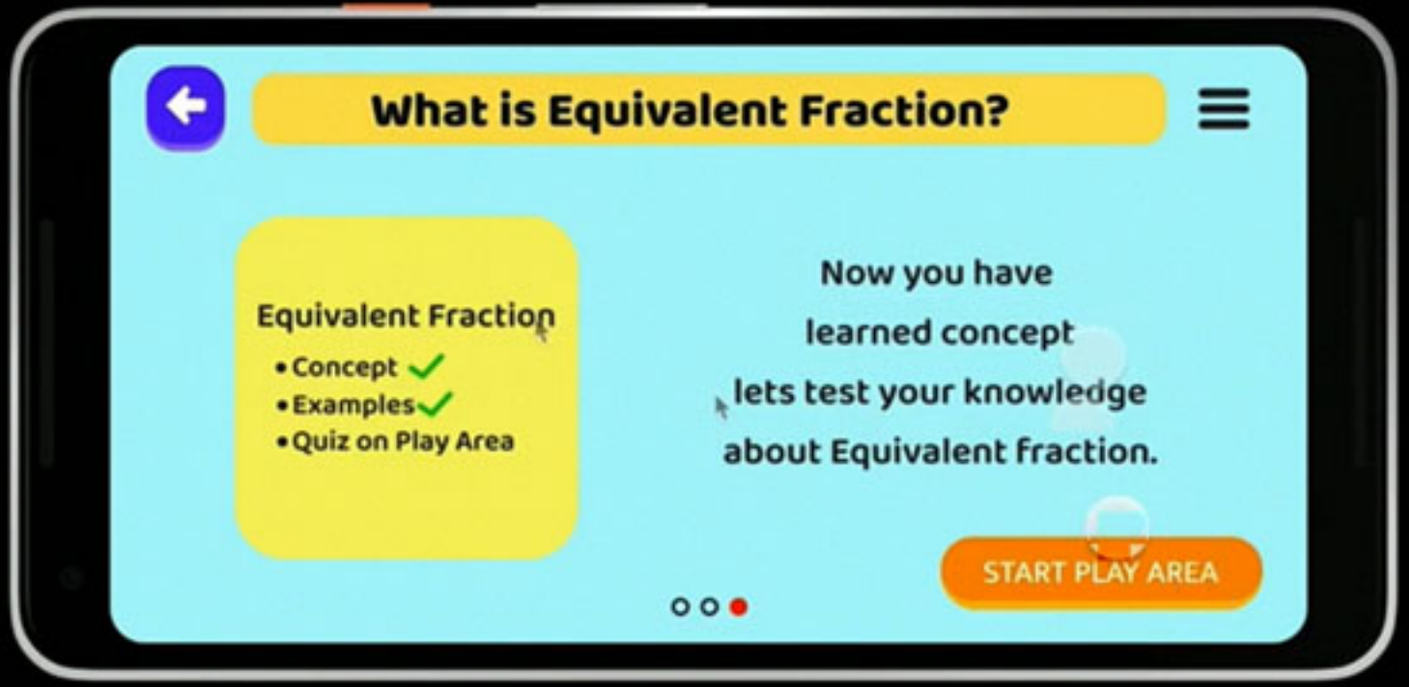

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Play Area Activity of toolkit App

Questions at Play Area

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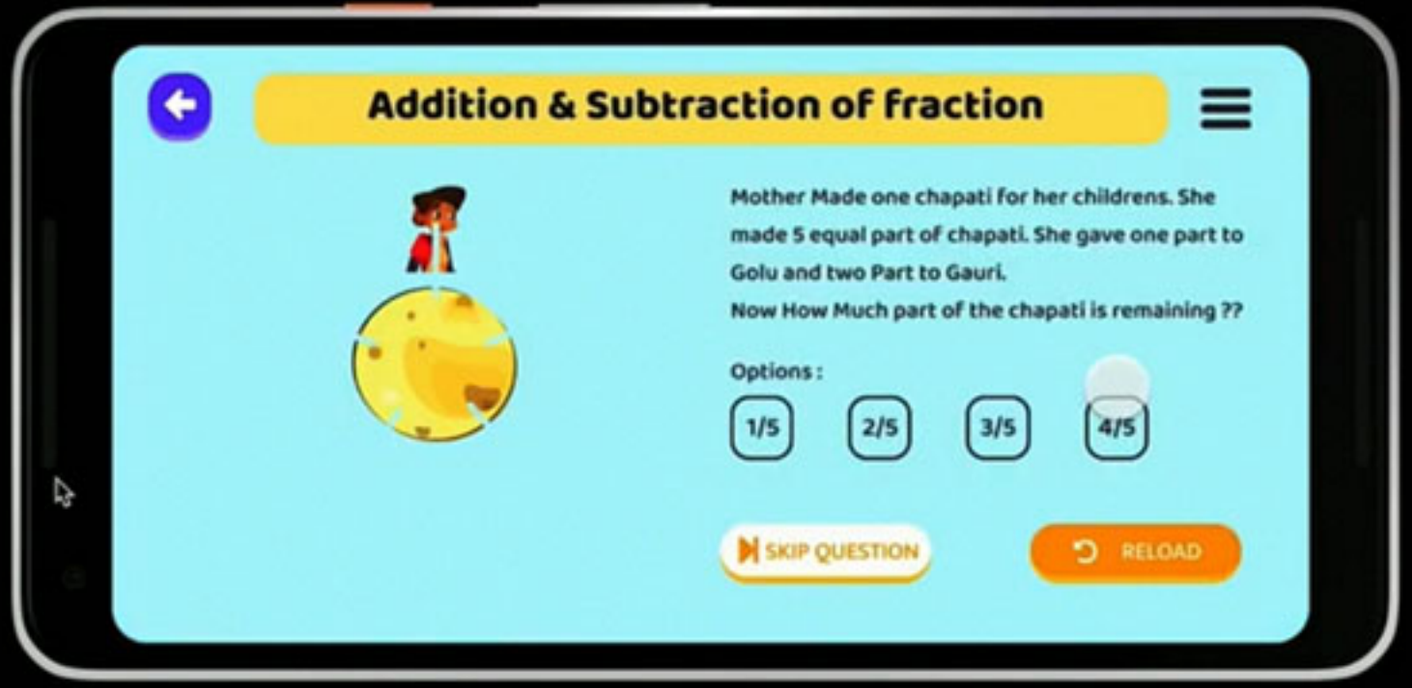
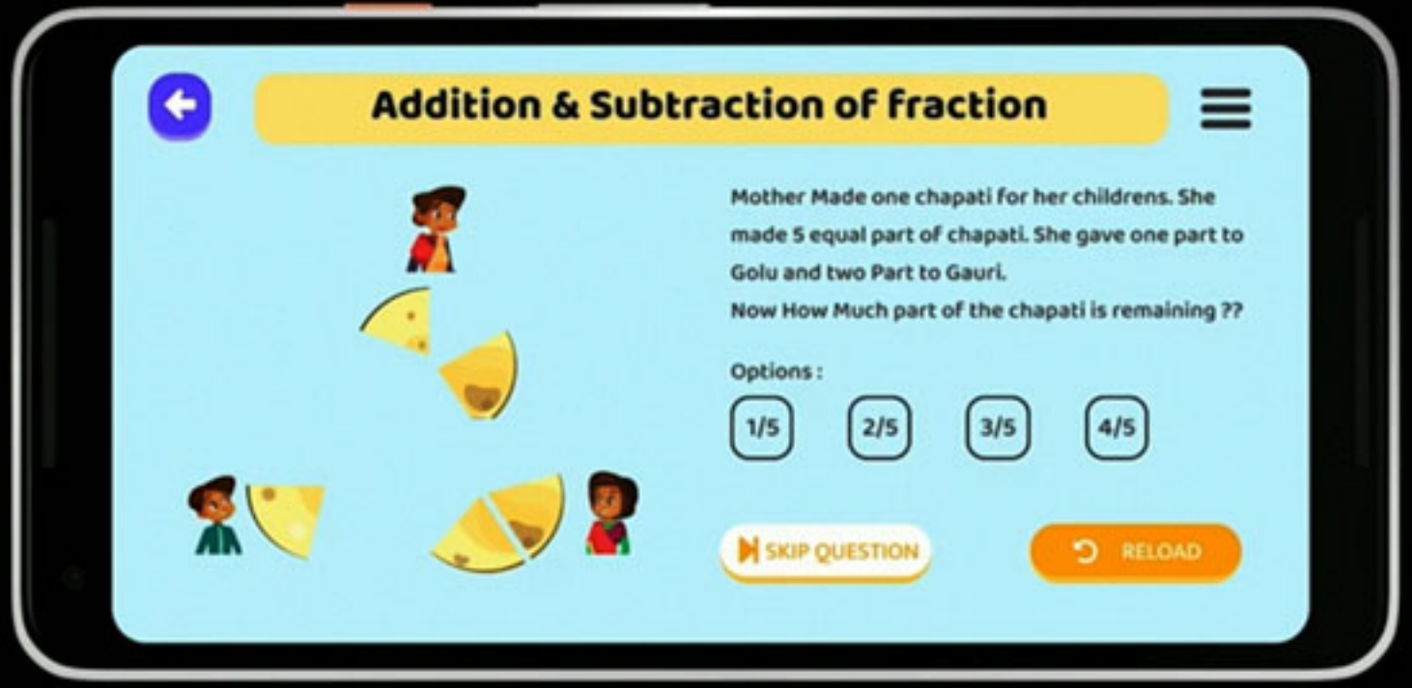


Lets Learn Fraction- a final toolkit

High Fidelity components of App

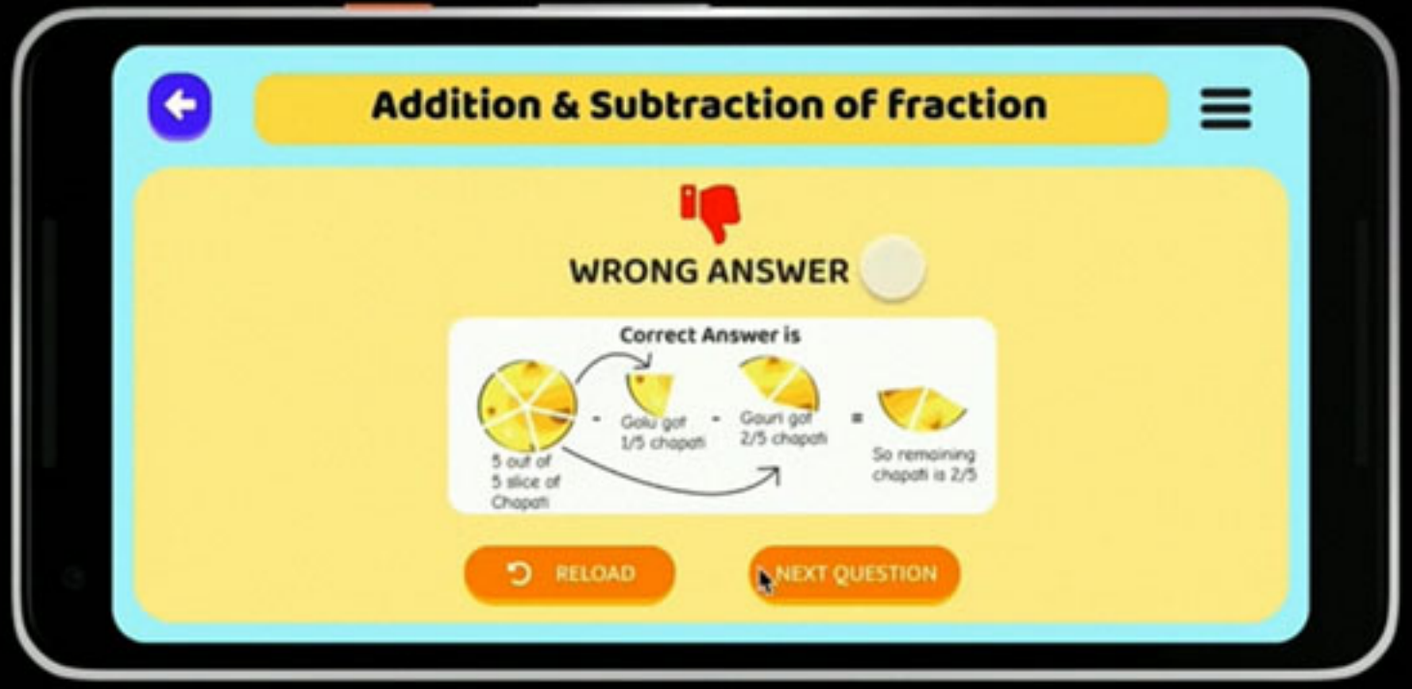
Play Area Activity of toolkit App



Lets Learn Fraction- a final toolkit

High Fidelity components of App

Play Area Activity of toolkit App



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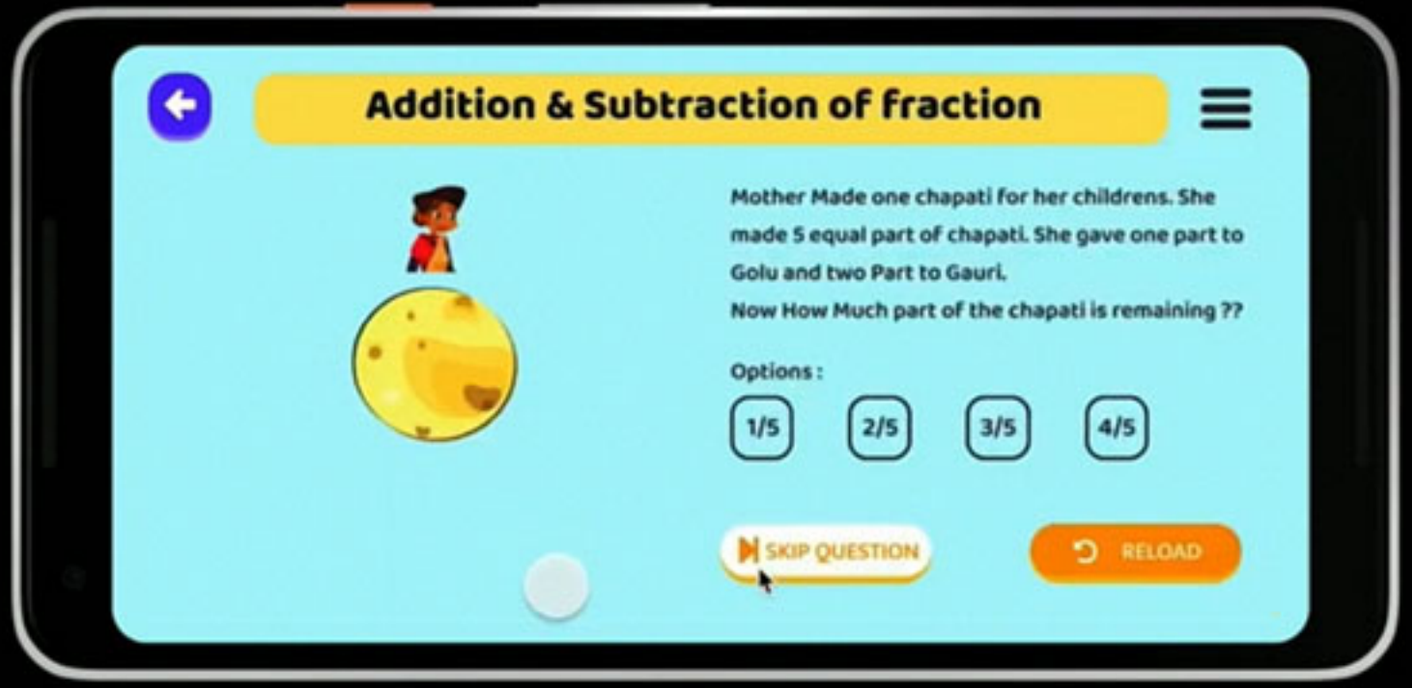
High Fidelity components of App

Play Area Activity of toolkit App



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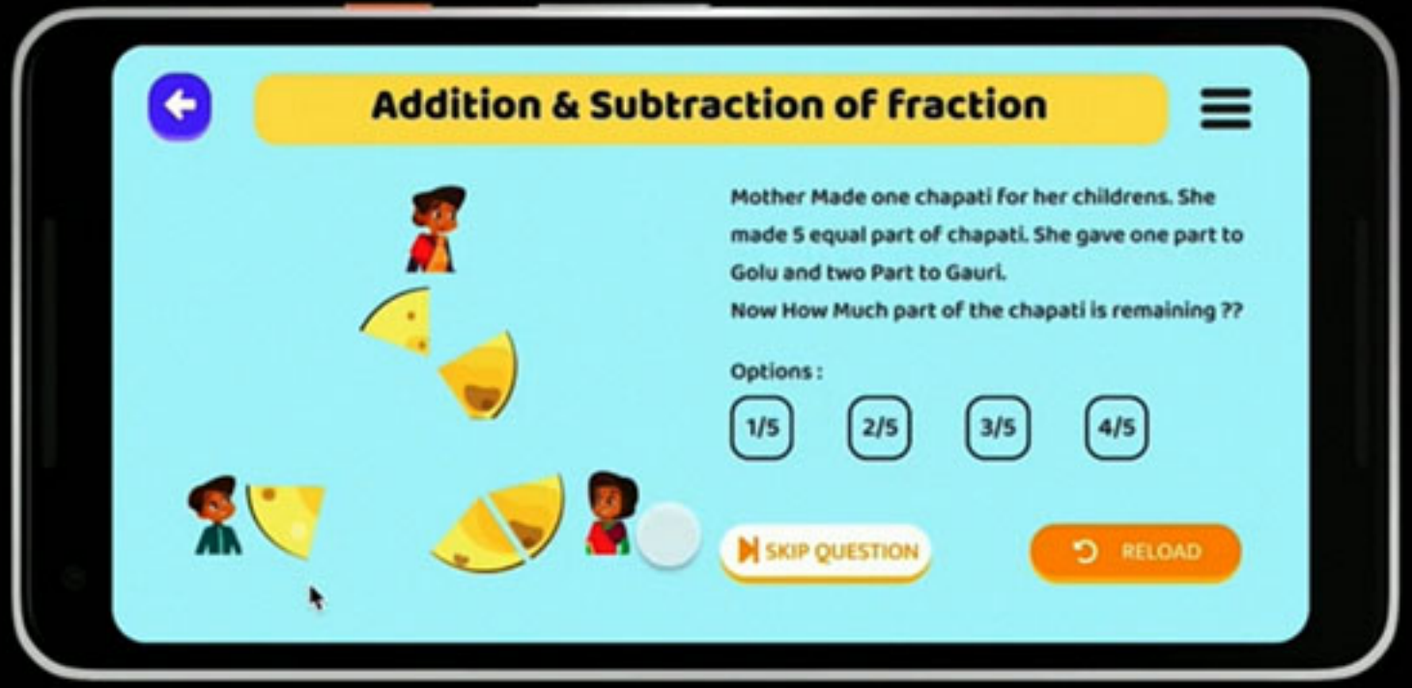
High Fidelity components of App

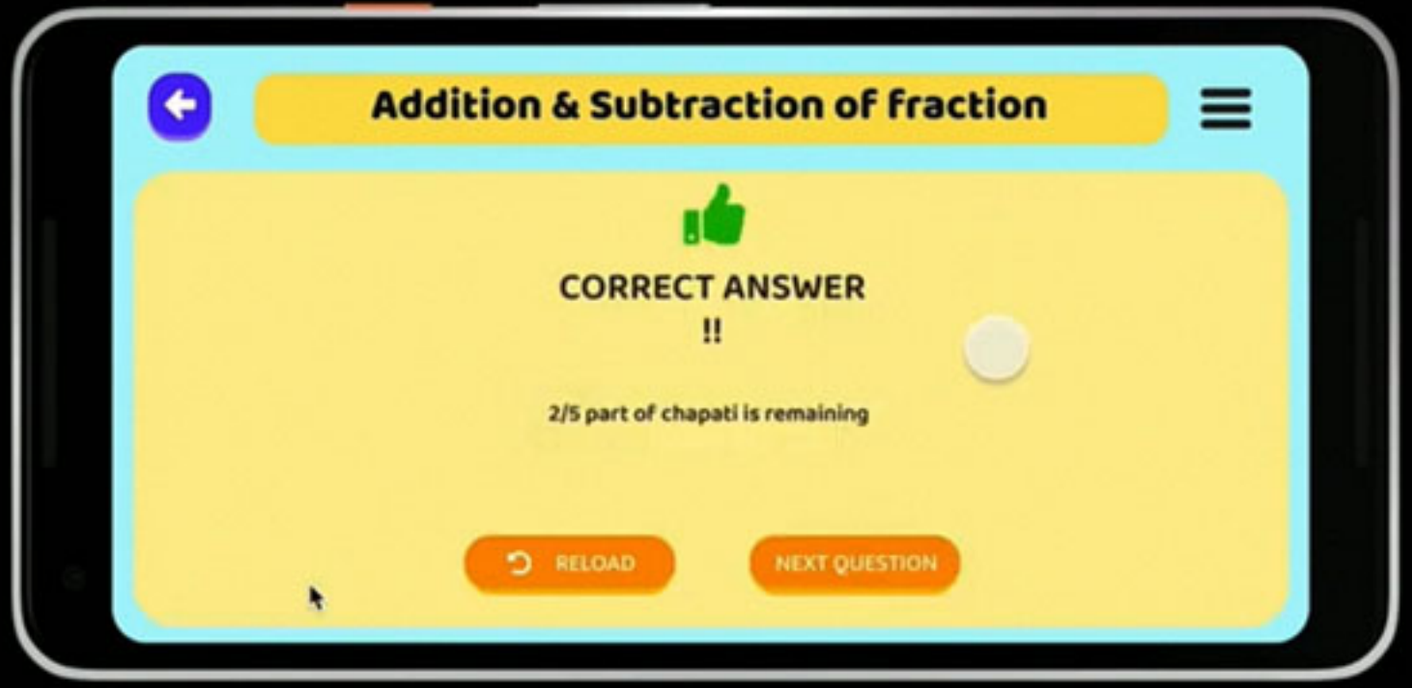
Play Area Activity of toolkit App



Lets Learn Fraction- a final toolkit

High Fidelity components of App

Play Area Activity of toolkit App



Lets Learn Fraction- a final toolkit

High Fidelity components of App

Profile and Hamburger menu

Lets Learn Fraction- a final toolkit

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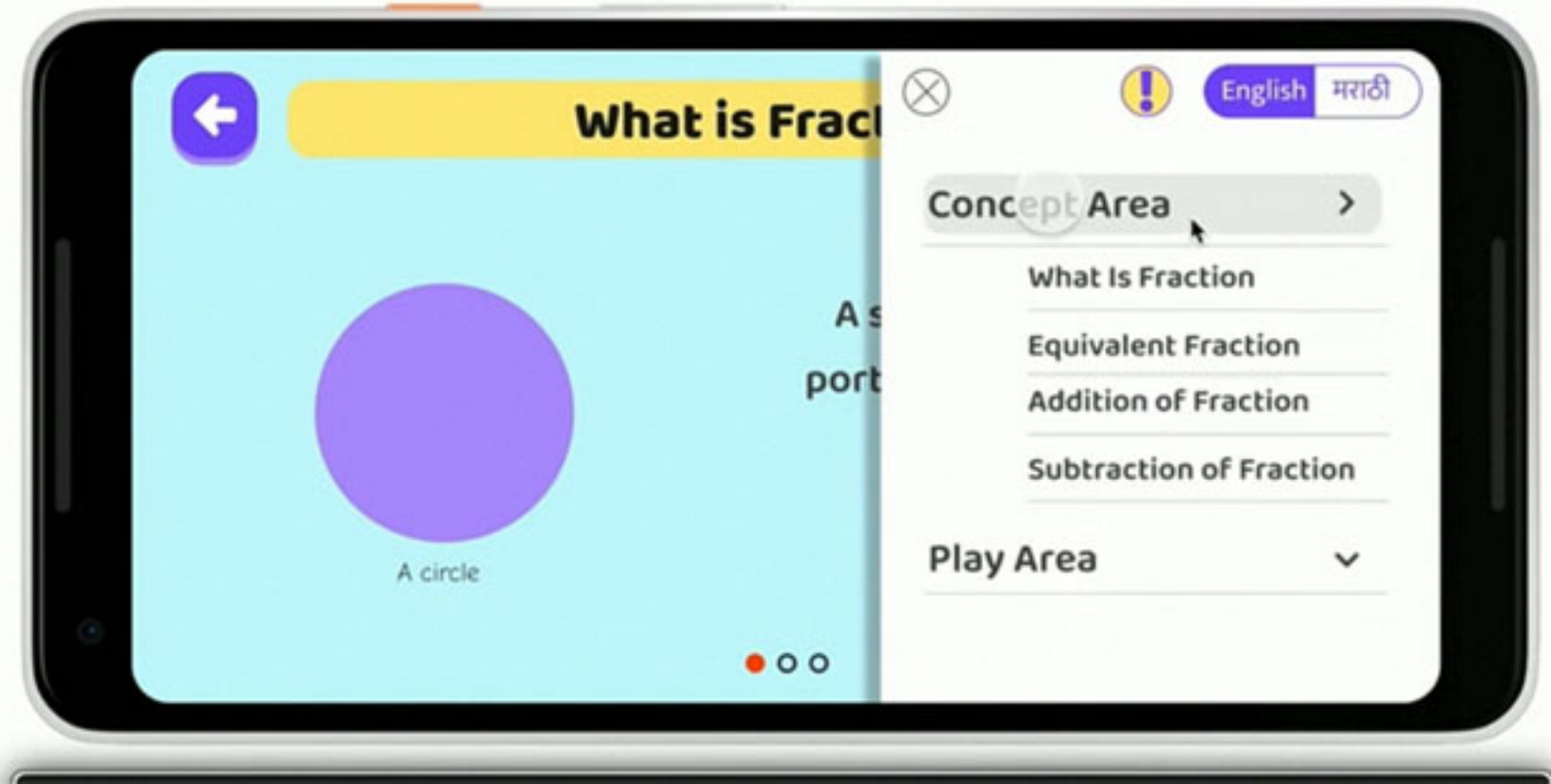

Evaluation plan

- Prototype and video prototype link is shared with students and teachers along with Byju and Khan academy's Fraction explaining concept link.
- The post play testing Qualitative feedback is taken over telephonic interviews from students.
- The Think Aloud test were used for six Teachers and Semi structured questions were asked to four students after Play testing. The evaluation was conduct with respect to following points.
    - Learning
    - Usability
    - Engagement

Evaluation Results

All the results were synthesised to understand the Evaluation result more accurately.

Leaning

- Student need to give full concentration to understand and need to watch whole concept to understand concepts.
- The narrative was easy to understand.
- The indigenous things such as Chapati, Lemon etc help to recall and relate with activity.

Usability

- The App toolkit give overall control to students, which is not present in competitive apps (Byju's and Khan Academy)
- Feedback sound and Voice narrative help them to enhance learning.
- Users were able to navigate from their own and can perform various tasks such as Profile view, Play activities, etc.
- The Guide walk through helps one student as well as teacher to navigate as first time users.

Engagement

- The concept part was easy, some students was more into listening to the narrative and some students more into watching animation.
- Students found Play Area questions more interesting than watching concept areas.
- After a some time user found skipping the concepts and not giving enough attention to play area.