

## Group 23 HCI assignment3

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**Group Number:** 23

**Group Members & Contributions:**

NAME	STUDENT ID	Contributions
NIYITEGEKA Berwa Aime Noel	21104645D	[Report] Technical specification, Presentation, compile testing data, PPT, Requirements collection
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LI Tong	21101988D	Group leader, Prototype, Report, video editing, task identification, requirements collection
LIU Yuzhou	21100602D	Collect the testing data, Report, Requirements collection, PPT, Presentation, Group coordination, prototype testing and change suggestion
YIU Pun Cham	21089475D	Requirement Collection & analysis, assist in specification, PPT, Presentation, meeting documentation

**Link to Prototype**

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**Link to Presentation Video**

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**Link to Demo Video**

<https://youtu.be/U8bDybUHkZI>

# REQUIREMENT COLLECTION AND ANALYSIS

## Children requirements

### Functional requirements

1. The children shall learn mathematical arithmetic operations through the application, including addition, deduction, multiplication and division.
2. The children shall learn arithmetic through interactive games and video tutorials.
3. The children shall track their achievement and reward features.
4. The children should be able to share and socialize through the application.
5. The children should be able to do revision through the application.
6. The children should be able to chat with the teacher when they meet any problem during their study process.

### Non-functional requirements

1. The system shall provide an interactive experience and provide real time response and feedback based on user interaction.
2. The system shall respond to input within 1 second to provide a responsive user experience.
3. The system shall provide educational content and promote the habit of learning to children.
4. The system shall be designed with appealing visual elements and feedback to provide an engaging experience to children.
5. The system shall protect the privacy of children's personal information from unauthorized access.
6. The system should allow usage without internet access.

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## **Parent requirement:**

### **Functional requirements**

1. The parents shall track the performance of the arithmetic of their children.
2. The parents shall communicate with the children's teacher through the application.
3. Parents should be able to limit the weekly playtime of their children to prevent addiction to electronic devices.

### **Non-functional requirements**

1. The system shall demonstrate uninterrupted functionality and data integrity over 5 hours of usage.
2. The system shall provide cross-platform support, ensuring compatibility across major operating systems.
3. The system shall ensure the content is age-appropriate through monitoring content editing privileges.

## **Teacher requirement:**

### **Functional requirements**

1. Teachers should be able to set up custom questions for the activities through a question preparation screen.
2. Teachers shall track the progress of the class.
3. Teachers shall be able to communicate with the children and parents through announcements and messages through the application.
4. Teachers shall be able to distribute tasks to let the children practice.

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## Non-functional requirements

1. The system shall generate constructive statistics for teaching purposes.
2. The system shall have comprehensive user support with a user manual and technical staff.
3. The system shall provide security measures to protect personal data and access to administrative functions.

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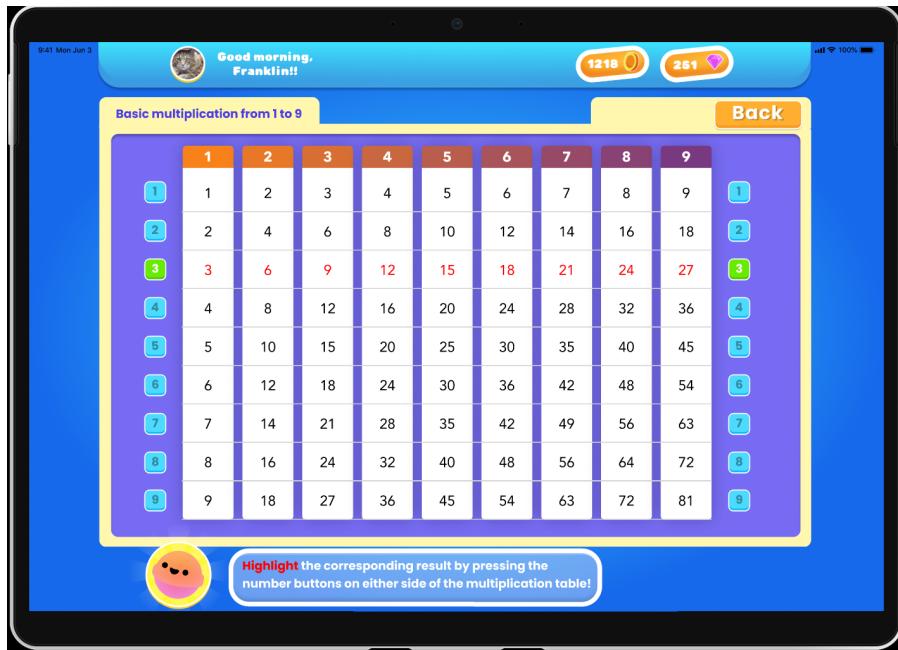
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# PROTOTYPE AND TECHNICAL SPECIFICATION

## Features analysis and specification

### 1. Learning Interface



#### Description

This is the interface that the children will use to learn the multiplication table. It is a lookup table where kids can find the multiple for  $a * b$  by checking the cell on row  $a$  and column  $b$  or vice versa. The kid can also select one of the rows he/she wants to emphasize and it will be highlighted to create contrast for easy learning.

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### **What requirement does it fulfill?**

This feature satisfies the following requirements:

- *[children] The children shall learn mathematical arithmetic operations through the application.*  
The children will use this table to familiarize themselves with multiplication tables from 2-9 and the more they visit this page the more familiar it will get, hence memorizing the multiplication table.
- *[children] The children should be able to do revision through the application.*  
This multiplication look table can also be used as revision. For instance, if the kid was studying a multiplication table of 5 at school, they can still use this table for their revision at home since it contains the same multiplication table they might be studying. Same can be applied for others from 2-9 as the table can be a handy tool to use when doing exercises.

## 2. Chat interface

### Link to Prototype

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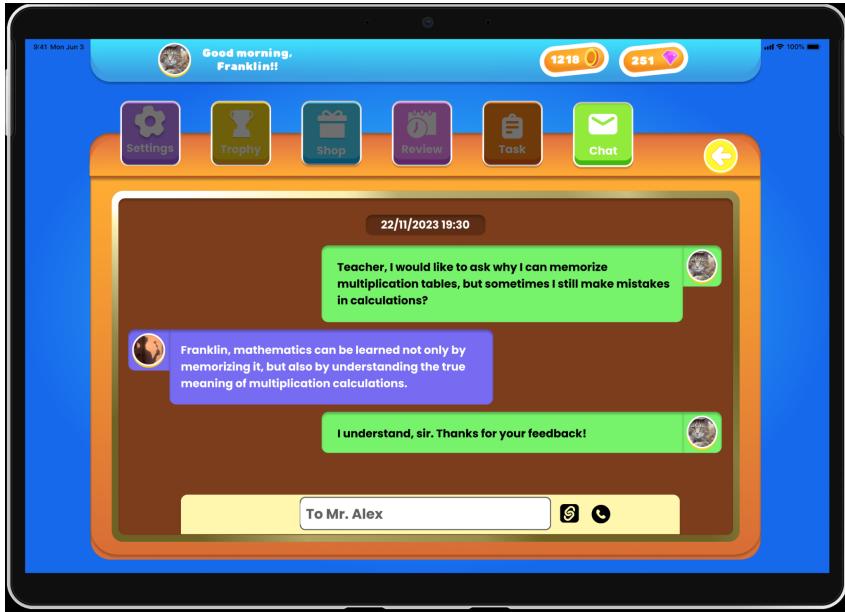
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### Description:

This is the chat interface where the child can chat with the teacher, where the child can type messages to discuss what problem they have met with their teacher. And if the problem still can not be solved, they can click the phone button to call the teacher. Also they can click the linkage button beside the phone button, in order to send some screenshot to their teacher in order to describe the question much more clearly.

### What requirement does it fulfill?

This feature satisfies the following requirements:

- *[child] The children should be able to chat with the teacher when they meet any problem during their study process.*  
The child will be able to discuss problems they have met with their teacher through this feature.
- *[Child non-functional] The system shall provide educational content and promote the habit of learning to children.*

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The Child will be prompted to study through this feature, because they are able to solve their problems effectively through chat with the teacher. And they can also build the good habit to always ask the teacher in their study.

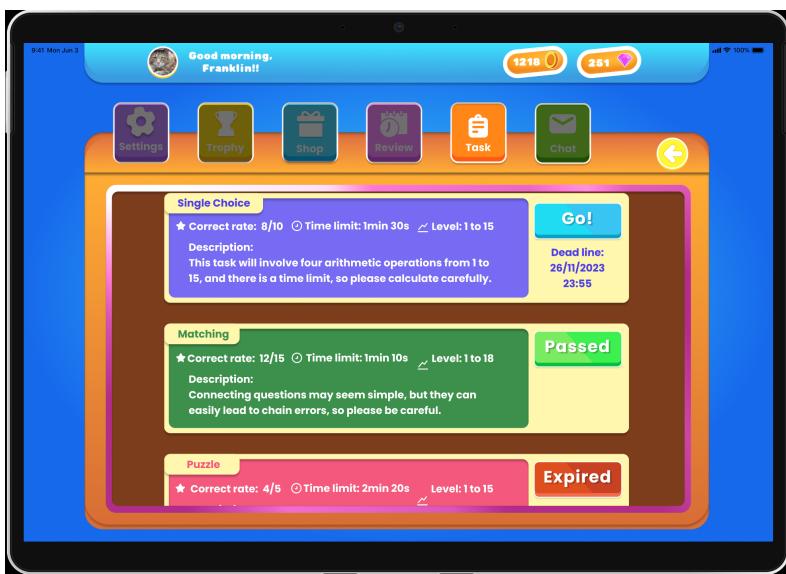
- *[Child non-functional] The system shall provide an interactive experience and provide real time response and feedback based on user interaction.*

The child can view the teacher message in real time through this feature.

- *[Teacher] Teachers shall be able to communicate to the children and parents through announcements and messages through the application.*

Through this feature, the teacher will be able to chat with different children.

### 3. Task interface



#### Description:

This page shows the task remaining for the child, and they view three different status of the tasks which are: Go(need to be completed), Passed(means the task has already been finished), Expired(the deadline already passed.) If the child clicks the Go button, he/she will directly move

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to the task page, then they can start to finish their task. For example in the screenshot shown here, if they click the Go button, they will navigate to the single choice question directly.

### What requirements does it fulfill?

This feature satisfies the following requirements:

- *[Children non-functional requirements] The system shall provide an interactive experience and provide real time response and feedback based on user interaction.*  
Children can view their status on each task in real time.
- *[Children non-functional requirements] The system shall protect the privacy of children's personal information from unauthorized access.*  
Other classmates, or parents of other children cannot view the status of their task.
- *[Parents non-functional requirements] The system shall ensure the content is age appropriate through monitoring content editing privileges.*  
The page is straight forward, and shows the content trivially, also the design is colorful and age appropriate, which may attract their kids.
- *[Teacher functional requirements] Teachers shall be able to distribute tasks to let the children do practice.*  
Children can view the task which the teacher has left for them through this feature.

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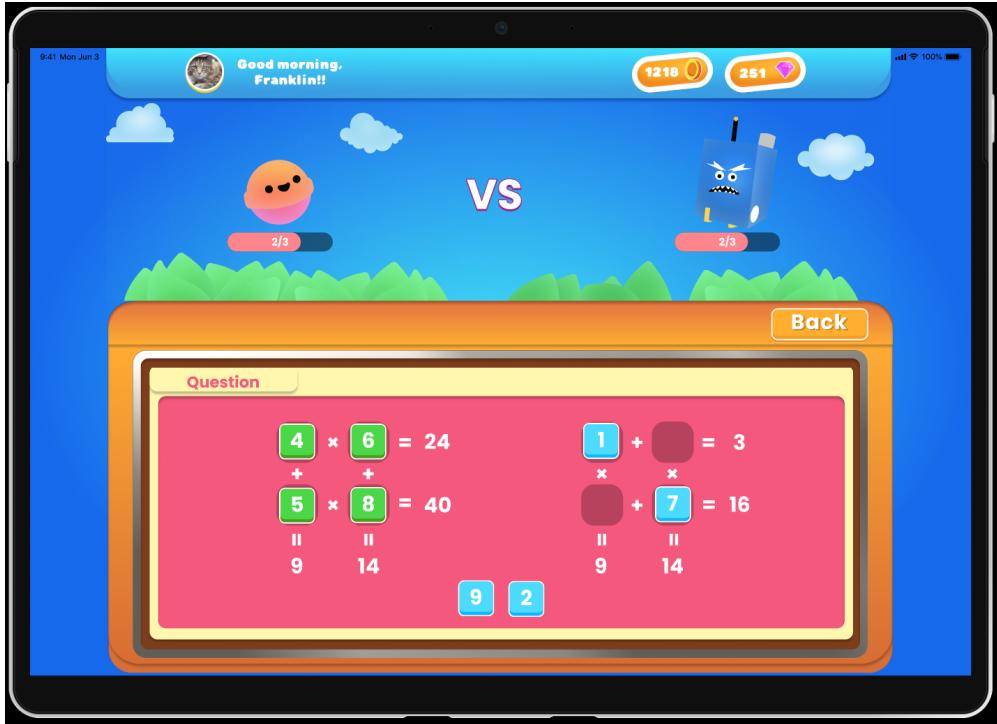
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#### 4. Head-to-head contest



##### Description:

The screen shows one of the game challenges that can be played by kids as means of practicing the arithmetic operations. On this page, kid has to select a right choice that fills a certain void. This game can be played in multiplayer mode where two players can play against each other. For this mode, when a player gets the question correct, they do damage to their opponent which reduces the opponent's health. That goes on until one of the player's health is zero. Therefore, the game emphasizes enhancing the speed and accuracy of kids doing these arithmetic operation.

##### What requirement does it fulfill?

##### Link to Prototype

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- *[children]The children shall learn arithmetic through interactive games and video tutorials.*  
This feature provides an interactive means of children to practice the arithmetic operations by interacting with the app and matching the correct numbers with the correct voids. Through series of interaction, the student can successfully complete the puzzle.
- *[children]The children should be able to share and socialize through the application.*  
This feature promotes the socialization of children as it encourages them to play with friends and classmates.
- *[children non-functional]The system shall provide an interactive experience and provide real time response and feedback based on user interaction.*  
During the game time, once the player selects wrong choice, the game notifies them that they selected wrong choice as they fail.

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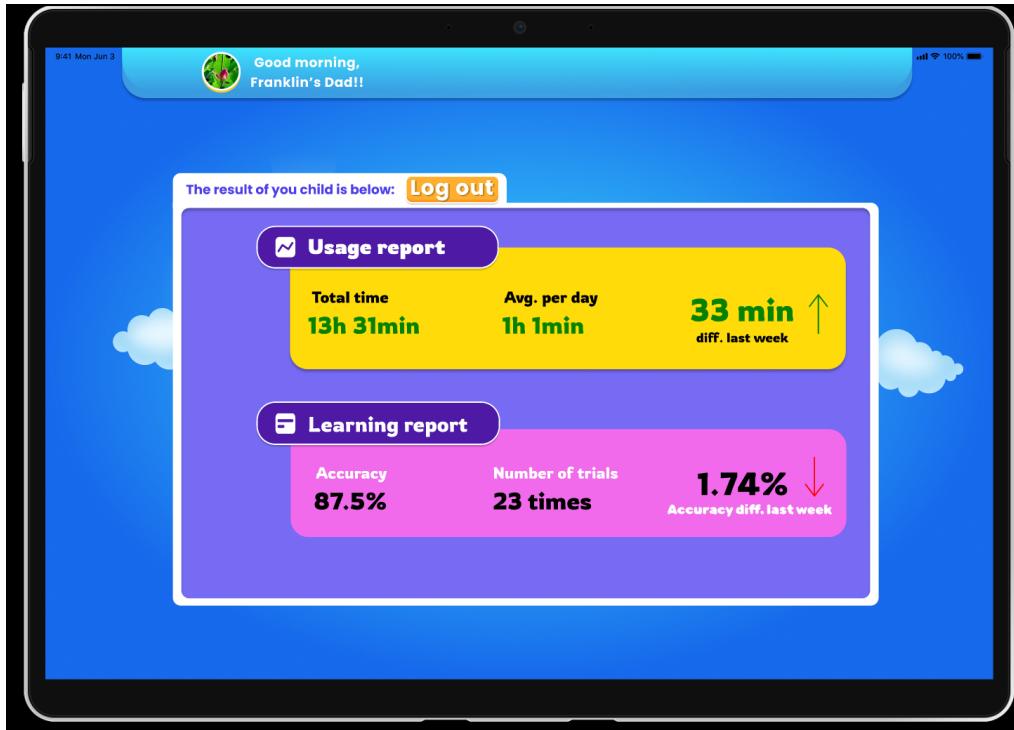
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## 5. Parental Monitoring



### Description

This screen shows the statistics of the children's usage and performance on the app to the parents. The report shown entails:

- Total time: the number of hours that the child has spent on the game
- Average time per day: estimation of the number of hours that the child has spent on the app.
- Difference from last week: it shows the increase/decrease in comparison to the week prior.
- Accuracy: ratio of correct answers to all question done
- Number of trials: number of practice challenges that the child has taken

### What requirement does it fulfill?

- *[Parents] The parents shall track the performance of arithmetic of their children.*

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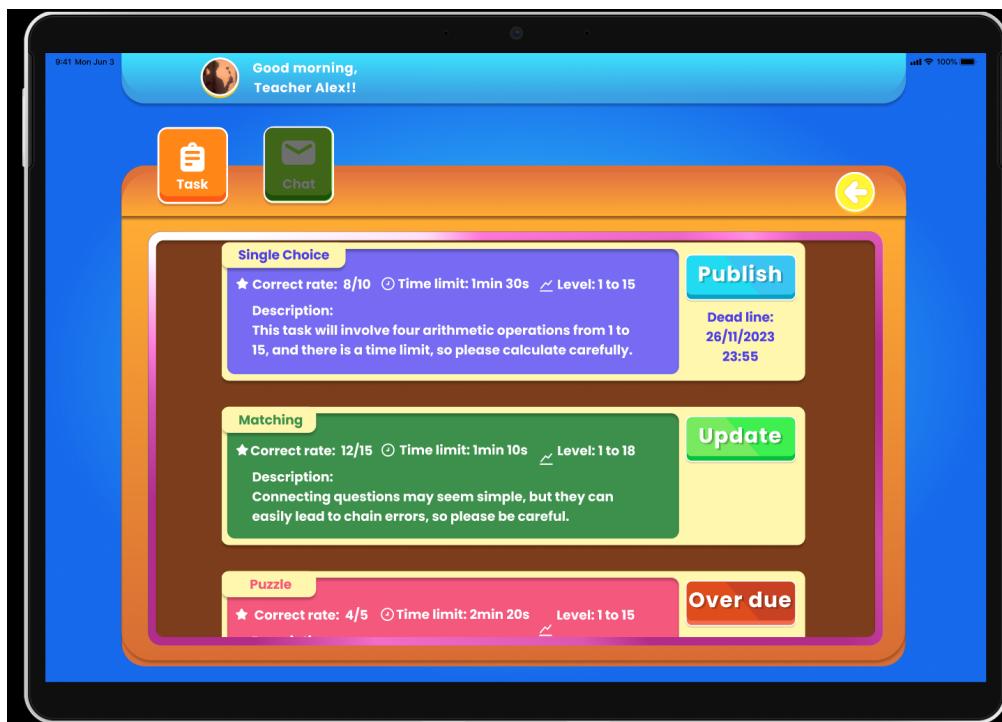
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The feature enables the parent to have a report showing the accuracy rate of their child and how they progress from prior week.

- [Parents] The parents should be able to limit the weekly play time of their children to prevent addiction with electronic devices.

This feature enables the parent to track the time the kid spent on the game and track the increase to notice if there is a potential addiction.

## 6. Teacher Task Creation and Distribution



### Description

### Link to Prototype

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This feature allows the teacher to prepare challenges and tasks for kids. They can publish and update the tasks. Each task also shows relevant statistics of the class performance including average accuracy of the class.

#### **What requirement does it fulfill?**

- *[Teacher] Teachers shall be able to distribute tasks to let the children do practice.*  
This feature enables teachers to publish the task to the class for the children's practice.
- *[Teacher] Teachers shall track progress of the class.*  
Teachers can monitor the accuracy rate of the class for the task they had distributed which allows them to know how the children are progressing in their learning.

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## 7. Character purchase



### Description

The feature enables kids to use the collected rewards to purchase some special characters that they might like. They will have multiple characters and different characters have different prices. If the kid has enough funds, they can own that character.

### What requirement does it fulfill?

- *The children shall track their achievement and reward features.*

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This feature enables the use of rewards collected to get more meaningful assets and increases the sense of achievement as they can work towards earning enough funds to buy a particular character.

- *The system shall be designed with appealing visual elements and feedback to provide an engaging experience to children.*

The visual graphics used in the shop such as characters, rewards, and other elements are cartoonish elements that are appealing to children of young age.

- *The system shall ensure the content is age-appropriate*

The system uses cartoonish characters as rewards for good performance which is appropriate for children at a young age and instead of using real money for in-app purchases, the system uses rewards earned in the game as the use of real money is inappropriate for children at such age.

## TESTING

After completing the development of our prototype, we progressed to testing to ensure that it effectively met the requirements we gathered. To comprehensively assess its performance, we devised a testing strategy that encompassed all our stakeholder groups, including children, parents, and teachers. To cater to the unique perspectives and needs of each group, we employed diverse testing methods tailored specifically for them.

### 1. Test for Children

Considering that Google Forms has age restrictions for children under 13 years old, we could not use it as a means of testing and collecting feedback. We defaulted to observation and semi-structured interviews to evaluate our app from a children's perspective.

#### Testing details

Testing Method: Interview

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Testing sample: 3 children

Age range: 6-9

### **How we performed the testing**

We handed in our prototype to the 3 children to complete the challenges developed on the game prototype and we observed them as they interacted with the prototype.

Here is our sample question for semi-structured interview:

1. Did you have fun completing the challenges? (a lot, okay, not all)
2. How difficult did you find the challenges? (challenging, appropriate, not at all)
3. Did you find the app boring? (very boring, okay, not boring at all)
4. What specific functions or features of the game did you enjoy the most?
5. Would you like to come back and play this game again? (Yes / No)

### **Link to Prototype**

Here is the link to the prototype of our application:

[https://www.figma.com/proto/8nQ8pKWeLeFPiAlVuHm3S1/3423\\_A3?type=design&node-id=566-4260&t=aweGEaqkIBO5BnBR-0&scaling=scale-down&page-id=0%3A1&starting-point-node-id=4%3A2](https://www.figma.com/proto/8nQ8pKWeLeFPiAlVuHm3S1/3423_A3?type=design&node-id=566-4260&t=aweGEaqkIBO5BnBR-0&scaling=scale-down&page-id=0%3A1&starting-point-node-id=4%3A2)

### **Link to Presentation Video**

<https://drive.google.com/file/d/1SEhS2IlvNBFBplgeXxOlahBdtLIUsSlZ/view?usp=sharing>

### **Link to Demo Video**

<https://youtu.be/U8bDybUHkZI>

## Testing results

What to test?	Question	Results	Comments
<b>Fun</b>	Did you have fun completing the challenges? (a lot, okay, not all)	<b>Okay: 2 participants</b> <b>Not at all: 1 participant</b> <b>A lot: 0</b>	Kids said that the app lacked animations that they find in other games.
<b>Content appropriateness</b>	How difficult did you find the challenges? (challenging, appropriate, not at all)	Challenging: 1 participant Appropriate: 1 participant Not at all: 1 participant	<b>One participant mentioned that the puzzle challenge was very challenging as more arithmetic operations were to be considered at once.</b>
<b>Interactivity</b>	Did you find the app boring? (very boring, okay, not boring at all)	<b>Very boring: 1 participant</b> <b>Okay: 2 participants</b> <b>Not boring at all: 0 participants</b>	
	What specific functions or features of the game did you enjoy the most?	<b>Matching puzzle: 3 participants</b>	
	Would you like to come back and play this game again? (Yes / No)	<b>Yes: 2</b> <b>No: 1</b>	

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## 2. Testing for Parent & Teacher

### **Test Method: Questionnaire**

To evaluate our application for teachers and parents, we employed questionnaires using Google Forms. The questionnaire was to be deployed after they were presented with the prototype and shown the kids' functionalities as well as their respective functionalities.

Testing details

Method: Questionnaire

Sample size: 4 parents, 4 teachers

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### Learn Arithmetic Testing Form

Testing Form for Learn Arithmetic Mobile APP

[Sign in to Google to save your progress. Learn more](#)

\* Indicates required question

Are you parent or teacher? \*

Parent  
 Teacher

How user-friendly was the app? \*

5 (very user-friendly)  
 4  
 3  
 2  
 1

How would you rate the appropriateness of the game's content for its intended audience? \*

5  
 4  
 3  
 2  
 1

Which are functions are you liked most? (If multiple, list them) \*

Your answer

How do you think this game will affect the children? \*

Positive  
 No impact  
 Negative

Why? (If affected)

Your answer

Overall, how do you rate this app? \*

5  
 4  
 3  
 2  
 1

Do you have some feedback or suggestion to us?

Your answer

[Submit](#) [Clear form](#)

Test Result:

## Link to Prototype

Here is the link to the prototype of our application:

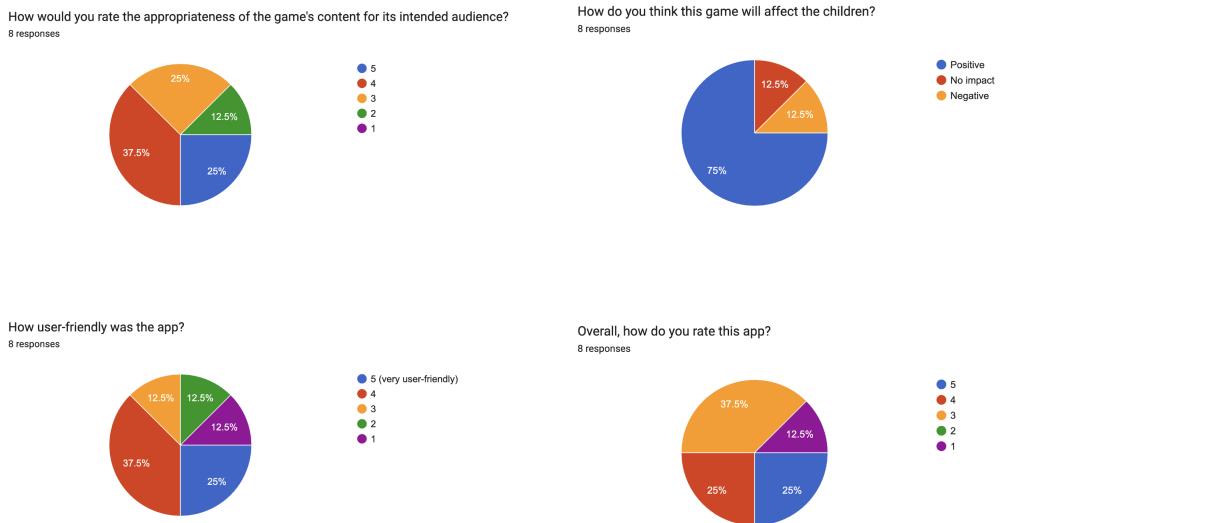
[https://www.figma.com/proto/8nQ8pKWcLeFPiAlVuHm3S1/3423\\_A3?type=design&node-id=566-4260&t=aweGEaqkIBO5BnBR-0&scaling=scale-down&page-id=0%3A1&starting-point-node-id=4%3A2](https://www.figma.com/proto/8nQ8pKWcLeFPiAlVuHm3S1/3423_A3?type=design&node-id=566-4260&t=aweGEaqkIBO5BnBR-0&scaling=scale-down&page-id=0%3A1&starting-point-node-id=4%3A2)

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