COMP3423 - Human Computer Interaction
Assignment 3
Learning algorithm application

Group 9

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Table of Contents

Overview of project

Introduction

The project is going to design the interface to simulate the application for children who are learning algorithm in school and assist their study by learning with game. In project, it will collect the stakeholder requirement and analyse them to process requirement of each stakeholder. Then, it will design an interface to satisfy the requirement of each stakeholder. After designing an interface, a usability testing will be held to ensure that the interface design is a good design.

Work Allocation

Name	Allocative Work
Fung Cheuk Hin	Collect Children Requirement, Technical Specification, Presentation
Fung Pui Kiu	Prototyping, Main for testing, Proofreading, Presentation
Lai Chun Ho	Collect Parent Requirement, Technical Specification, Group Work
Wan Hoi Nam	Testing, Main for Prototyping, Proofreading, Presentation
Wong Hiu Chun	Collect Teacher Requirement, Technical Specification

Task 1 - Requirement Gathering and Analysis

Collecting Children's Requirement

Introduction

To collect data from children, it has designed some question which allow to interview the children for getting the user requirement. During data collection, it has interviewed a few children who are studying the mathematics algorithm.

Besides, there are four sections in the interview form:

1. Preferences and Engagement
    - Participants would ask for the preferences on mathematics and its reason. Mainly collects the guard of participants.
2. Learning Environment
    - To find out the most acceptable teaching method for children, we would collect the learning habit and the elements children would interest with. The application format would be decided after collecting the following feedback.
3. Platform preferences
    - To determine the interface of the application, the platform preferences would be collected by children to decide the platform selection of the application. Also, theme selection can help the application for children be enticed to keep playing and all the features in the app are influenced by the theme.
4. Feedback and Improvement
    - To collect other user requirement, feedback and improvement section has provided other user stories of the application to find out the additional

requirement for children. Therefore, some open-end questions are provided in section.

Question of Interview

Section 1: Introduction of Project

Our project is going to design an interface to assist children for learning of mathematics algorithms. Thus, we are going to ask some questions about the preferences of learning mathematics, learning environments, preferences on platform, feedback and improvement and some reflection after using the prototype.

Section 2: Children's Personal Information

1. Name of interviewee:
2. Age of interviewee:
3. Grade of interviewee:

Section 3: Preference and Engagement

1. Do you like Maths?
2. Do you good at Maths?
3. Why do/don't you like maths?
4. Which mathematics algorithm (e.g. addition, subtraction, multiplication, division) makes you feel challenging or interesting to found the answer?
5. What do you like to do in your spare time?

Section 4: Learning Environment

1. What is your favourite channel to learn new knowledge? (e.g., learning through games, stories, videos, etc.)
2. What do you consider to be the elements that appeal to you?

Section 5: Platform Preferences

1. What themes do you want to implement in mathematics application or game? (e.g., outer space, jungle adventure, underwater world)
2. Which devices would you prefer to use when learning the mathematics? Why do you use it? (To take as example: computer, tablet, smartphone)

Section 6: Feedback and Improvement

1. What make you excited to use a math learning app or game?
2. If you had done a great job, what do you want to get out of it?
3. If there was something you didn't understand, how would you like to be helped?
4. Is there anything else you would like to tell us about your preferred learning style or ideas or making math learning more fun?

Sample Result

Result one:

Section 2: Children's Personal Information

1. Name of interviewee: Alex
2. Age of interviewee: 8
3. Grade of interviewee: Grade 10

Section 3: Preference and Engagement

1. Do you like Maths?
   Ans: Sometimes it's fun, and sometimes it's a bit tricky.

2. Do you good at Maths?
   Ans: I'm getting better! Some topics are easy, but I'm still working on it.

3. Why do/don't you like maths?
   Ans: I like it when it's like a puzzle, and I have to figure things out. But sometimes it feels a bit hard.

4. Which mathematics algorithm (e.g. addition, subtraction, multiplication, division) makes you feel challenging or interesting to found the answer?
   Ans: Multiplication is a bit tricky, but I like adding things up because it's like a game.

5. What do you like to do in your spare time?
   Ans: I love playing video games and I like building things with my LEGO too.

Section 4: Learning Environment

1. What is your favourite channel to learn new knowledge? (e.g., learning through games, stories, videos, etc.)
   Ans: Games are awesome! If I can learn and play at the same time, that's the best.

2. What do you consider to be the elements that appeal to you?
   Ans: I'll be really interested on colorful subject. Also, I hope that it has a cool character.

Section 5: Platform Preferences

1. What themes do you want to implement in mathematics application or game? (e.g., outer space, jungle adventure, underwater world)

Ans: I think space would be great, I usually looking at the stars and imagine I would be exploring space in the future!

2. Which devices would you prefer to use when learning the mathematics? Why do you use it? (To take as example: computer, tablet, smartphone)
   Ans: I like using my tablet because I can take it anywhere and it's screen size is larger than a phone. Also, I used iPad for learning at school too!

Section 6: Feedback and Improvement

1. What make you excited to use a math learning app or game?
   Ans: I look forward if there has any surprises and new challenges every day. It's so excited to see what's next!

2. If you had done a great job, what do you want to get out of it?
   Ans: I would like to catch the stars!

3. If there was something you didn't understand, how would you like to be helped?
   Ans: Maybe a friendly character could help explain things, or there could be hints to guide me.

4. Is there anything else you would like to tell us about your preferred learning style or ideas or making math learning more fun?
   Ans: Can I play this game with my friend? It would be good to play with friends.

Result two:

Section 2: Children's Personal Information

1. Name of interviewee: Lily
2. Age of interviewee: 7
3. Grade of interviewee: Grade 9

Section 3: Preference and Engagement

1. Do you like Maths?
   Ans: No! I hate it.

2. Do you good at Maths?
   Ans: No! I think is a boy thing.

3. Why do/don't you like maths?
   Ans: I think is too hard.

4. Which mathematics algorithm (e.g. addition, subtraction, multiplication, division) makes you feel challenging or interesting to found the answer?
   Ans: I like adding things, and taking away. But multiplication and division is too hard for me.

5. What do you like to do in your spare time?
   Ans: I like watching YouTube.

Section 4: Learning Environment

1. What is your favourite channel to learn new knowledge? (e.g., learning through games, stories, videos, etc.)
   Ans: I like when there are stores.

2. What do you consider to be the elements that appeal to you?
   Ans: If it's colorful and has cute characters, I'll be really interested in it!

Section 5: Platform Preferences

1. What themes do you want to implement in mathematics application or game? (e.g., outer space, jungle adventure, underwater world)
   Ans: I think underwater is a good choice. I like fish and mermaid! But I think space is good. I went to space museum recently!

2. Which devices would you prefer to use when learning the mathematics? Why do you use it? (To take as example: computer, tablet, smartphone)
   Ans: I like my tablet! My school gave me one!

Section 6: Feedback and Improvement

1. What make you excited to use a math learning app or game?
   Ans: If there are happy sounds when I get things right, that would be really fun!

2. If you had done a great job, what do you want to get out of it?
   Ans: Maybe some cute stickers that cheers for me!

3. If there was something you didn't understand, how would you like to be helped?
   Ans: I want some hints or I will ask my teacher.

4. Is there anything else you would like to tell us about your preferred learning style or ideas or making math learning more fun?
   Ans: Can I have music and sound in the game? I think sound and music is attractive when pressing button and playing game.

Result Analysis

Prototype demonstration

To have demonstration, it has chosen a prototype from our groupmate for children to play and provide reflection on prototype. Below is the figma: https://www.figma.com/file/v8f9oQ5fSR2Ek5dtvNiJe0/Untitled?type=design&node-id=0-1&mode=design&t=2Bwfxr1o93BM6t0I-0

After demonstrating the prototype to children, two open questions will be asked:

1. What is the most impressive part after the demonstration?
2. What do you think about the method of learning?

The forest theme is the most impressive part of prototype which is attractive and colourful. It reminds us to spend more time for thinking about the theme of project. The theme of application can attract the interest of children and allow them to use application in long term. Besides, the interactive element such as drag or drop object can attract their attention. Those comment help us to design a better interface of prototype.

Besides, it has summarized some functional and non-functional requirement through analysis.

Functional Requirement:

1. The application should have colourful and engaging picture to attract the attention of children.
2. The application should provide some interactive elements that allow children to practice multiplication in amusing way.
3. The application should provide some reward for achievement to engage them to study the multiplication.
4. The application should give hints when the user face difficulty when playing games.
5. The application should have a plenty of games or activities for attracting children to learn multiplication with playing the game.
6. The application should allow children to compete with other players (e.g., friend or classmates) in ranking mode.
7. The application should compete with friends for example (Time racing, marks of the task)
8. The application should have adjustable setting for adjusting sound, music, screen quality to adapt the preference or needs of children.

Non-functional Requirement:

1. Speed
    a. The delay of application should be less than once per a day and operate the application in smoothly.
    b. The transmission speed should be 10 Mbps.
2. Size

    a. The storage of application should be less than 5GB to reduce the usage of resource and its energy consumption.
3. Reliably
    a. The downtime of application should be less than once per week and reboot system within 3 hours.
4. Portability
    a. The application should be compatible with other devices (iPad, mobile phone) or operating systems (e.g., Android, iOS) to allow children to use the application with other devices.
5. Security
    a. The application should ensure data security, the personal information should not be leaked.
6. Interface
    a. The theme of the application would be in space or forest.

Parents

Introduction

To collect data from parent, it has designed some questions which allow to interview the parents for getting the user requirement. During data collection, it has interviewed a few parents who has children that learning the mathematics algorithm.

Besides, there are four sections in the interview form:

1. Preference and Expectation
    - To understand parent preferences and expectations regarding the learning experience and app design. It explores the types of learning experiences or activities they find most engaging for children, as well as any specific design or visual preferences they may have. This information helps shape the content and aesthetics of app.
2. Current Challenges
    - To focus on the difficulties and challenges that parent faced when children are learning the arithmetic. It helps to find the difficult topic or concept that children find it as challenging and identify the difficulties when learning with game.
3. Parent Involvement
    - To understand the need of parents, the questions will explore parent's preferences on learning progress of children through the application. It helps to design the feature as tracking screen, involvement.
4. Platform preferences
    - To gather the information about preferences for children's learning devices and provide suggestions on designing the user interface of applications.

Question of Interview

Section 1: Introduction of Project

Our project is going to design an interface to assist children for learning of mathematics algorithms. Thus, we are going to ask some questions about the preference and expectation of learning mathematics, Parent Involvement, preferences on platform.

Section 2: Parents' Personal Information

1. Name of interviewee:
2. Age of interviewee:
3. Gender of interviewee children:
4. Age of interviewee children:

Section 3: Preference and Expectation

1. What type of activity does children feel engaging when they are learning the mathematics?
2. Do you have any specific design or visual preferences on the application?

3. What features or functionality would you like to implement into application and enhance child’s learning experience?

Section 4: Current Challenges

1. What challenges or difficulties does children face when they are learning arithmetic?
2. Do you face any challenges or barriers when learning arithmetic with children?
3. Are there any topics or concepts in arithmetic that makes children feel confusing or challenging?

Section 5: Parent Involvement

1. Would you want to have progress reports or updates about child's learning performance in the app?
2. Do you want to participate in your child's learning process through an app?

Section 6: Platform Preferences

1. What device do you prefer children to use? Why do you choose it? (e.g. smartphone, iPad)

Sample Result

Result one:

Section 2: Parents' Personal Information

1. Name of interviewee: Tim
2. Age of interviewee: 38
3. Gender of interviewee children: Female
4. Age of interviewee children: 7 years old

Section 3: Preference and Expectation

1. What type of activity does children feel engaging when they are learning the mathematics?
   Ans: I find that my daughter is most engaged when learning math through interactive and playful activities that focus on basic arithmetic skills.

2. Do you have any specific design or visual preferences on the application?
   Ans: I prefer visually appealing apps that have colourful and engaging visuals that grab my daughter's attention.

3. What features or functionality would you like to implement into application and enhance child's learning experience?
   Ans: I wish the app had a variety of games to make learning math fun and interactive. It would also be helpful if the app offered progress tracking and possibly some rewards after completing the exercises to motivate my daughter 's learning journey.

Section 4: Current Challenges

1. What challenges or difficulties does children face when they are learning arithmetic?
   Ans: My daughter finds it challenging to understand and remember number patterns, especially when counting by twos, fives, and tens. They also have difficulty mastering basic addition and subtraction.

2. Do you face any challenges or barriers when learning arithmetic with children?
   Ans: My daughter lack confidence in math abilities and I struggle to build confidence and encourage a positive attitude toward math. She also asks hints without doing the question.

3. Are there any topics or concepts in arithmetic that makes children feel confusing or challenging?
   Ans: My daughter finds the concepts of division and solving word problems challenging. She also needs more addition and subtraction practice to build confidence.

Section 5: Parent Involvement

1. Would you want to have progress reports or updates about child's learning performance in the app?
   Ans: Yes, I would like to receive progress reports or updates about my daughter 's performance in the app. This will allow me to keep abreast of their progress and identify areas where they may need additional support.

2. Do you want to participate in your child's learning process through an app?
   Ans: I'm open to the idea of participating in my daughter 's learning process through an app.

Section 6: Platform Preferences

1. What device do you prefer children to use? Why do you choose it? (e.g. smartphone, iPad)
   Ans: I prefer my daughter to study on a tablet because it provides a larger screen for better viewing of math problems, illustrations, and interactive elements.

Result Two:

Section 2: Parents' Personal Information

1. Name of interviewee: Carol
2. Age of interviewee: 38
3. Gender of interviewee children: Male
4. Age of interviewee children: 8 years old

Section 3: Preference and Expectation

1. What type of activity does children feel engaging when they are learning the mathematics?
   Ans: I think learning by game is engaging for my son because my son love playing video games and play puzzle.

2. Do you have any specific design or visual preferences on the application?
   Ans: I hope that the interface of the application should be as simple and easy to understand as possible so that my son can easily get started with the application. In addition, the visual images of the interface should avoid violent scenes as much as possible.

3. What features or functionality would you like to implement into application and enhance child's learning experience?
   Ans: I hope that the app can be used to learn mathematics in the form of puzzles games. I can also track his progress through the app, and my son can also adjust the difficulty of his questions according to his progress to suit my son's learning needs. It would also be helpful if the app provided explanations and tips for solving the problem.

Section 4: Current Challenges

1. What challenges or difficulties does children face when they are learning arithmetic?
   Ans: When my son first learned about multiple, he often had to look at multiplication table when doing exercises because he cannot memorize the multiplication table.

2. Do you face any challenges or barriers when learning arithmetic with children?
   Ans: I struggle to find suitable learning resources or materials to supplement my children's numerical learning at home.

3. Are there any topics or concepts in arithmetic that makes children feel confusing or challenging?
   Ans: The idea of division is very challenging for my child, especially when dealing with remainders and multiple-digit divisors.

Section 5: Parent Involvement

1. Would you want to have progress reports or updates about child's learning performance in the app?
   Ans: Yes, I would like to receive progress reports or updates about my son's performance in the app.

2. Do you want to participate in your child's learning process through an app?
   Ans: Yes, I want to participate in my son's learning process through an app. I believe my involvement can enhance their learning experience.

Section 6: Platform Preferences

1. What device do you prefer children to use? Why do you choose it? (e.g. smartphone, iPad)
   Ans: I prefer my son to learn on a tablet because of its larger screen size. It allows for a more immersive and interactive learning experience. It also provides a comfortable interface for them to learn and view math problems and visual elements easily.

Result Analysis

Through analysis, it has summarized some functional and non-functional requirement.

Functional requirement

1. The app should provide parents with the ability to track their child's progress, including completed lessons, performance metrics, and areas that need improvement.
2. Parents should have access to detailed performance reports that provide insights into their child's strengths and weaknesses in different arithmetic concepts.
3. The app should offer customization features, allowing parents to set specific learning goals, adjust difficulty levels, or choose specific topics for their child to focus on.
4. The app should provide some hints when children have difficulty. It considers using visual cues or animations to convey the hints effectively.
5. The app should provide some rewards and encourage feedback massage to keep children motivated.

Non-functional requirement

1. Portability
   - The app should be compatible with different mobile devices and operating systems, ensuring that parents can access it from various platforms.
2. User-Friendly Interface
   - The app should have an intuitive and user-friendly interface that is easy for parents to navigate and understand, even if they have limited technical knowledge.
3. Hints Constraint:
   - To encourage children independent thinking and problem solving, the app can impose certain constraints on the hints. For example, limit the number of hints per practice or show the hints button after children answered three times. This can ensure children put in effort before opening the hints and develop a sense of accomplishment as they solve problems on their own.
4. Age-appropriate Screen
   - Visual images used should be chosen carefully to avoid any violent or disturbing content. Graphics, illustrations, or animations should be age-appropriate, non-threatening, and promote a positive learning environment. This will help create a safe and enjoyable experience for children when using the app.

Teachers

Introduction

To collect data from teachers, it has designed some question which allow to interview the teacher for getting the user requirement. During data collection, it has interviewed a few teachers who are teaching the mathematics algorithm.

Besides, there are four sections in the interview form:

1. Understanding of Current Teaching Practices
    - Aimed to understand the teaching methods currently used by teachers in teaching arithmetic concepts. It helps us consider and meet the needs of teachers when designing the app.
2. Perception of Children's Learning Needs
    - To find the key challenges children face from teacher when learning basic arithmetic, user requirement could be collected to make the application more effective to support children's learning.
3. Learning tools
    - Gain insight into teachers' perspectives on the use of technology in teaching arithmetic. This will help us better understand their needs so that we can develop corresponding applications more efficiently.
4. Others
    - To collect teachers' opinions and suggestions on functions and user interfaces in order to gain a deeper understanding of their needs and carry out functional design and interface optimization based on this information.

Question of Interview

Section 1: Introduction of Project

Our project is going to design an interface to assist children for learning of mathematics algorithms. Thus, we are going to ask some questions about the understanding of current teaching practices, perception of children's learning needs, learning tools, and other aspects.

Section 2: Teacher's personal information

1. Name of interviewee:
2. Age of interviewee:
3. School of interviewee teach at:

Section 3: Understanding of Current Teaching Practices

1. How do you currently teach basic arithmetic concepts to your students?
2. What learning resources or tools do you currently use for teaching?

Section 4: Perception of Children's Learning Needs

1. In your opinion, what are the key challenges children face when learning basic arithmetic?

2. Are there any specific topics within arithmetic that you find students struggle with the most?

Section 5: Learning tools

1. Have you used any educational apps or technology tools to teach arithmetic concepts?
2. What are your thoughts on incorporating technology into the teaching of arithmetic?

Section 6: Others

1. What features would you like to see in a "Learn Arithmetic" app for your students?
2. How important is the visual appeal and user-friendliness of the interface in engaging students?

Sample Result

Result 1:

Section 2: Teacher’s personal information

1. Name of interviewee: Ms. Chan
2. Age of interviewee: 54
3. School of interviewee teach at: Super Primary School

Section 3: Understanding of Current Teaching Practices

1. How do you currently teach basic arithmetic concepts to your students?
   Ans: I currently use a set of textbooks, worksheets, and interactive activities to teach basic arithmetic concepts. Because real-life examples to make the learning experience.

2. What learning resources or tools do you currently use for teaching?
   Ans: I will use online mathematics education websites and some mobile software as learning tools.

Section 4: Perception of Children's Learning Needs

1. In your opinion, what are the key challenges children face when learning basic arithmetic?
   Ans: I see that children often struggle with memorizing multiplication tables and grasping the concept of division.

2. Are there any specific topics within arithmetic that you find students struggle with the most?
   Ans: I noticed challenges in teaching about division, as these concepts tend to be more abstract for students.

Section 5: Learning tools

1. Have you used any educational apps or technology tools to teach arithmetic concepts?
   Ans: I used educational apps to provide quizzes and games to teach mathematics skills. Because I find that technology can enhance student engagement and motivation.

2. What are your thoughts on incorporating technology into the teaching of arithmetic?
   Ans: I believe it is crucial to integrate technology into the teaching of numeracy, especially given the current generation's familiarity with digital tools

Section 6: Others

1. What features would you like to see in a "Learn Arithmetic" app for your students?
   Ans: I like to see some interactive features, such as quizzes and games, can keep students motivated. Because it captures students' attention.

2. How important is the visual appeal and user-friendliness of the interface in engaging students?
   Ans: I think the visual appeal and user-friendliness of the interface are critical because they provide positive learning experience for students.

Result 2:

Section 2: Teacher’s personal information

1. Name of interviewee: Mr. Lee
2. Age of interviewee: 42
3. School of interviewee teach at: Happy Primary School

Section 3: Understanding of Current Teaching Practices

1. How do you currently teach basic arithmetic concepts to your students?
   Ans: I teach basic arithmetic using a combination of traditional teaching methods, including lectures and written exercises, as well as interactive group activities.

2. What learning resources or tools do you currently use for teaching?
   Ans: I teach using educational software provided by some textbook publishers.

Section 4: Perception of Children's Learning Needs

1. In your opinion, what are the key challenges children face when learning basic arithmetic?
   Ans: I think the main challenge children face when learning basic arithmetic is that math is a bit abstract and difficult for them to understand.
2. Are there any specific topics within arithmetic that you find students struggle with the most?
   Ans: I find that multiplication is the hardest for students to understand.

Section 5: Learning tools

1. Have you used any educational apps or technology tools to teach arithmetic concepts?
   Ans: I tried a virtual VR math game to provide students with a more interactive and dynamic learning experience. Technology has corresponding potential in providing personalized learning opportunities.
2. What are your thoughts on incorporating technology into the teaching of arithmetic?
   Ans: I believe there needs to be a balanced approach to the use of technology, ensuring that technology is a complement to traditional teaching methods rather than a replacement.

Section 6: Others

1. What features would you like to see in a "Learn Arithmetic" app for your students?
   Ans: I would like to see features that encourage student participation and collaboration, such as virtual group activities and forums. I believe that an effective

"learn arithmetic" app should promote active participation rather than passive learning.

2. How important is the visual appeal and user-friendliness of the interface in engaging students?
   Ans: I believe that the visual appeal and user-friendliness of the interface are important in engaging students because clear, intuitive navigation and visually appealing graphics enhance students' understanding and retention of arithmetic concepts.

Result Analysis:

Through analysis, it has summarized some functional and non-functional requirement.

Functional Requirements:

1. The application shall have interactive modules for teaching basic arithmetic concepts, including addition, subtraction, multiplication, and division.
2. The application shall have an error book feature to help teachers monitor individual or class-wide progress.
3. The application shall contain practical applications of mathematics to encourage students to see mathematics in their daily lives.
4. The application shall include quizzes and games to make learning more engaging and enhance numeracy skills.
5. The application shall have features for student collaboration, such as virtual group activities and forums. Promote students to actively participate in learning

Non-functional Requirements:

1. The application should have a visually appealing and intuitive user interface to attract students to use it.
2. The application should have a simple and user-friendly design, ensuring that it can be used by students with varying levels of electronic device abilities.
3. The application should ensure compatibility with various devices, ensuring students can access it from different devices.
4. The application question bank should be expandable, allowing new courses and topics to be added over time to ensure students continue to learn.

Task 2 - Prototyping and Technical Specifications

Our implementation

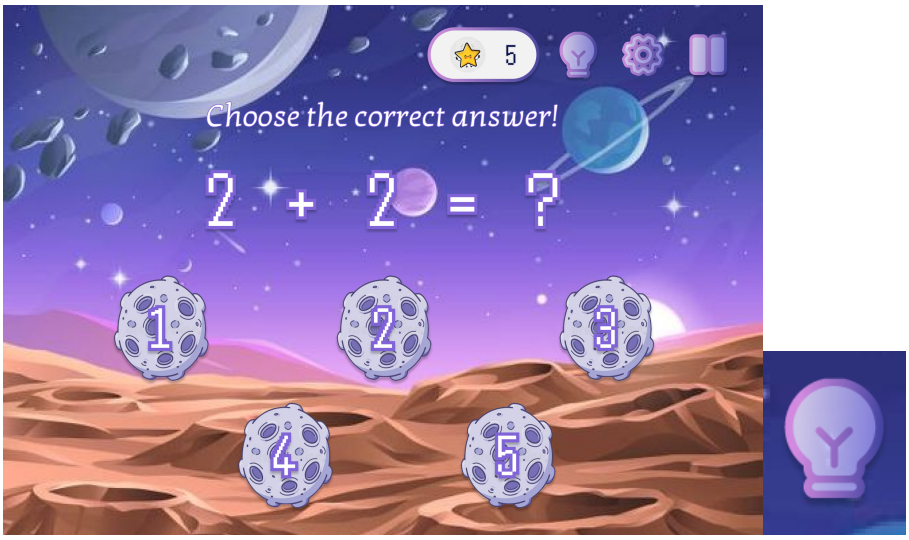
Figma Draft:
https://www.figma.com/file/xFPG8JtF5J1ntddn6fJvDu/COMP3423_GroupProject?type=design&node-id=0%3A1&mode=design&t=erme9ROubNB1Biyd-1

Figma Prototype:
https://www.figma.com/community/file/1310241701525245783/comp3423-groupproject

Technical Specifications

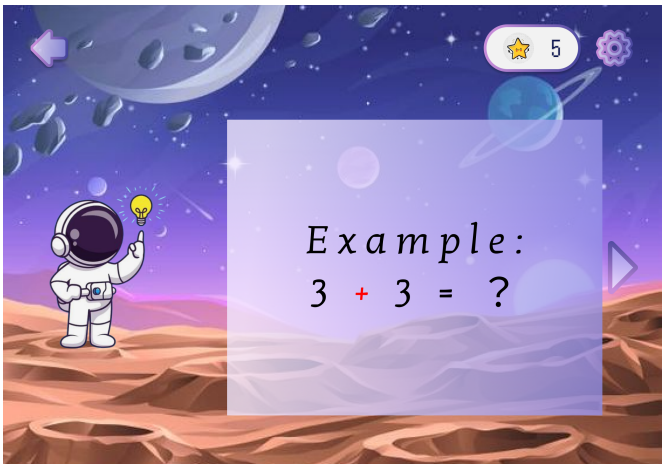
Hints Button

According to the interview from children and parents, both of them want to get hints if facing difficulty when learning mathematics in applications.



Therefore, there has a lightbulb which means hints in gaming page. If children feel frustrated, they can press the light bulb and it will forward to the specific operator reviewing page. It can help children to clarify the concept of the algorithm.

After they click the hints button (lightbulb):



Requirements fulfilled:

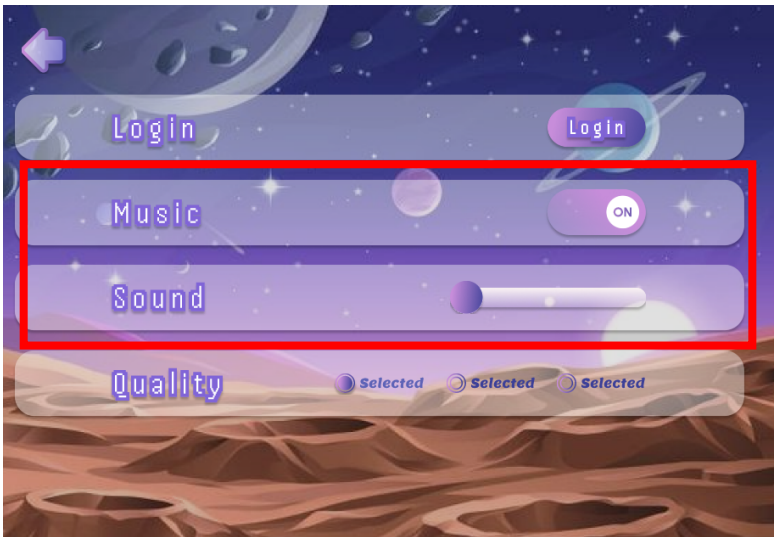
1. Children's functional requirement:
   #4 "The application should give hints when the user face difficulty when playing games"
2. Parents' functional requirement:
   # 4 "The app should provide some hints when children have difficulty".

Hints could break down the complex math problem into smaller problem. Children could easily understand the mathematics concept by using step-by-step guidance. Also, It considers using visual cues or animations to convey the hints effectively. Visual cues could show the math algorithm process visually with clear illustrations. Animations can provide interactive demonstrations that help children to grasp mathematical concept.

Music toggle and sound slider

According to interview of children, music and sound can attract their attention when they are playing game or clicking button. It can provide interaction that children may keep the interest on the playing game or using the application.

In the setting screen, it has an on / off button to control the open / closed of music and slider to control the size of the volume.



Requirements fulfilled:

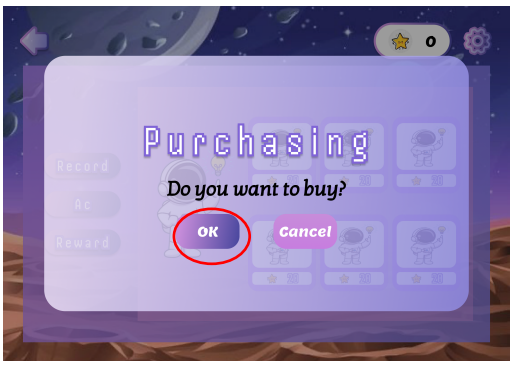
1. Children functional requirements:
   “The application should have adjustable setting for adjusting sound, music, screen quality to adapt the preference or needs of children.”

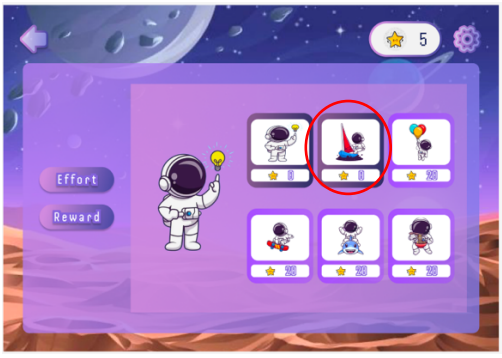
Prize Button

According to interview record of parent, application should provide some rewards to children to keep their motivation of learning. From the reward page, some money will be provided through the play of gaming page, children can choose the wearing of astronaut which they are interested in. The wearing of character in main menu will also be changed.

Walkthrough:

1. 

2. 

3. 

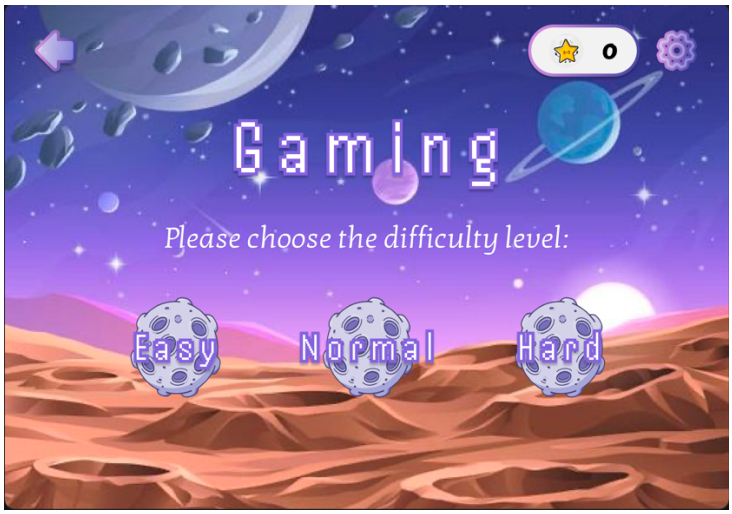
4. 

Requirements fulfilled:

1. Children's functional requirement:
   #5 "The app should provide some rewards and encourage feedback massage to keep children motivated."

Difficulty button

It is the gaming page in the program which separate different difficulty levels, which has easy mode, normal mode, and hard mode.



Children could try different types of game by selecting the difficulty levels according to the learning progress they are. Easy mode minigames focus on guided learning to help children to practice and consolidate the mathematical concept. Normal mode minigames mainly focus on teaching the digit concept and to calculate the answer by using straight format. For the hard mode minigames, it involves challenging questions to measure the learning progress of children.

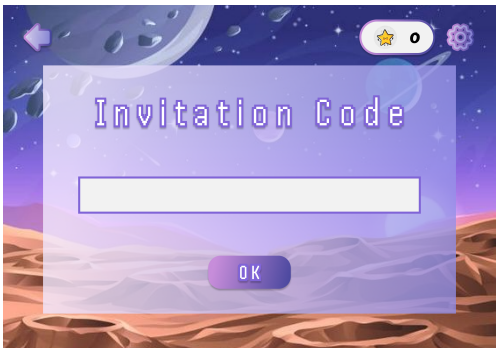
Requirements fulfilled:

1. Parents' functional requirement:
   #3 "The app should offer customization features, allowing parents to set specific learning goals, adjust difficulty levels, or choose specific topics for their child to focus on."

Invitation code

According to the interview of children, a compete function should be provided in application. To satisfy the requirement, a compete screen is created. It has separated into two selections: Create Room (left), Enter Room (right).

The invitation code will be provided when user select the function of create room. Other player can enter the invitation code through the function of enter room. It can allow users to have more interaction with other players and provide a medium to train their ability to have better calculation skill.



Requirement fulfilled:

1. Children functional requirements:
   #6 “The application should allow children to compete with other players (e.g., friend or classmates) in ranking mode.”

Tracking Page

According to the interview of parent or teacher, application should help them monitor individual or class-wide progress.

Button

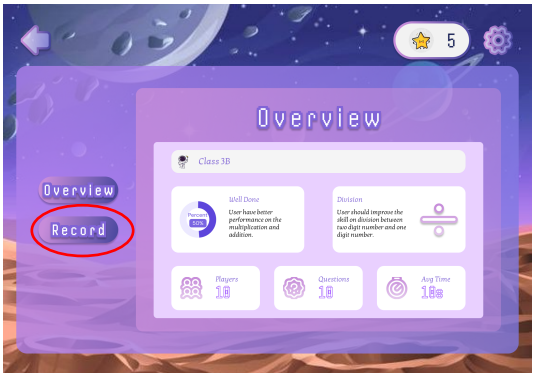
In the tracking screen of parents, it has provided some button to allow teacher for accessing the record of class and monitor their progress by navigating to selected class. To take an illusion with class 3B:

User can select the box of 3B and direct to the overview of tracking page. It has provided the “watch” button to click specific mode of gaming. After pressing the button, teacher can preview the performance of particularly class with a specific mode or individually with the summary page.

Walkthrough of tracking screen:

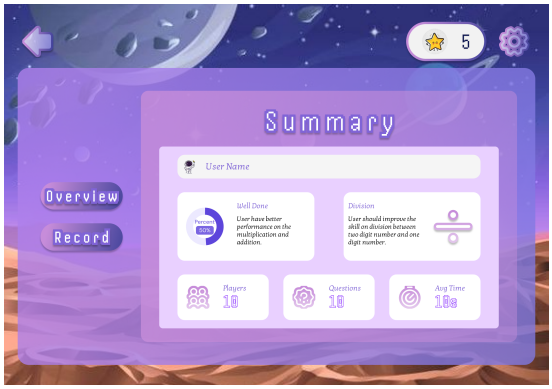
1. 

2. 

3. 

4. 

5. 

6. 

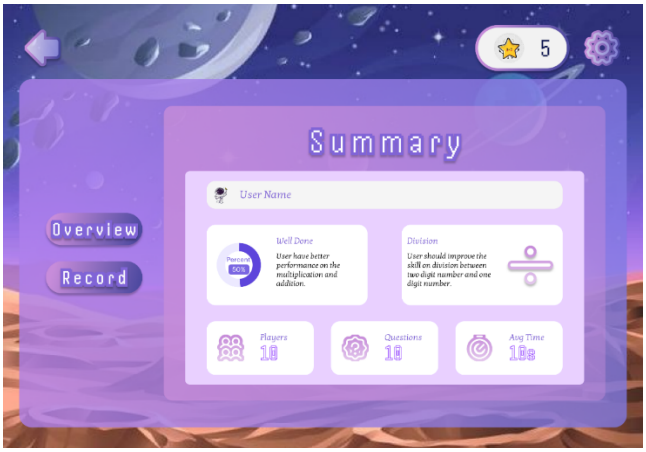
Progress Bar

It shows the tracking page of parents of the program,

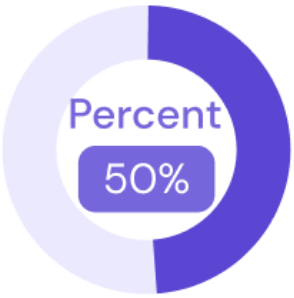
The children account is needed for registering into the add record page.

After registering, all the child's records will appear on the Tracking Page

User need to select the record of specific mode. After "Record" button is pressed, a summary about the child is shown.



On this page, there is a Progress Bar that allows parents to see their children's progress.



Requirement fulfilled:

1. Parents' functional requirements:
   #1 "The app should provide parents with the ability to track their child's progress, including completed lessons, performance metrics, and areas that need improvement."

It uses a Progress Bar to effectively communicate to children Progress reminder.

Also, All tracking elements satisfied the following requirements:

1. Teachers' functional requirements:
   #2 "The application should have an error book feature to help teachers monitor individual or class-wide progress."
2. Parents' functional requirements:
   #1 "The app should provide parents with the ability to track their child's progress, including completed lessons, performance metrics, and areas that need improvement."
3. Parents' functional requirements:
   #2"Parents should have access to detailed performance reports that provide insights into their child's strengths and weaknesses in different arithmetic concepts".

Task 3 - Testing

Introduction

The purpose of testing is to gather stakeholders' feedback and user experiences to measure the usability performance. In order to measure how stakeholders interact with "Space Math Adventure". Different testing methods are prepared for each stakeholder. For children and teachers, we decided to use experiments to test the usability. For parents, we decided to use surveys to test the usability.

Children:

Introduction:

- Experiment is an age-appropriate method for children that can collect their thoughts on the game usability, clarity, and suggestions of the game through children's behavior, gameplay preferences, and emotional responses.

Testing coverage:

- To assess how easily children can navigate the app, understand the instructions of the gaming section.

Testing setting:

- Number of subjects: 5
- Purpose: ask children to find game page and play the game
- Preset screen: preset starting screen to check the clarity of game instructions.

Observations:

- Children find and start the game immediately.
- They always interact with the character.
- They start the game with the easiest mode at most.
- They seldom use the hint's function.
- Some children use their fingers to count the answers during gaming.
- Upon they have completed one of the games, they are excited to start the next level.
- They will always use compete mode to play with other subjects.
- Female subject would spend more time pretending to be characters.

Testing result:

- Game is the most attractive function for children.
- Children might use trial and error method to answer the question instead of taking the hints.
- Female subject would spend more time pretending to be characters.
- Children frequently utilize the competitive mode to play against other subjects.
- The game instructions have enough understandable.

Parents:

Introduction:

The purpose of this survey is to gather feedback on the user experience and learning progress of the children using the application with their children. It was also intended to find out about improvements in usability as a result of their children's use of the app.

Survey Setting:

- Number of subjects: 5 pairs of parents and children were invited.
- Purpose: To ensure parents can fully observe their children's learning progress
- Requirement: test game with their children and complete survey after the testing period
- Testing period: one month as a period

Survey Content:

1. How often do you engage in the application with your child?
2. How easy was it to understand the purpose and goals of the game?
3. Were the instructions and prompts clear and easy to understand?
4. What part of the game appealed to you the most?
5. Did the game provide interactive and engaging activities for your child?
6. On a scale of 1 to 5, how satisfied were you with the usability and effectiveness of the mathematics game?
7. Would you recommend this game to other parents for their children?
8. Is there anything else you would like to share about your experience using the mathematics game?

Testing Result:

- The application provides a medium to enhance the communication and increase the time of parent-child activities and enhance parent-child relationships.
- The application may encourage children to spend more time understanding math.
- Parents almost understand the purpose and goals of the game.
- Parents thought that the compete function was the most attractive part.
- Most of parents will recommend the application to others so children can learn math together with parents.

Teachers:

Introduction:

- To test the performance of teachers using the application as a teaching tool and collect feedback for both teachers and children.

Testing Coverage:

- To assess the learning engagement for children and the suitability of being a learning tools for teaching a group of children.

Testing Setting:

- Number of classes: 3
- Purpose: teachers were asked to perform a learning activity by using application.

Observations:

- Children get interest for playing games during the lesson.
- Teachers use compete function with group to cultivate team spirit among children.
- Some teachers may also use review function to teach the basic concept of multiplication and division.
- After the activity, children always make positive feedback and look forward to the next mathematics lesson.
- All teachers were checked out the strength and the weakness of the classes by the tracking function.

Testing Result:

- The application often required students to think critically and solve problems within a given context.
- A positive classroom environment where students can learn from each other and develop their communication skills.
- Review function and Compete function is almost use by teachers for each activity.
- The application can boost students' motivation and confidence in mathematics.
- Teachers can use the tracking feature to understand the strengths and weaknesses and adjusting the education guidelines to get improvement.

Presentation

Presentation video link:

Youtube link :
https://youtu.be/Z73Q15qw4UE?si=9QPOq1uJWN3gpDsP

link to download the video :
https://drive.google.com/drive/folders/1M6Yi84YdLzg7qej7_JrQQj6FCJ2LY7CN?usp=sharing

Appendix - Group Work

Meeting 1

Date: November 1, 2023
Time: 6:30 pm – 8:00 pm
Venue: PolyU Pao Yue-Kong Library

Participants:

- Natalie
- Kiu
- Ivan
- Hugo
- Jacky

Agenda:

1. Assumptions and theme of the application
2. How we collect the user requirements
3. Brainstorming requirements of the application
4. Method of Learning
5. Work Allocation

Discussion:

1. **Assumptions and theme of application:**
   - All participants were agreed that the app would not produce negative number results.
   - The numbers used in the app should not exceed four significant figures.
   - After voting, the chosen theme for the app is astronauts.
2. **How we collect the user requirements:**
   - The group discussed the method for collecting requirements and considered using a questionnaire.
3. **Brainstorming requirements of the application:**

   Children:
   - The app should focus on using pictures rather than words.
   - The app should be visually attractive and colourful.
   - Game-based learning was considered an important aspect to engage children effectively.

   Parents

- Parents should have access to a progress report of their children.

Teacher

- The app should provide different difficulty levels to cater to individual needs of students.
- The app should identify weaknesses in students' understanding and provide remedial teaching.
- Progress monitoring of children's learning should be implemented.
- The app should reinforce math concepts and skills.

4. **Method of Learning:**
   - The group discussed different methods of learning and agreed to include various types of questions in the project:
     - Image-based questions, such as counting apples.
     - Situational questions, such as calculating the number of oranges after receiving additional ones.
     - Make a challenging question about asking the prioritize of multiplication and division before addition and subtraction.

5. **Work Allocation:**
   - Natalie and Kiu will be responsible for the design and prototyping aspect of the project.
   - Ivan, Hugo, and Jacky will handle the documentation tasks.

Action Items:

- Natalie and Kiu: Start thinking about the design of project.
- Ivan, Hugo, and Jacky: Start working on the project documentation.
- All: Think about requirements of the stakeholders and do some research on maths learning game applications.

Next Meeting:

The next meeting will be scheduled on 7-11-2023 to review the progress made and discuss any challenges encountered.

Minutes recorded by:

Hugo Lai

Meeting 2

Date: 7-11-2023
Time: 6:30 pm – 8:00 pm
Venue: PolyU Pao Yue-Kong Library

Participants:

- Natalie
- Kiu
- Ivan
- Hugo
- Jacky

Agenda

- Assumption of project
- Function and non-functional requirement
- Flow of application
- Interface for prototype
- Preset deadline

Discussion:

Assumptions:

- The process will involve interview, preparation of questions, and requirement generation.
- Students/children will login using their school email.

Functional and Non-functional Requirements of Stakeholders:

Children:

Functional requirements

1. The application should provide engaging graphics and interactive elements for fun multiplication practice.
2. The application should offer various difficulty levels, rewards for achievements, and plenty of games.
3. The application should provide clear instructions, allow children to review multiplication problems, and compete with others.
4. Children should be able to share their progress via instant messaging applications and adjust settings (sound, music, screen quality) according to their preference.
5. The application should facilitate competition with friends through time racing and task marks.

Non-functional Requirements

1. The app should operate smoothly with minimal delays and a transmission speed of 10 Mbps.
2. The app's storage should be less than 5GB.
3. Reliability of the application's downtime should be minimal and reboot system should be within 3 hours.
4. Portability of the application should be compatible with different devices and operating systems.

5. Security of the application should ensure data security and personal information should not be leaked.

Parents:

Functional requirement

1. The app should allow parents to track their child's progress, set specific learning goals, and provide detailed performance reports.
2. The app should offer customization features, provide hints when children struggle, and maintain student interest and motivation.

Non-functional requirement

1. The app should prioritize user data protection and adhere to relevant privacy regulations.
2. The app should be compatible with different mobile devices and operating systems.
3. The app should have an intuitive and user-friendly interface.

Teachers:

Functional requirement

1. The application should offer different difficulty levels, be interactive, and find out students' weaknesses.
2. The application should include an error book function, a variety of math problems, and practical applications of mathematics.
3. The application must ensure its content and exercises are relevant to classroom lessons.

Non-functional requirement

1. The application should use visual cues and instructions, have a highly responsive user interface, and regularly back up data.

App Flow:

1. Start page: login/signup.
2. Homepage: navigation buttons
3. Review Page: Mini games for different arithmetic operations
4. Gaming Page: Difficulty selection, tips, and encouragement
5. Tracking Screen: Progress tracking and improvement suggestions
6. Compete Screen: Room creation and entry.
7. Reward Page: Character and background customization
8. Setting Page: Account management and settings adjustment

Interface:

1. Button from tracking screen to stage improvement.
2. Accuracy bar upon stage completion.
3. Sign in should include account creation function.

Preset deadline:

12/11 Wireframe: The Prototype team will finish the Wireframe before 12/11, with feedback from the Doc team.

20/11 Figma deadline: The Prototype team will comment on the finished parts and complete the Figma before 20/11.

Minutes recorded by:

Hugo Lai