



ECE1778: LunchTIME Final Report

Michelle Chan - 998791302

Linghan Li - 995937063

Jordan Saleh – 996217035

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Introduction (including Apper context)

LunchTIME is a mobile application developed on Android platform. It is designed to be an educational app with the goal of teaching children how to read time on an analog clock. The game is designed to be appealing for children from kindergarten to grade three. Using principles from gaming research, rewards are used to motivate self-directed learning (Chatfield, 2010; Fu, Su, and Yu, 2009; Pink, 2009). The purpose of the game is to collect ingredients to build a sandwich, and then children have the option to shake the phone to wake up and feed an in-game character, Mr. Wolf. Voice instructions are integrated into the game to make it as interactive as possible.

Research on the effectiveness of gaming technology in the classrooms is still at its early stages. Our app is grounded in research on educational technology and principles of learning. There is a lot of potential for the use of mobile technology in the classroom as funding for education continues to decrease, at the same time, learning happens both inside and outside of the classrooms, as parents are always searching for ways to support their child's learning. Thus, a game-based learning app would be beneficial for children who are in need of extra help in the classrooms who would not receive help otherwise.

There are five different levels in the game that are organized into sub-skills based on research on children's cognitive functions and math instruction. Children are more successful if they are gradually introduced to more complex concepts with carefully planned curriculum (Campione, Case, and Shapiro, 1995; Williams, 2004). LunchTIME utilizes the interactive touchscreen to optimize learning experience. For each question, children are shown an interactive clock. There are three types of questions:

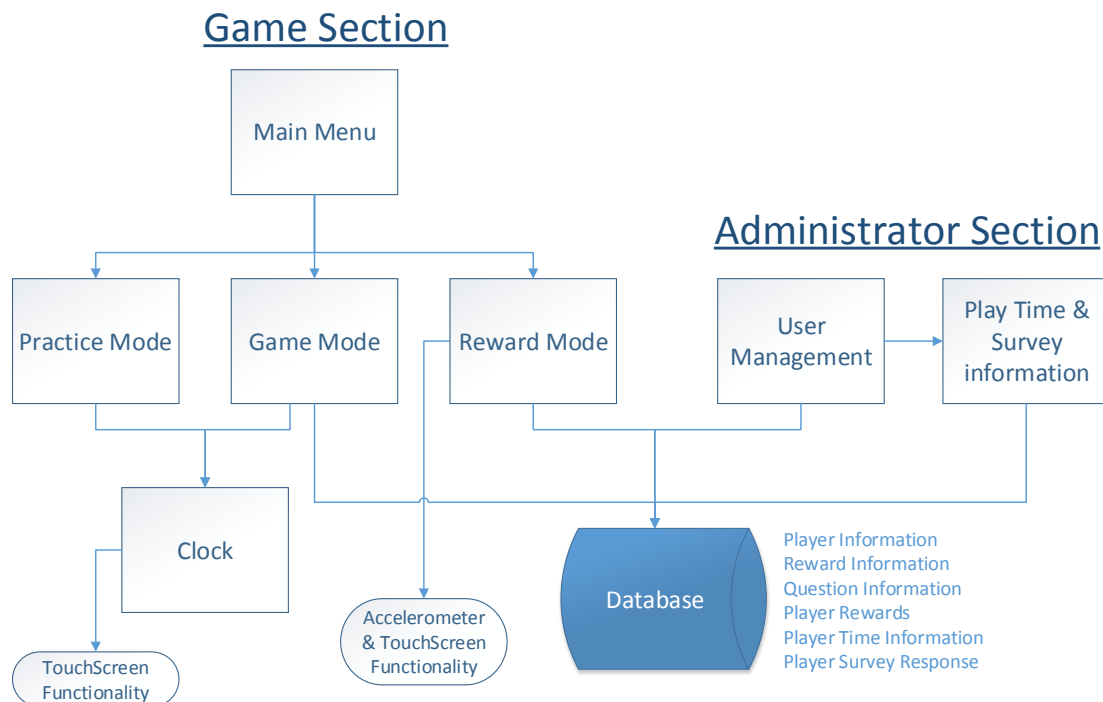
1. Puzzle
2. Set the time
3. What time is it? Multiple-choice

Level one consists of puzzle type questions that focus on basic recognition of numbers and pieces on a clock. Children are asked to place the correct numbers and pieces back onto a clock in order to proceed to the next level. Level two teaches how to read the hour hand using set the time and multiple-choice questions. Level three involves set the time and multiple-choice questions for the minute arm. Level four proceeds to combine reading the hour and minute arm with set the time and multiple-choice questions. Level five is a special challenge level that contains questions from levels one to four.

Flow theory describes that if children believe they have the skills to complete a challenge, they are more likely to experience intrinsic motivation (Csíkszentmihályi, 1990). This is described as a mental state known as "flow". Current research uses experience sampling method to measure flow, involving randomly alerting individuals to answer questions about their feelings during an activity. Examining flow is valuable as educational game design and evaluation is still in its infancy. Our app tracks the amount

of time it takes for each child to answer a question, and pop-up window surveys children to ask how they are feeling at that moment with three emotions to choose from: happy, bored, or sad.

Overall Design



LunchTIME is divided into two major sections, the game section and the administrator section.

Game Section

The game section of the application is targeted towards children learning how to tell time. It consists of the main menu, practice mode, game mode and reward mode. Audio was placed throughout the game section to create an immersive gameplay experience that captures children’s attention through voice instructions. Providing audio feedback based on children’s actions also serve to enhance player’s learning outcome through delivering a responsive feeling and positive feedback reinforcement.

Main Menu

The main menu takes the user to the other parts of the game section and has a tutorial animation that quickly explains how to navigate the interface and purpose of each section of the gameplay.

Practice Mode

The practice mode is where the user learns how to tell time using an interactive

clock.

Game Mode

The game mode contains 25 questions that the user must answer to win the game and gain rewards. These questions are distributed into 5 questions per level. There are three varieties of questions and each level contains a mixture of them which become progressively more challenging as player levels through all questions.

The information about the current level of the user is retrieved from, and later stored to the database. The data for each question is then loaded from the database. The amount of time it takes to answer a question as well as the correctness of the answer is also stored. In addition, user surveys will occasionally pop up that gauges the mood of the user. This data will also be stored in the database and can be seen by the administrator in the administrator section.

Clock

The clock is the central part of the app and is used to teach time in the practice mode, and is also used as part of the questions in the game mode. The clock has two main forms; one is used for the practice mode, multiple-choice questions and the set the time questions, and the other is used exclusively for the puzzle questions. The clocks are manipulated using a touch screen.

Reward Mode

In the reward mode the users are able to interact with Mr. Wolf. The rewards that have been unlocked for a particular user are loaded onto the screen. The users build a sandwich using the ingredients to feed to Mr. Wolf. The touch screen is used to create the sandwich and feed Mr. Wolf and the accelerometer is used to wake up Mr. Wolf for lunchtime.

Administrator Section

The administrator section can be accessed by pressing the settings button on the phone and then selecting Administrator Settings. The user will be taken to the user management, and from there can access the play time and survey information.

User Management

The user management section loads the users from the database. There is the option to add and delete users from the database, and to edit their user information. There is also an option to view data, which will open the play time and survey information section.

Play Time and Survey Information

This section loads data from the database about player time and player surveys.

This data is compiled so that the administrator gets an idea of how the child played the game. This information can be used for research purposes.

Functionality & Screen Shots

Main Menu



The launch screen contains three buttons for user to navigate through to different features of the app, and question mark that starts the tutorial animation. The user can access the practice mode, game mode, and reward mode from the main menu. There is also a tutorial button that explains to the user what the different modes of the game are, the goal of the game, and how the user can navigate throughout the application. It does this using a voiceover and enlarges the buttons to the center of the screen when mentioning that section of the gameplay. This makes it clear to children which buttons to press. Once a player completes the game, the “Play” button is replaced by a “You won!” button.

Practice Screen

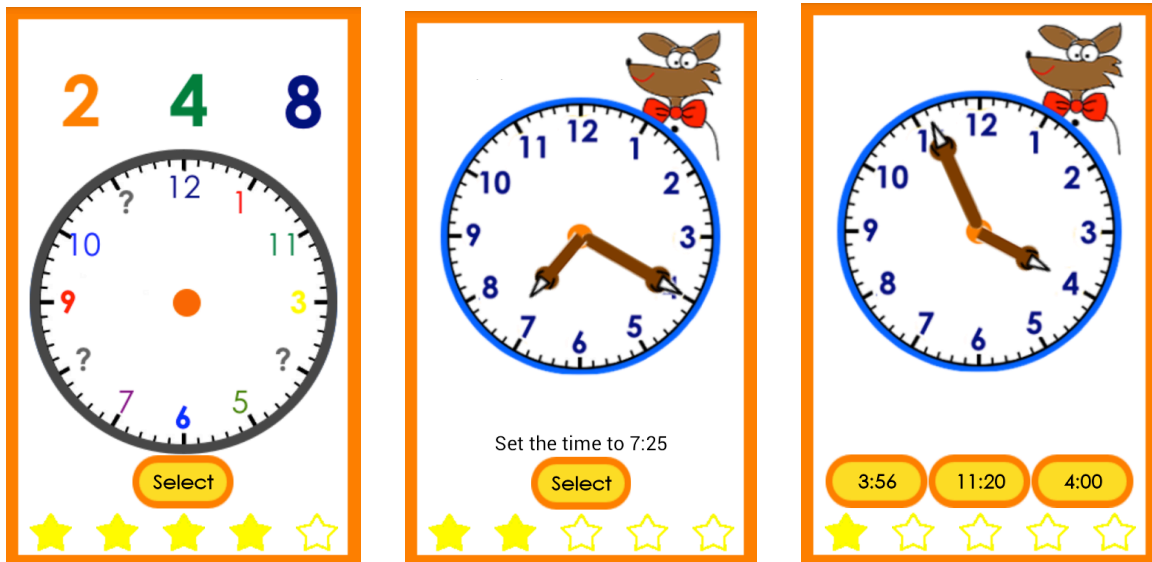


The practice teaches the children how to tell time. This is done by having an interactive clock that can be manipulated by the children using the touch screen. When the clock arm is moved, there is a clicking noise similar to the ticking of a clock, and the arms change color. Additionally there is a digital clock at the bottom of the screen that shows the same time as the analog clock, making it easy for the user to learn how to read the time. When player's finger leaves the touch screen, a voice will say the time that the clock is set to.

Game Mode



The game mode contains 25 questions for the user to play through in order to unlock all of the rewards. When the user first enters the game mode they will see a table indicating which level they are on, and which questions they have completed.



There are three types of questions in the game mode. A voice will indicate to the user what style of question it is and indicate to them whether they go the answer right or wrong. The first type is the “puzzle” question (seen above to the left) here the user must drag the numbers from the top of the screen and drop them into the correct spot on the clock. The second type of question is the “set the time” question (above center). Here the user must move the clock hands to the time specified. In some of these questions the minute or hour hands is fixed. The last type of question is the “what time is it?” question (above right). This is a multiple choice question that sets the clock to a certain

time and selects the correct time from three choices.



Feedback will be given to the user about whether they got the correct or incorrect answer. If the answer is incorrect, the phone will vibrate, the button selected will get a red outline, the screen will say “Try Again”, and there will be a voice instructing the user to try again. When the user answers a question correctly the button selected will get a green outline, the screen will say “Good Job!”, and there will be a saying “Good job.”



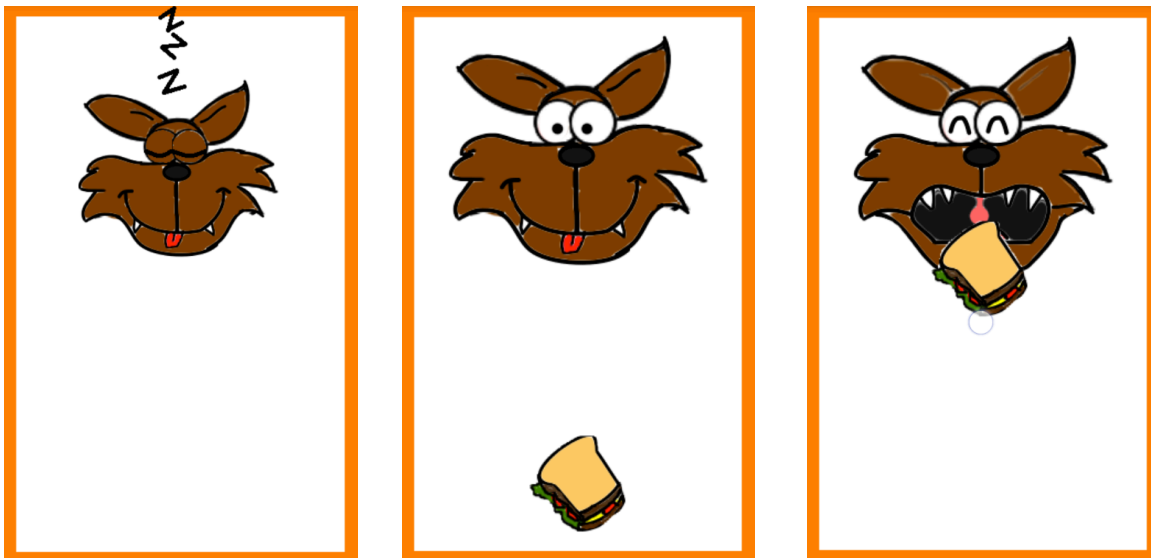
Once the user has completed a level there will be a page displaying which rewards were unlocked and options for the player to keep playing take a break or go to the reward mode to build a sandwich.

Throughout the game, the user will occasionally receive mood surveys asking them how they are feeling as seen above to the right.

Reward Mode

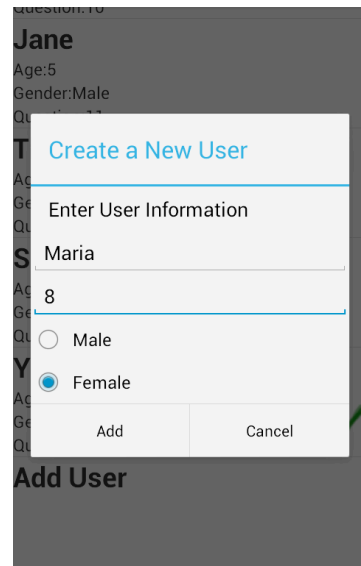
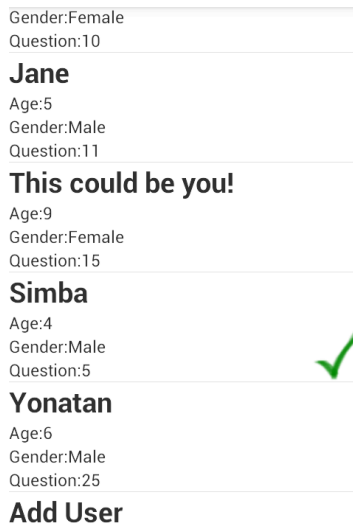


The reward mode is where the players are able to feed Mr. Wolf. When they first enter the reward mode Mr. Wolf instructs the user to make a sandwich and then to wake him up once the sandwich is done. There is a scroll view at the bottom of the screen with the ingredients that they have unlocked and they can drag them onto a plate in the center of the screen to build their sandwich. When they are done they hit the ready button and are taken to a sleeping Mr. Wolf.

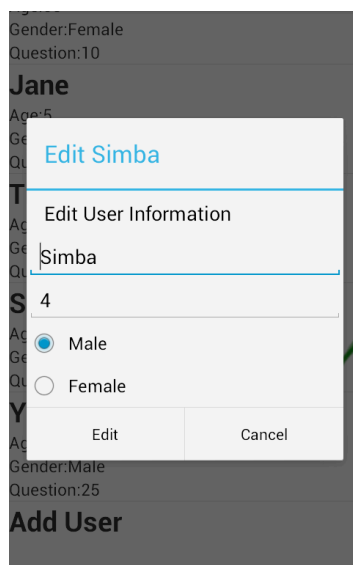
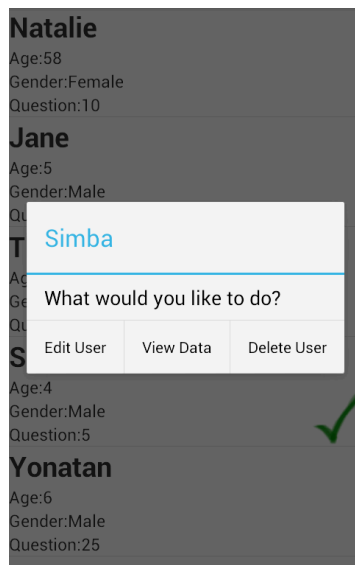


Once they arrive to the screen with the sleeping Mr. Wolf, they can shake the phone to wake him up. Once he wakes up, the sandwich will appear at the bottom of the screen and the user feeds him by dragging the sandwich across the screen into his mouth. Mr. Wolf will chew and eat the sandwich and then thank the user.

Administrator Section



The administrator section is accessed by pressing the settings button on the phone and selecting “Administrator Settings.” This will open up the user management section. The user management section displays a list of users currently in the system, with the last item on the list being a button to add a user. The information recorded for each user is the name age, and gender.



Question	Answer	Time	Mood
1	Correct	5	Happy
2	Correct	5	Happy
3	Correct	9	-----
4	Correct	4	Happy
5	Correct	7	-----
6	Correct	7	Happy
7	Correct	9	-----
8	Correct	2	-----
9	Correct	5	Happy
10	Correct	3	-----
11	Correct	13	sad
12	Correct	6	-----
13	Correct	5	-----
14	Correct	8	-----
15	Correct	5	-----
16	Correct	9	Happy
17	Incorrect	6	-----
17	Incorrect	14	-----
17	Correct	8	-----
18	Correct	2	-----
19	Correct	3	-----
20	Incorrect	9	-----

When a user is selected the option is given to edit the user information, view the user’s data, or delete the user. Editing the user will bring up the edit user screen. The view data selection takes the user to the play time and survey information. From here the user can view the number of answers given by each player, the question number that each answer was given for, the correctness of each answer, the time spent for each answer, and the mood at the time (if a survey was given).

Key Learning

Our main key learning is that we should have tested the app with children in at earlier stages of development to receive appropriate feedback. In addition, we should have focused on more communicating game objectives during the initial design phase.

On the Apper's side, the key learning is to understand the codes and systems underlying the app during the design process in order to create some degree of common ground and facilitate smooth communications with the programmers.

On the Programmers' side, the key learning is to integrate code using version control to increase productivity.

Individual Contributions

<u>Team Member</u>	<u>Role</u>
Michelle	<p>Concept and UI design</p> <ul style="list-style-type: none">- Research mobile applications specific to children in the educational field- App concept development <p>Liason with colleagues and education researchers</p> <ul style="list-style-type: none">- Share and test project development- Content influenced by Dr. Earl Woodruff – Professor at Dr. Eric Jackman Institute of Child Study <p>Project co-ordinator</p> <ul style="list-style-type: none">- Coordinate scheduling for weekly meetings, send weekly group meeting notes- Assign tasks, write and submit project reports- Design, develop, and manage presentations <p>LunchTIME development</p> <ul style="list-style-type: none">- Use Pixelmator to design and create graphics for LunchTIME- Designing game content and questions
Ling Han	<ul style="list-style-type: none">- Implemented tutorial animation- Implemented wolf animation- Constructed game's look and flow using Michelle's screen mockups

	<ul style="list-style-type: none"> - Integrated voice clips and sound files where appropriate - Integrated Jordan's database through function calls
Jordan	<ul style="list-style-type: none"> - Implemented the clocks for the practice mode and the game mode - Implemented the Administrator Section - Implemented the section of the Reward mode where sandwiches are made - Implemented the database and wrote the function calls to the database

Future Work

In the future we would like to improve the children's engagement in multiple ways. We would set time limits on some of the later questions. We would also like to change the reward system to a variable reward system instead of having it set to the end of each level. In addition, we would like turn Mr. Wolf into a more interactive digital pet that grows bigger as children acquire ingredients to nurture him, like Tamagotchis.

We would also increase the administrator functions by adding the ability for educators or parents to input own questions into app on a server website, editing the frequency of the mood surveys, and sending the collected data using email.

Business Plan

We are interested in making LunchTIME available to the Rotman Business School since our app is targeted to the children population.

Resources Used

Jordan

No specific tutorials were used but stackoverflow.com was a good resource while learning how to implement new functionality.

Michelle

I used <https://www.fluidui.com> and <https://gomockingbird.com> to provide mockups for the programmers.

Linghan

To avoid out of memory issues when loading custom fonts follow this link: <http://helpmeco.de/2012/2/custom-fonts-in-android-widgets>

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