Runner Game

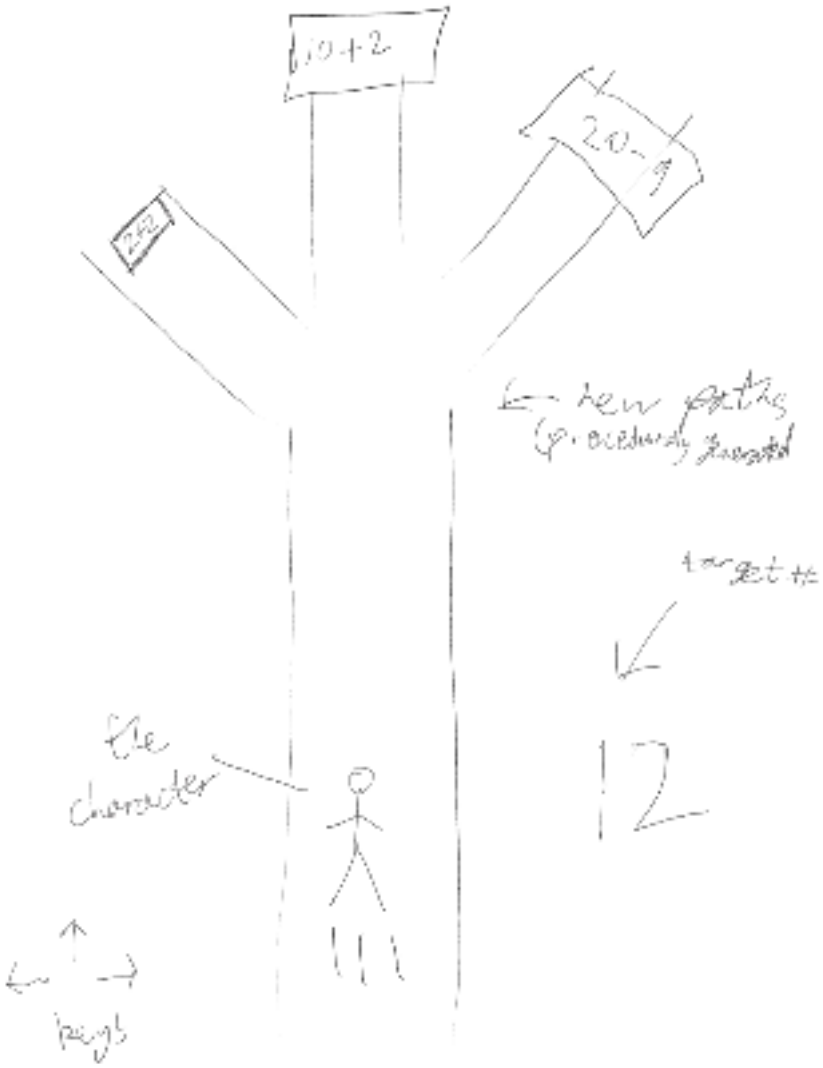
Project Concept Document

By Team *Mitochondia is the Powerhouse of the Cell*

Description

Runner Game is a 3D endless educational platformer inspired by the popular genre of endless running games on mobile platforms. The core game mechanics are designed to provide 1st and 2nd graders at Mad River School District an immersive experience while improving the mathematical skills. Questions in the Runner Game cover math concepts that older students encounter on state issued standardized tests. The target audience is great for kids because the endless runner genre is easy to learn, but hard to master.

In the endless running genre, students are given the option to ‘run through’ the correct number that finishes an assigned equation. If the student runs through an incorrect answer, their character misses points and slows down. The objective of the game is to chain as many correct answers in a row to achieve the highest score possible. A student is awarded higher star rankings based on how many points they achieve during in a round.



User Profile

Runner Game is designed with two types of users in mind, the students and the teachers.

Students (Primary User)

The majority of users are 6 to 7 year old elementary school students working towards a first or second grade math and english level. They will be using Runner Game to practice their math skills primarily. They will be able to start the game, identify keys on a keyboard, and click on objects displayed on the screen.

Students can access the Runner Game through any web browser, including personal computers at home with no installation needed. Teachers may help pick out the URL, if requested and based on availability. At the end of a gaming session, students can check their cumulative and historical performance and print a certificate with their long-term progress.

Teachers (Secondary User):

Fewer teachers than students will use this software by nature, and these users will range in age. Their capabilities include: using a drop-down menu, clicking on icons, entering information, and using checkboxes and radio buttons. They will be using our software to track the progress of their students and to enter new problem sets for their students to solve in-game.

Teachers can control their class roster by adding and dropping profiles through the webpage and is accessible from anywhere and compatible with iPads. If requested, tablet support for the students can be investigated for a release product. A teacher can view students full game history, as well as generate reports for the student including the date of the session, total score, percent correct, and play time. Reports are viewable in the browser and available to download as raw text.

In addition to several default problem sets that are provided, teachers can create, save, and load custom problem sets. Each class can be assigned one or more problem sets. Aggregate statistics accompany the problem sets to help identify weakness and strengths in comprehension. A function to import and export any problem sets in a raw text format is also included.

Educational Model

Runner Game is based on the Department of Education's Learning Standards for Mathematics. The game is designed for 1st and 2nd grade students.

Problem sets include three mathematical concepts designed for the 1st and 2nd grade curriculum:

1) Simple addition (for single and double digits),
2) Simple subtraction (for single and double digits)
3) Recognizing numbers at the ones, tens, and hundreds place.

Problems are presented in the following situations:

		Addition	Subtraction
1)	Result Unknown:	2 + 3 = ?	5 – 2 = ?
2)	Change Unknown:	2 + ? = 5	5 - ? = 3
3)	Start Unknown:	? + 3 = 5	? – 2 = 3

Usage Features

- Runs in internet browser (requires internet access)
- Basic mouse & keyboard skills needed
- Game controls are keyboard-oriented
- Backend runs on dedicated server
- Students login to account by simply selecting their teacher and name
- Game and teacher portal accessed by by navigating to URL
- Teachers can add new problems via template
- Teacher portal manages student accounts and problem sets

System Requirements

- Unity WebGL supports most modern browsers.
- Runs if the desktop browser is comparable in performance to recent iOS devices.
- Outdated browsers or older architecture may have unexpected incompatibilities.
- A native iOS or desktop app be provided as an alternative.

Requirements (Draft)

Category	%	Objective	Completed
Progress Reports	0%	Student can view cumulative progress for the session upon completing 1+ game	no
		Program generates certificate for the student including long-term progress	no
		Teacher can view student's progress history	no
		Teacher can generate report of progress history (including date, score, % correct)	no
Problem Sets	0%	Simple addition (single digits and double digits)	no
		Simple subtraction (single digits and double digits)	no
		Recognizing numbers at the ones, tens, and hundreds place	no
Usability	0%	Simple vocab (sum, minus, equals)	no
		Bright colors and design	no
		Student receives feedback soon after answer	no
		Student acknowledges correct answer	no
		Student acknowledges incorrect answer and correct answer is shown	no
		All numbers positive integers	no
Documentation	0%	Online documentation describes how software functions	no
Project Completion	**0%**		

Additional References

Ohio State Mathematics Standards for 1st graders
http://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Ohio-s-Learning-Standards-in-Mathematics/MATH-Standards-Grade-1.pdf

Ohio State Mathematics Standards for 2nd graders
http://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Ohio-s-Learning-Standards-in-Mathematics/MATH-Standards-Grade-2.pdf

Unity System Requirements
https://unity3d.com/unity/system-requirements

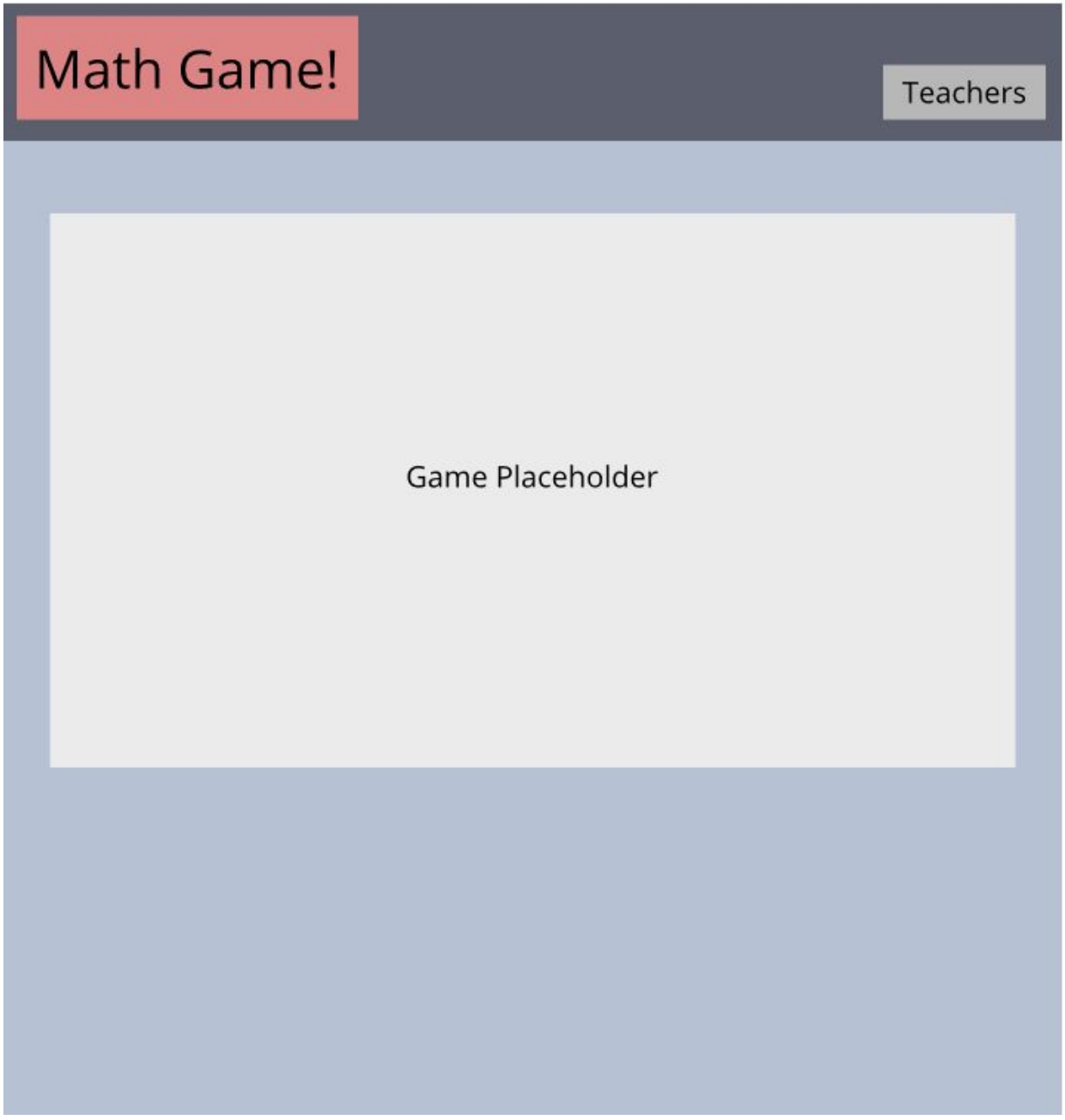
WebGL Browser Compatibility
https://docs.unity3d.com/Manual/webgl-browsercompatibility.html

WebGL Compatibility Test
https://get.webgl.org/

Appendix

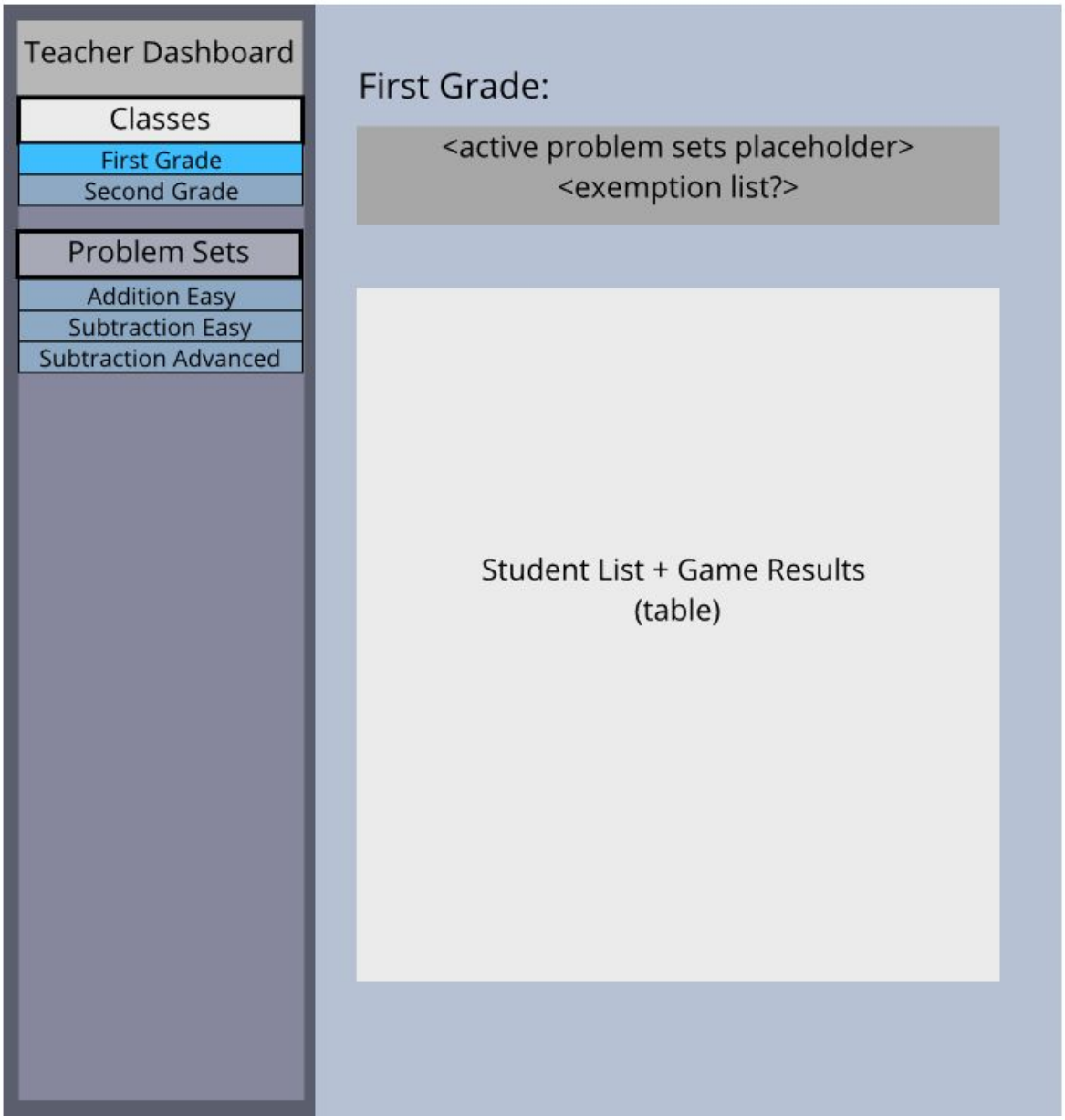
Wireframe.UX1

endpoint: /



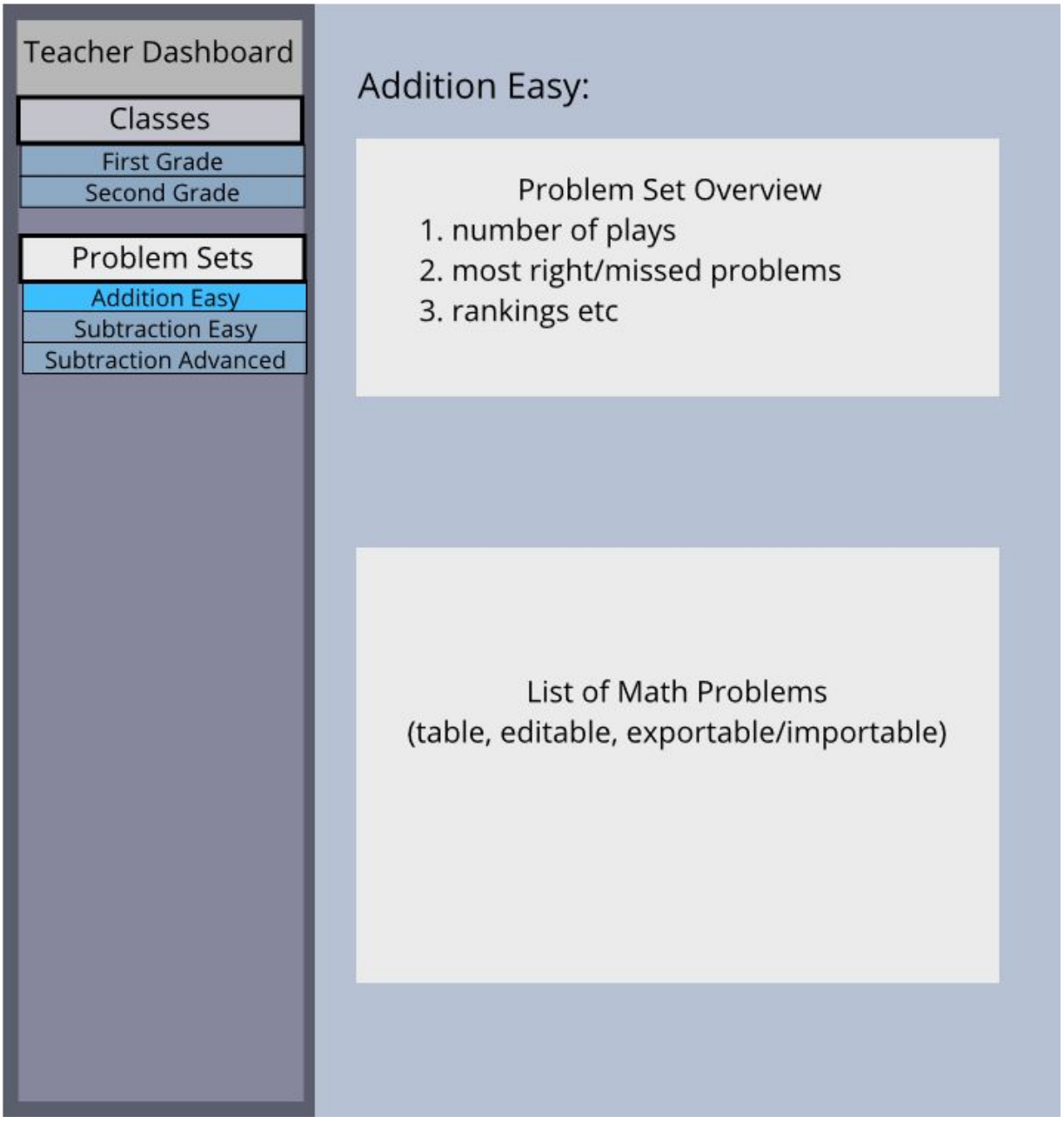
Wireframe.UX2

endpoint (auth): /teacher/{name}/{class}



Wireframe.UX3

endpoint (auth): /teacher/games/{game name}



Software Stack

Purpose	Software	URL
Hosting Service	AWS EC2 (t3.micro)	https://aws.amazon.com/ec2/instance-types/t3/
Server OS	Debian 9	https://www.debian.org/releases/stretch/
Production Server	Nginx 1.10	https://nginx.org/en/
Django Middleware	Uwsgi 2.0.17.1	https://github.com/unbit/uwsgi
Support Language	Python 3.7	https://www.python.org/
Webserver	Django 2.1.5	https://www.djangoproject.com/
Database	Postgres 11	https://www.postgresql.org/
Game Framework	Unity Framework 2018.3 (C#)	https://unity3d.com/
VCS	Git	https://git-scm.com/
Repo	GitHub	https://github.com/
Deployment/Container	Docker (TBD)	https://www.docker.com/

Server Endpoints

Scope	URL Endpoints	Description
Student	/	launches game
Teacher	/teacher	login to teacher profile
Teacher	/teacher/{name}/{class}	student list (links to student profile)
Teacher	/teacher/{name}/problem_sets/{set_name}	lists all problems in the set summaries i.e. total plays, most missed problem
Teacher	/teacher/{name}/problem_sets/{set_name}/edit	add or remove problems from set import/export/delete the table to CSV etc
Teacher	/student/{student guid}	historical data / profile
Developer	/admin	database access

Browser-based Educational Math Game
Technical Specification (Draft)