Dwight Look College of
ENGINEERING
TEXAS A&M UNIVERSITY

ECEN 404 Final Presentation
Team #28: Power Outage Education App

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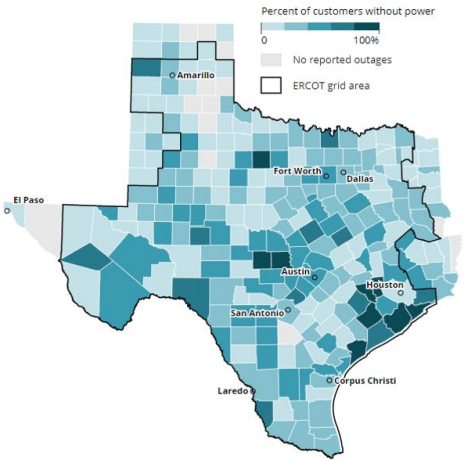
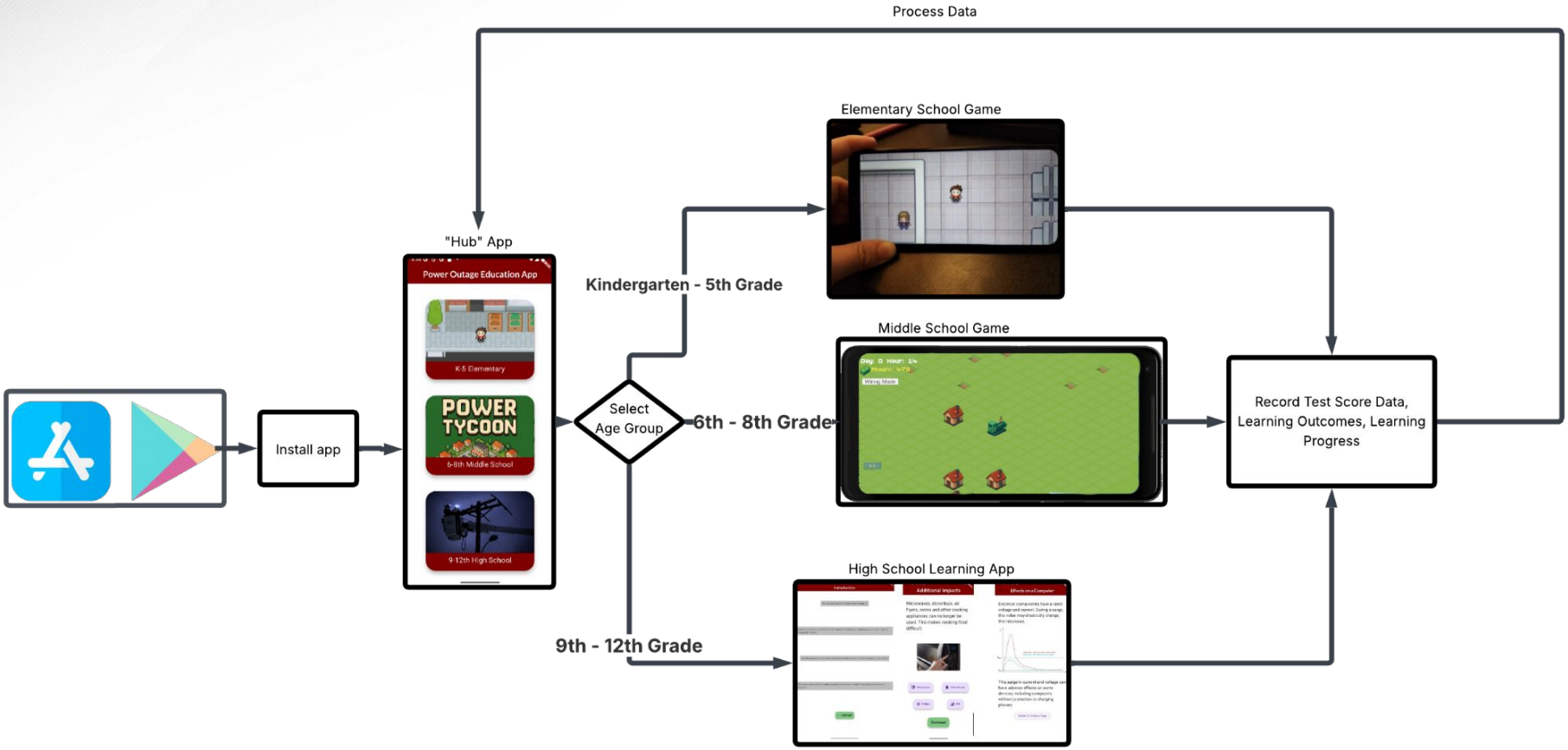
Problem Overview

- Problem statement: “People are often uninformed about the best course of actions to take before and during a power outage.This lack of knowledge can result in lack of preparation and uninformed decision-making that can cause further harm.”
  - The 2021 Texas Freeze
  - Outages caused by natural disasters
- Solution: Develop an app that provides different age-specific knowledge to educate students about the impact of power outages utilizing engaging, interactive apps. By informing people about what measures to take before, during, and after a power outage, the harm caused by power outages can be mitigated.



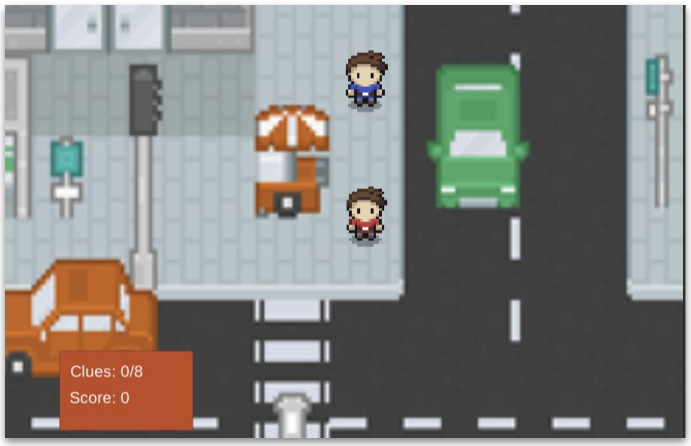
Integrated System Diagram

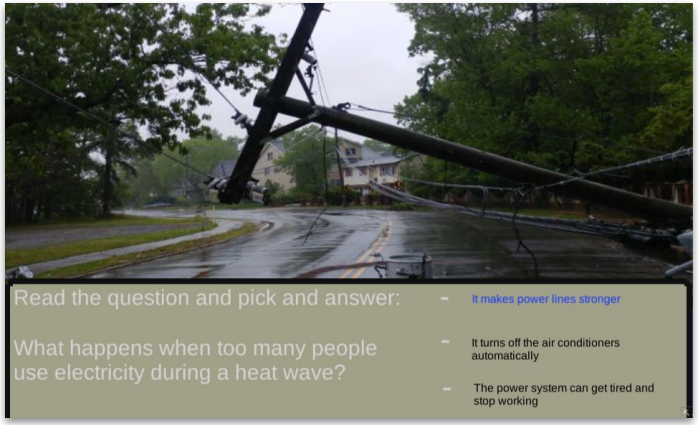


Engineering Design Accomplishments

Aidan Petropoulos

- Developed an app meant for K-5th graders
- Designed Features:
  - Compatible with PC/Android devices
  - Designed interactive map that mirrors real-world Doseum
  - Integrated pre- and post-quizzes for data collection
  - Built node-based clue system
  - Implemented clue-tracking system that rewards correct interactions





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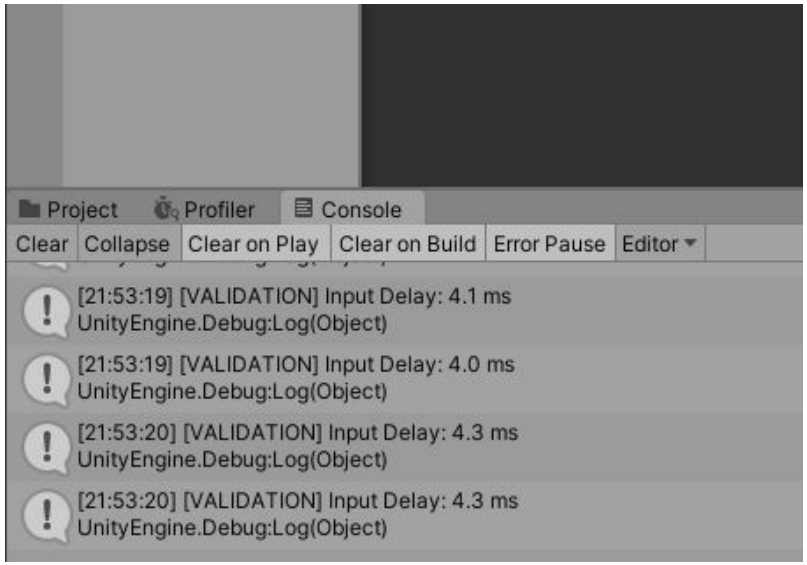
Engineering Design Accomplishments

Aidan Petropoulos

Specification	Measured Results
Average ≥ 30 FPS throughout play session	Average FPS: 40 FPS | Minimum: 28 FPS | Maximum: 52 FPS | 95% of frames < 33 ms
Input latency between user interaction and visual feedback ≤ 200 ms	Average: 4.2 ms | Min: 4.0 ms | Max: 4.3 ms
Game loads completely within 5 seconds (WebGL launch)	Average: 3.23 s | Min: 3.1 s | Max: 4.3 s
Memory usage ≤ 2 GB	Average: 2.05 MB | Max: 428.6 MB | Stable over 60 s
App reloads safely after temporary network loss	Recovery Time: 4.1 s | No crash
UI scales consistently across 8–12 inch displays	Readable and aligned



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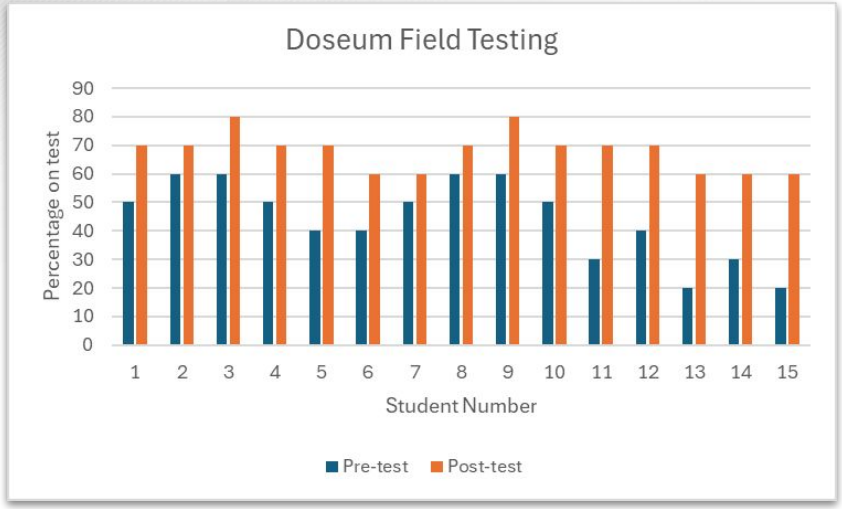
Engineering Design Accomplishments

Aidan Petropoulos

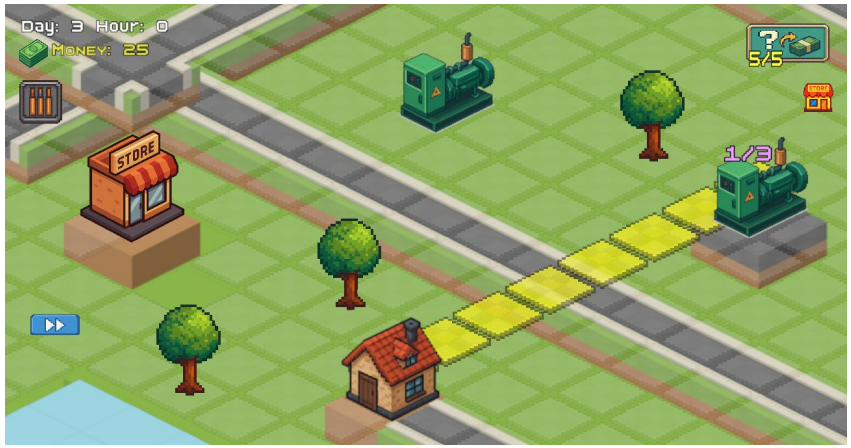


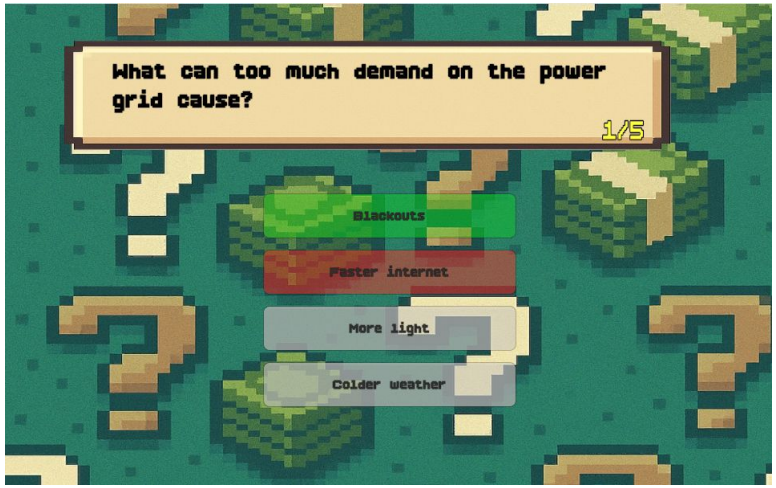
Metric	Pre-Test (%)	Post-Test (%)	Change
Average	40.8	68.5	27.7
Minimum	20	60	40
Maximum	60	80	20
Standard Deviation	13.3	6.6	-6.7
Improvement (%)		68%	
Participants (n)	15	15	

Engineering Design Accomplishments

Joey Raphael

- Developed a game targeted towards middle school students
- Main Features
  - Compatible with PC / Android devices
  - Integrated Quizzing System
  - Implemented A* algorithm for automated wire pathfinding
  - Developed grid-building system for tycoon-style game





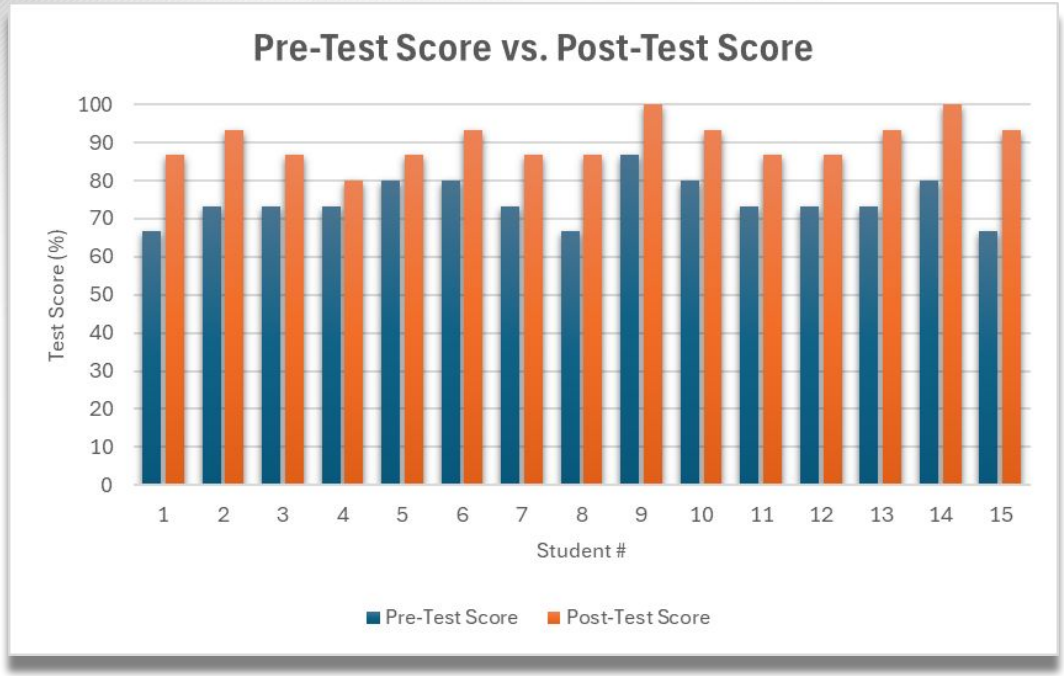
Engineering Design Accomplishments

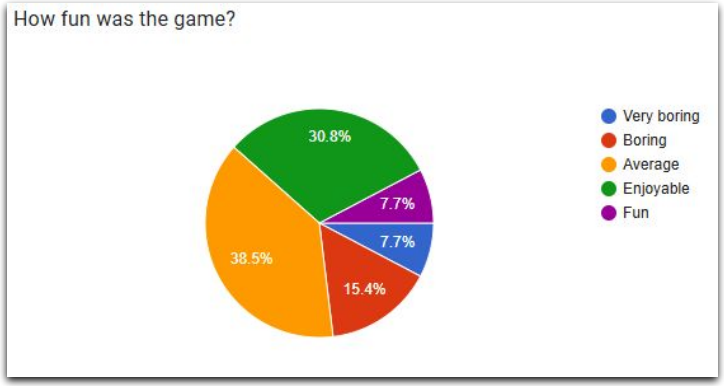
Joey Raphael

Specification	Measured Results
Average ≥ 30 FPS throughout entire play session	Average FPS: 33 FPS Minimum FPS: 15 FPS Maximum FPS: 49 FPS 1% Low: 9 FPS
Input latency between UI interaction is ≤ 200 milliseconds	Average Latency: 28 ms Minimum Latency: 5 ms Maximum Latency: 137 ms
Game takes ≤ 15 seconds to load	Average Load Time: 8.9 s Minimum Load Time: 6.5 s Maximum Load Time: 15.8 s
Memory usage of game is ≤ 1 GB	Average Memory Usage: 254 MBs Maximum Memory Usage: 437 MBs
User is able to read text and visually identify UI elements from 20 inches, UI elements are not cropped or too small, must support 16:9 aspect ratio	Minimum Readable Resolution: 960 x 540 px

Engineering Design Accomplishments

Joey Raphael



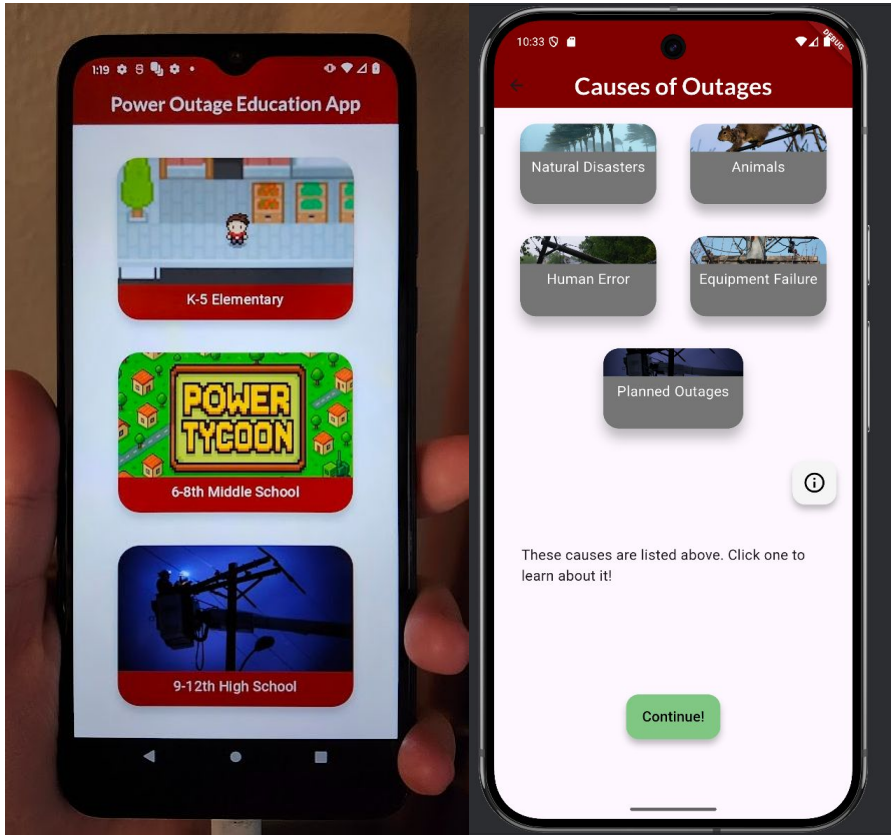


Average Pre-Test (%)	Average Post-Test (%)	Average Increase (%)	Low (%)	High (%)
75	90	16	80	100

Engineering Design Accomplishments

Jackie Villanueva

- Developed the 9th - 12 grade lesson and Flutter app page to navigate to each lesson
  - Outage Scenario
  - Causes of Outages
  - Mitigation Measures
  - During an Outage

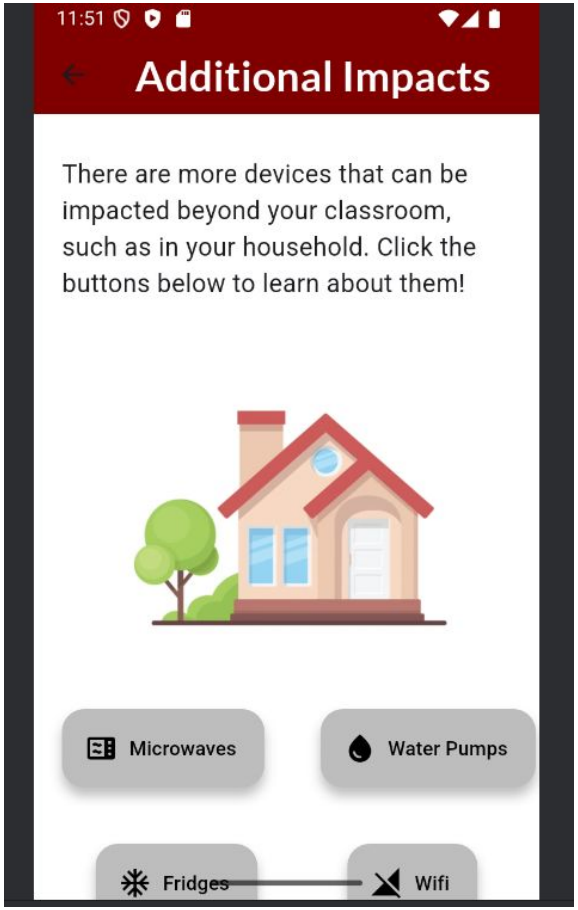


Engineering Design Accomplishments

Jackie Villanueva

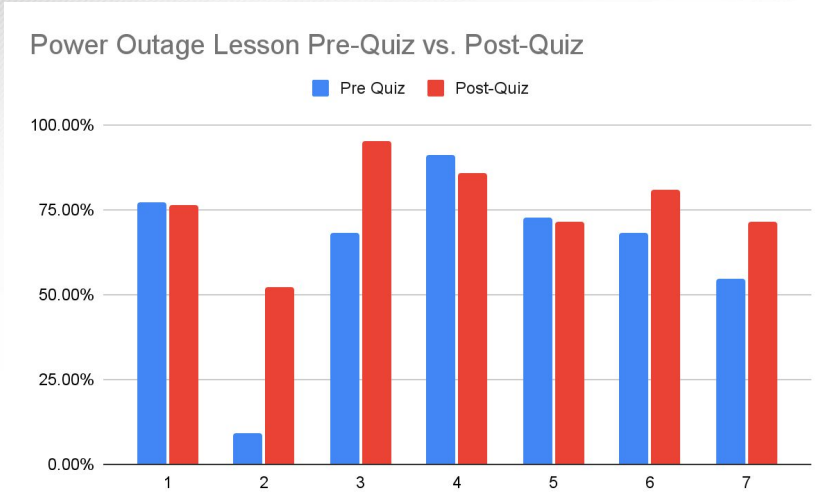
- Main issues with UI
  - Currently investigating solutions using packages and/or UI Flutter Widgets

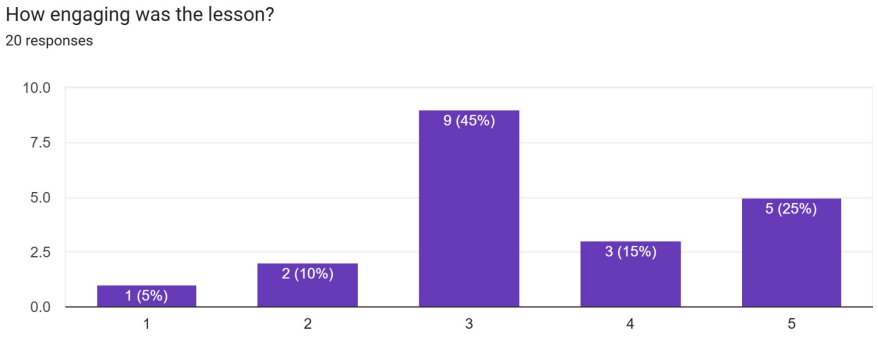
Requirement	Specifications	Measured Result
App Loading Time	≤ 3s	Mean: 0.91s Min: 0.76s Max: 1.02s
Frames per second (fps)	≥ 30 fps	Mean: 54.5 fps, Min: 51 fps Max: 58 fps
Touch input delay	≤ 200ms	Range: 2-3ms
UI Consistency	Consistent on all devices	Functions as intended on most phones, UI is cropped on small devices

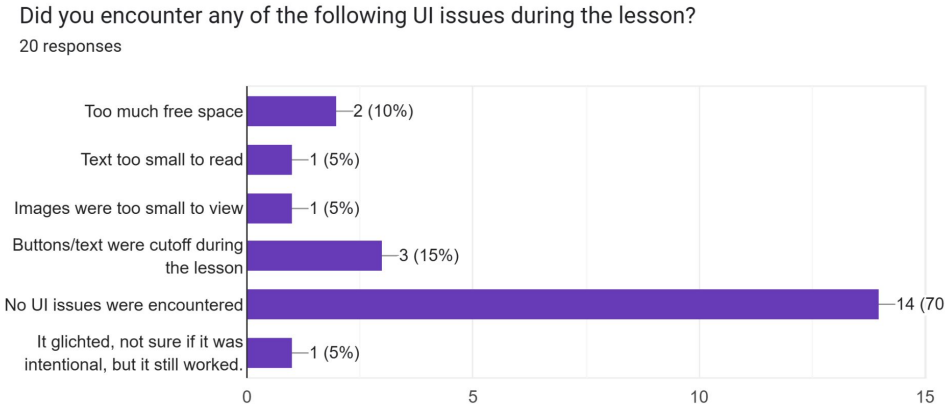


Engineering Design Accomplishments

Jackie Villanueva

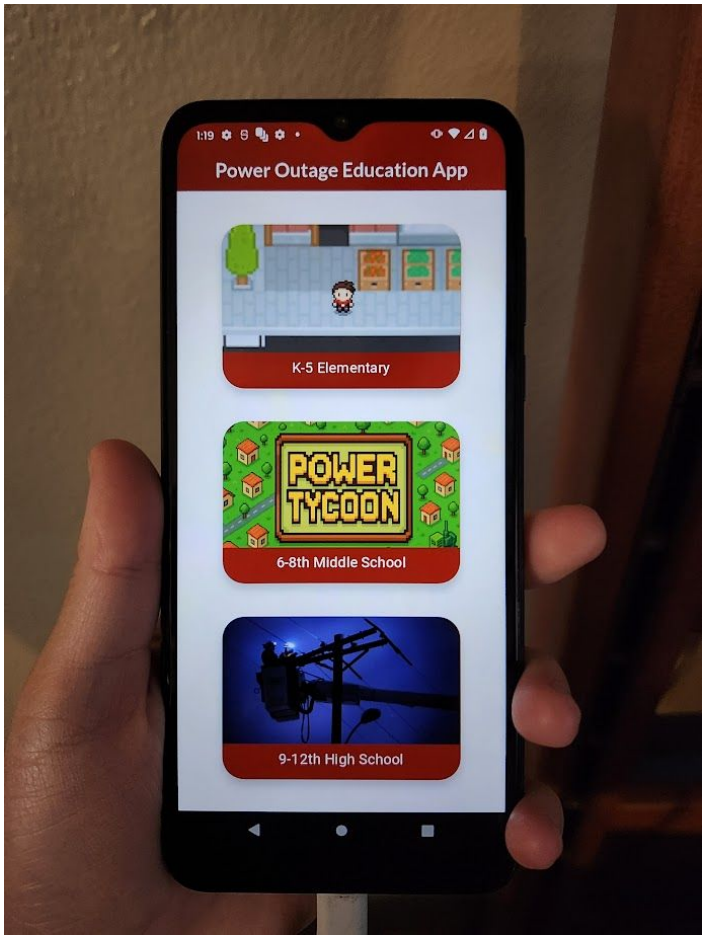






Integrated System Testing

- Integrated system testing was performed on a Moto G Phone
- Testing included:
  - Running through each lesson in one instance
  - Navigating back to the main page



Integrated System Results

- App successfully runs end-end on across all sections of the app

Requirement	Specifications	Measured Result
App Loading Time	≤ 3s	Mean: 2.584 s Min: 2.39 s Max: 2.92 s
Frames per second (fps)	≥ 30 fps	Mean: 48 fps Min: 28 fps Max: 55 fps
Touch input delay	≤ 200ms	Mean: 4.9 ms Min: 2.2 ms Max: 5.8 ms
UI Consistency	Consistent on all supported device resolutions.	Functions as intended on Moto G Phone. UI is cropped on small devices
Stability	App does not crash when under high memory load.	App performance remains stable when all 3 subsystems are running.
Seamless Navigation	User should be able to navigate through the 3 subsystems and back to the “hub” app.	User is able to access all necessary pages and return to the “hub” app.

Conclusions

- Issues encountered
  - Could not fully embed unity games into flutter app and instead used a WebGL build as a workaround
  - Unable to achieve compatibility with IOS devices
- Current Status
  - Integration of three systems has been completed
  - *All three games have been tested
  - Validation checks for games have been completed
  - Currently working on feedback received from testing on UI of App, to be completed in two weeks

Thank you! Any questions?