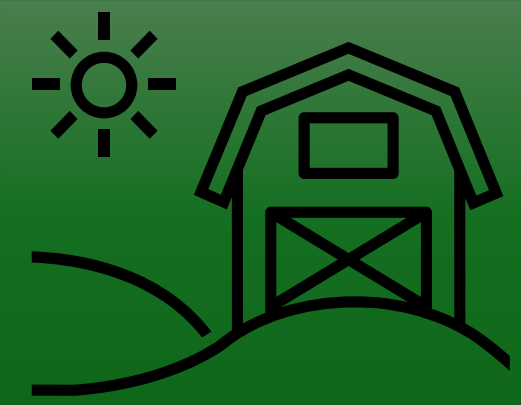
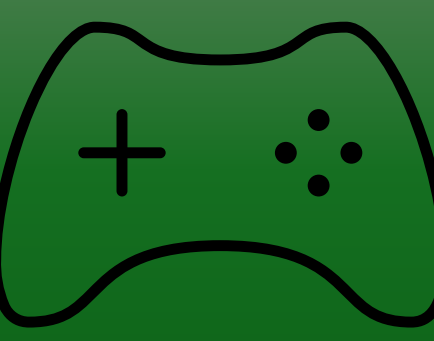




A Study of the integration of Real-World Data in a Farming Video Game



Introduction

The idea of play and game-based learning being used as an educational strategy is one that has been frequently explored [1][2]. One area in which game-based learning has strong potential in is agricultural education.

Studies have looked at the use of both pre-existing games such as Farming Simulator 2022 [3] as well as custom made solutions [4] for game-based learning strategies. These games were shown to be potentially viable for use within education; however, many studies did not look at how gameplay variables had an impact on overall learning effectiveness [5]. In addition, many games lacked an incorporation of environmental or weather factors with regards to game mechanics [6][7]. Many video games used in studies mainly came from Europe, with certain continents such as South America being neglected [8]. Certain educational games had their overall effectiveness impacted by being too difficult [9].

Aim & Objectives

This project involved develop a farming game with real-world data integration; to evaluate the impact such data can have on the game's mechanics and experience. The game would showcase a more realistic depiction of farming and the challenges farmers face.

The objectives were:

- To create a farming game prototype with API and real-world data integration
- To collect gameplay metrics through playtesting sessions to analyse the effects such data has on gameplay
- To deploy the game within an educational environment to evaluate its effectiveness as an educational tool.



Fig.1: A screenshot of the game, with the location corresponding to Wellington, NZ.

Methodology

A prototype farming game was developed in UE5, integrating real-world locations and data into the growth and harvest mechanics, by using the OpenMeteo weather API [10] and SoilGrids for soil data [11]. Functionality was also added to the game to collect play session analytics.

The game was sent to 9 participants to collect gameplay metrics. The game was also deployed in an educational environment to evaluate learning outcomes, with 5 students participating in the session.

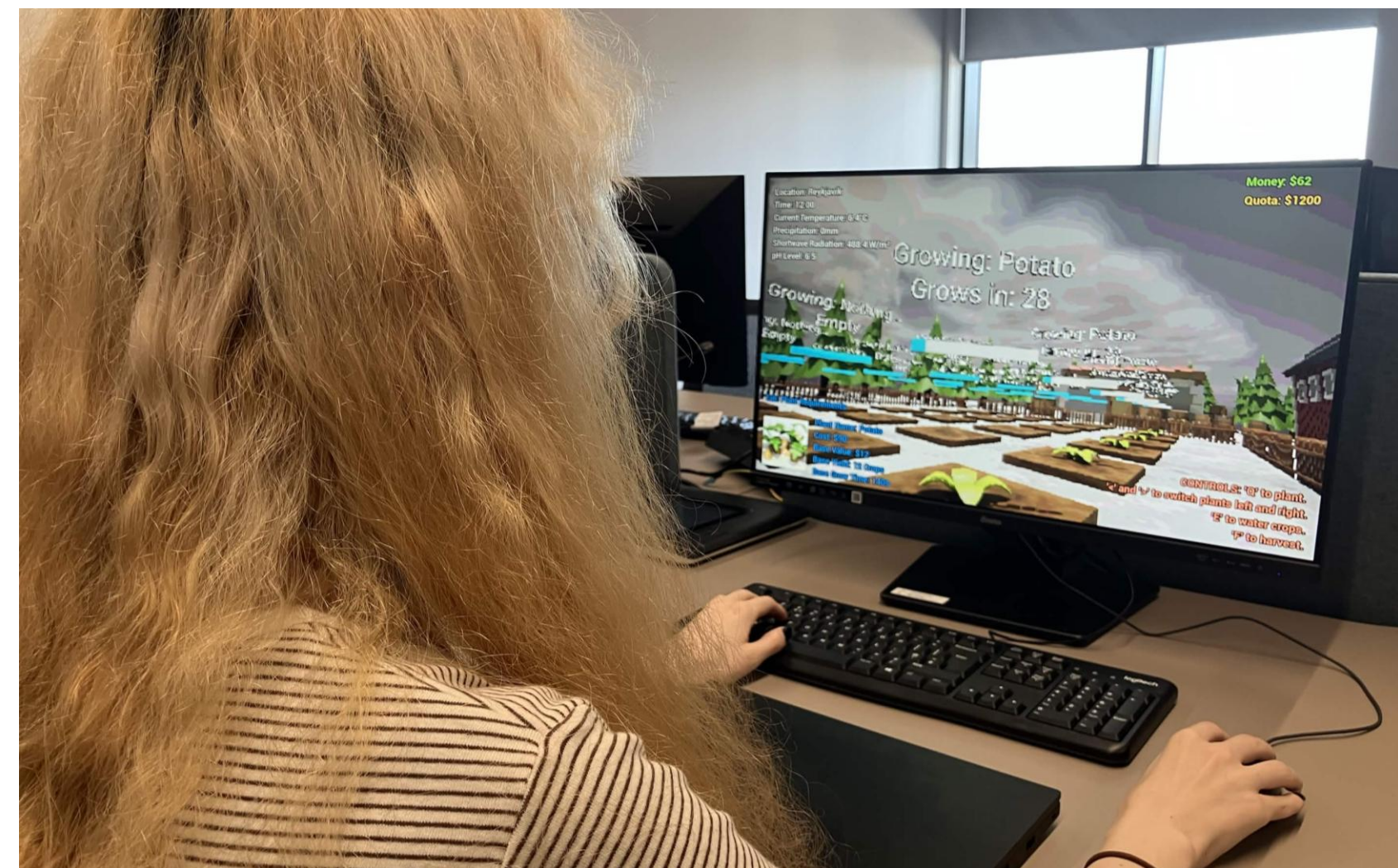


Fig.2: A student playing the game during the educational session.

Results

Playtesting results showed that real-world data integration had an impact on the game in multiple areas, such as crop growth time and selection strategies, mean money made, and overall success, with variables such as shortwave radiation having a positive correlation with win rates. The feedback from participants from the session showed 100% of participants noticing the effect real-world data had on the game experience, 80% believing it had potential as an educational tool, and 60% believing it demonstrated the challenges farmers face extremely well.

Limitations of the study include the small sample sizes for participants, the scope of environmental factors incorporated into the game, certain variables having little effect on growth mechanics, and educational clarity for students, particularly with regards to understanding how certain variables influence the growth process.

Overall, do you believe that this game or its use of data integration can be used as a suitable educational tool?

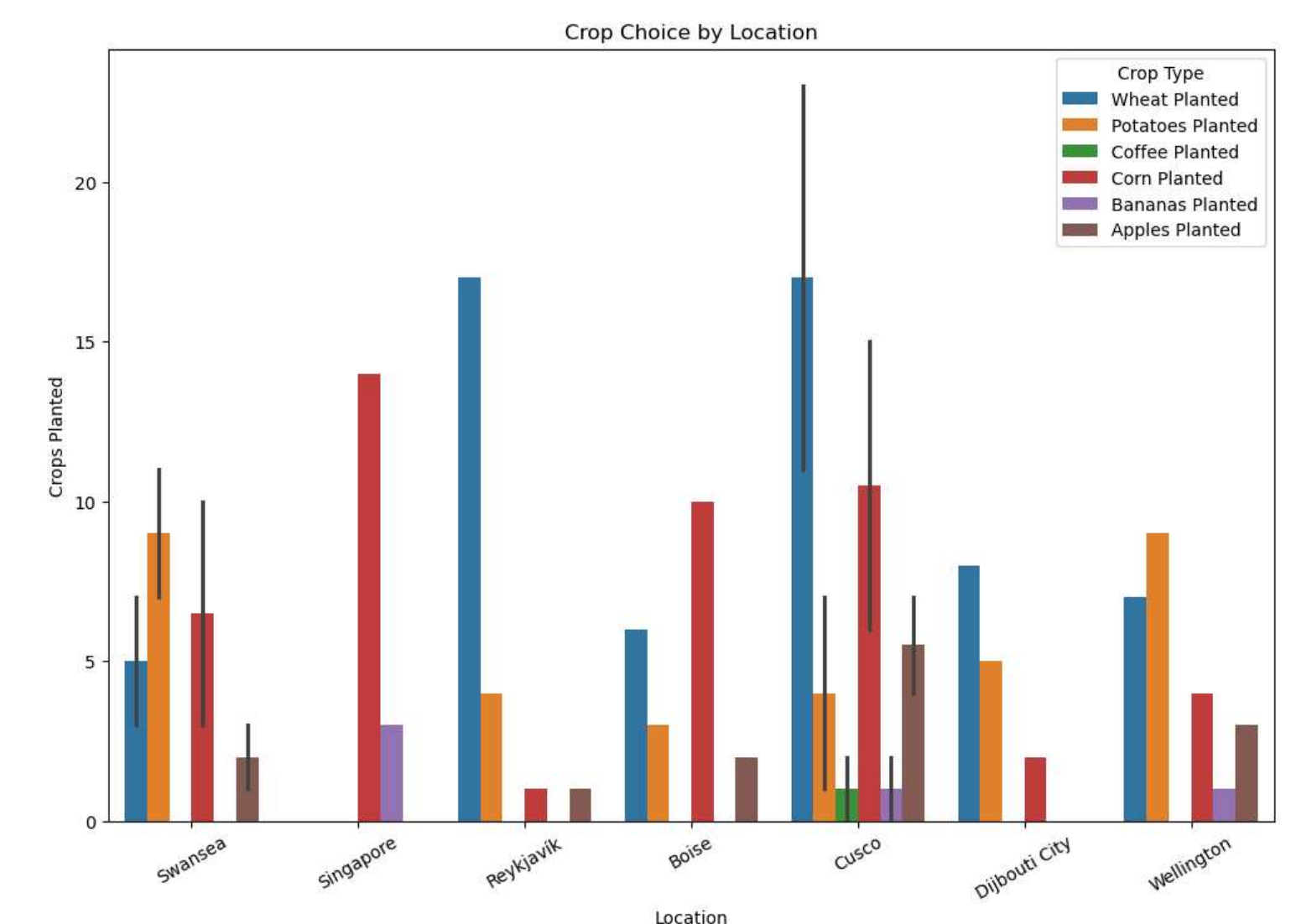
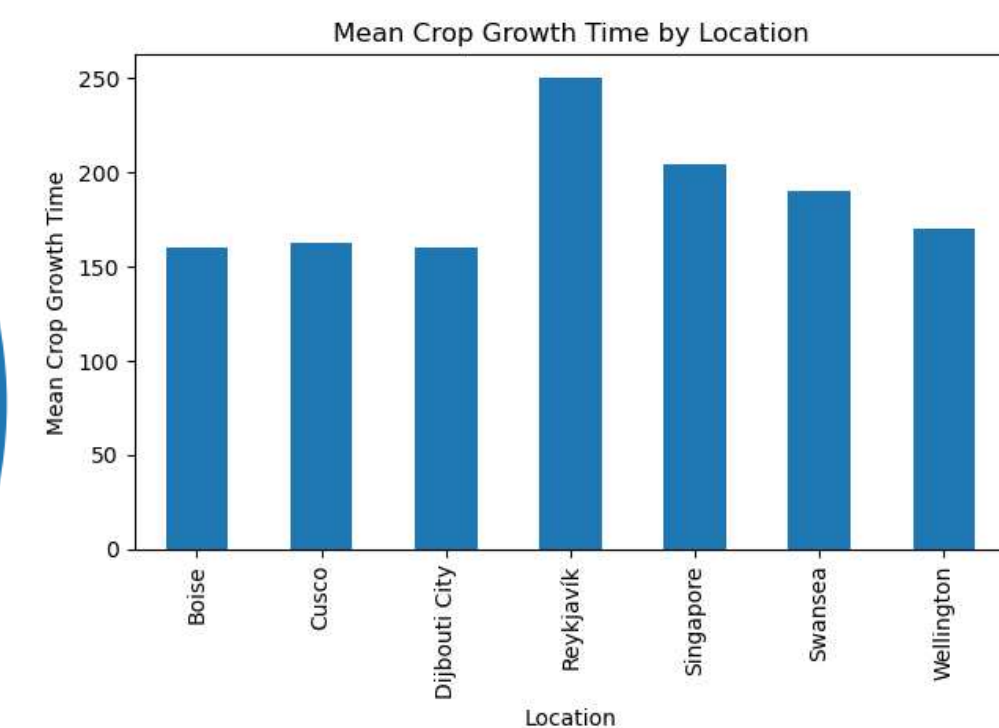
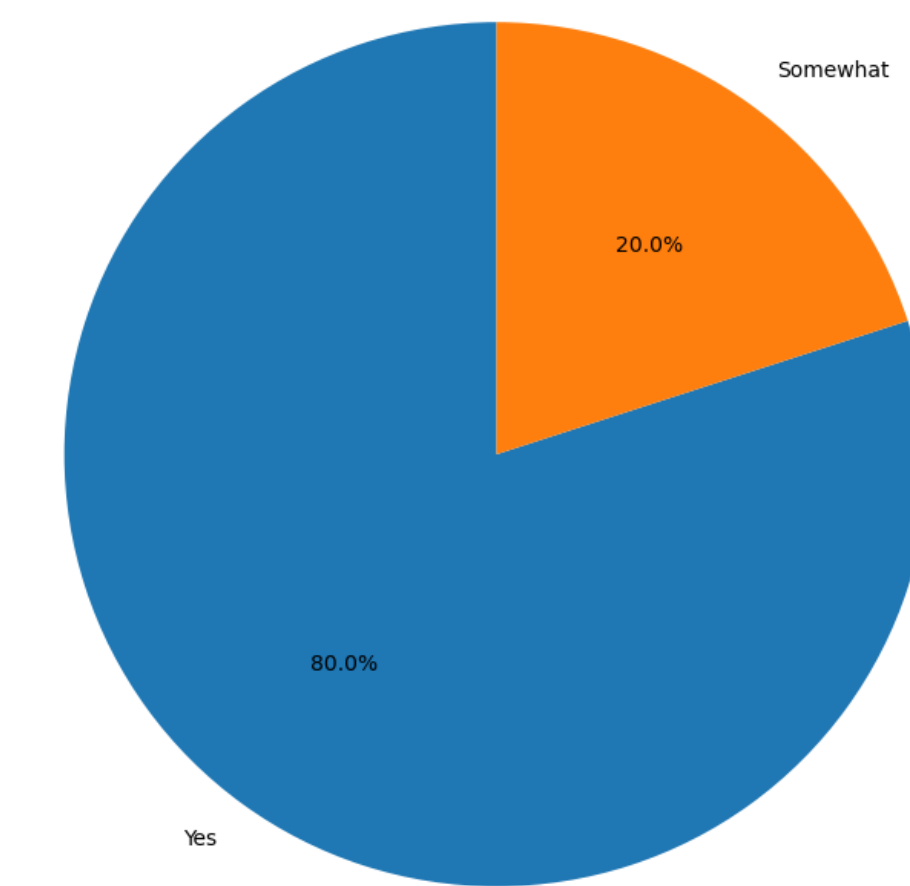


Fig.3, 4 and 5: Graphs showing results from the educational session questionnaire as well as crop choice and growth time metrics collected from the playtesting sessions.

Conclusions & Future Work

The farming game prototype and data collected has shown a game such as this has immense potential as a fully-fledged video game and educational tool in learning environments related to agriculture. The real-world environmental data had a sizable impact on the mechanical aspects of the game, and many participants saw the value of a game as an educational tool.

Future work will include expanding the scope of environmental variables used in the game, an improvement to educational clarity with regards to demonstrating which variables have effects on certain processes and deploying the game within an agricultural education environment.

