Researching adaptivity for individual differences in number games

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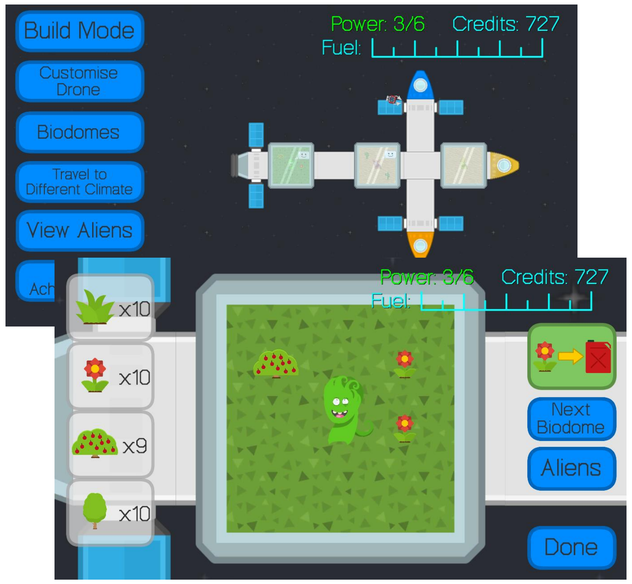
Sessioning and Return Triggers

Our game uses *sessioning mechanics* to limit the amount of players can engage with the game on a single occasion, and *return triggers* to motivate players to resume playing at a later time. These mechanics aim to lengthen the overall gameplay experience and sustain player interest over time.

The main sessioning device in the game is the alien system. After playing for some time, a player will be rewarded with an alien egg, which will grow into a full-sized alien when placed in a suitable biodome environment. Biodomes must be built to house new aliens, and the player must play the mathematical minigames to earn the credits required to expand their base. Aliens also require plants to make them happy, which are grown from seeds obtained from the minigames. Both plants and aliens take a period of time to grow. Different aliens come from contrasting climates, and the player must travel to appropriate parts of the solar system to find the plants that each alien needs. However, in order to travel to these areas, the player must grow additional plants to use as biofuel.

Using these plant and alien-based sessioning mechanics, the player is limited in how much they can do in a single game session, while still allowing for interesting variety, and the promise of new experiences when they return. Furthermore, with certain elements taking a long period of time, the player is encouraged to return later to see what has happened since they last played.

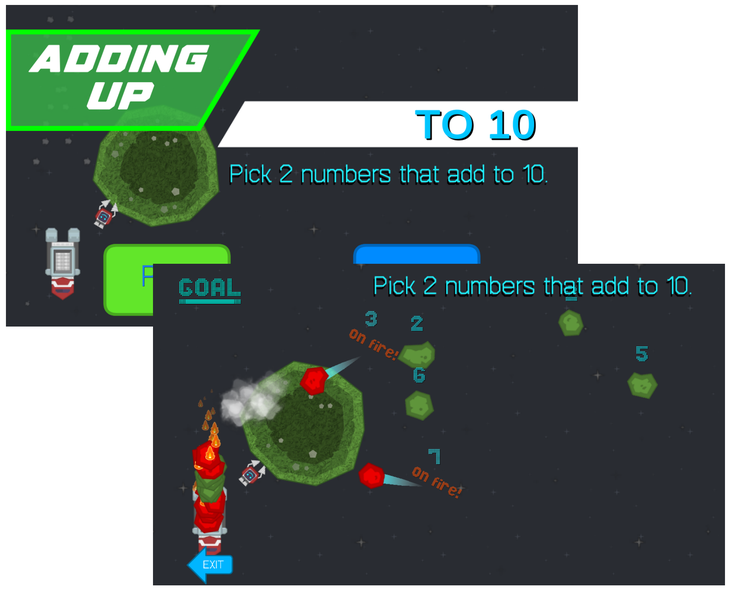


Adaptivity

The game is adaptive to each player's current level of knowledge and fluency. We also have an analytic module in the game which captures data on how a child is performing as they play the game, utilising accuracy and response time as measures of performance. The performance data that is gathered feeds back into the game to ensure an appropriate level of challenge.

Our aim is to support children to develop automaticity in their recall of times tables and number bonds. So by using individual performance data from players, we construct dynamic association strength tables that estimate the degree to which a child "knows" a given set of number facts. We support the child's learning by providing fewer trials involving facts they know well, and more trials that they are ready to learn next.

In addition to supporting the child's learning, the data collected will allow us in various studies to investigate different learning trajectories, and ways in which different aspects of game design influence learning.



RAIDING: Researching Adaptivity to Individual Differences In Number Games

An interdisciplinary research project investigating game based learning and adaptivity, using the free to play gameplay model.

3 Aspects of Investigation

With this project, we will, in later studies, be looking into 3 aspects of game design that we can experiment with and change, to see if these have any effect on learning.

Movement

There is evidence to suggest that players will be more likely to encode information when associated with a moving target. Our game has two different methods for how the rocks move; one is that the fall down and then stop, and the other is that they spawn and move constantly.

Uncertain Reward

The literature says that an uncertain reward can be more motivating that a fixed reward. Our game will test different reward schedules, in order to further study the relationship between reward schedule and learning.

Time Pressure

Another aspect is whether having visible time pressure improves or worsens the learning experience. Not every player likes time pressure, but some thrive under a deadline. Our game will test the effect of different levels of time pressure, from no time pressure at all up to strict, quick, time limits.

Project Time Scale:
Nov 2016 – Oct 2018

Sheffield Hallam University

University of Bristol

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