# **Serious Games and Learning** Educating high school students about genetics.

### **Motivation**

Studies show that many high school students do not understand how biological systems like meiosis relate to inheritance. Traditional teaching practices alone have not been sufficient in educating students about how the biological systems relate to operational knowledge about inheritance (Visscher et al., 2008).

### Development

Two undergraduate software developers and one artist designed and implemented the game over the course of the summer. The game was developed iteratively; a playable prototype was developed as quickly as possible followed by incremental changes. The game was tested informally and changes were made based on test results.

The game was developed in ActionScript using the Flixel library. This allows the game to be run on any web browser that has a Flash plugin. This also enabled the game to be posted on popular game portals and reach a broad audience of casual gamers. In the first day of posting the game online, over 1,000 people played it. Online data was not part of the analysis.

## Methods

Participants were administered a pre-test to measure base level of genetics knowledge. This was a between subjects study. Participants played one of two prototypes of the game (level 1 or level 2 of interaction). After gameplay, participants were given a post-test. Learning was measured by the difference in pre- and post-test scores. User satisfaction was measured through an end survey and user engagement was measured by Emocard analysis of videos filmed during gameplay.

### Gameplay

Players are presented with two parent fuzzies and must breed a new fuzzy that matches the one on the "wanted" poster. Players click to select the adult fuzzies and can breed two at a time. When the desired fuzzy reaches adulthood, the player wins the round and can move onto the next level.

### **Educational Objectives**

Level objectives and fuzzy genotype were designed based on national education standards.



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### **Game Design**



- Dominance
- Molecular Basis
- Environmental Effects
- Incomplete Dominance

### Level 1 vs. Level 2

This button is the only difference between level one and level two. In level two only, it allows the player to select which gametes are used in producing a fuzzy.



Step 1: Select fuzzies to breed.



Step 2: Watch meiosis animation.



Step 4: Choose place to plant fuzzy.



Step 5: If correct choices were made, player wins.

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### Results

Nine participants split into two groups played the game. In analyzing combined survey data, it was found that the game was enjoyable compared to neutral (p < 0.01). No other conclusions were made.



No significant differences found between interaction level 1 (n=4) and level 2 (n=5) for any measure.

### Conclusion

Although there was insufficient data collected to conclude that the game has educational value on its own, teachers may find it to be a useful tool. As an enjoyable (p < 0.01)simulation of genetics, teachers may find value in using it as a class activity to engage students in the topic. Also, with over 1,000 people playing the game on the first day it was posted on a popular game portal, there is promise that students may find the game to be enjoyable and educational even outside the classroom.