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E-Rebuild: Mathematics and Design

Earthquake Rebuild, or E-Rebuild, is a game focused on the giving students an informal knowledge of mathematics using architecture and design principles. E-Rebuild is designed to be a tool to assist in formal education and should be used in conjunction with traditional methods of teaching to reinforce the informal knowledge gained from these exercises. Primarily focused on grades sixth through eighth, E-Rebuild will focus first on being fun. We think the more a student enjoys the experience, the more time they will put into it. Learning and assessment will be done through the gameplay experience. Using evidence centered design, the tasks involved will measure competencies in certain areas of the Common Core Standards to build a model of the player. This model will then be used for scaffolding and difficulty scaling. Dynamically scaled difficulty will allow for a targeted play experience and will increase player engagement. Procedurally generating levels using the model of the player will allow us to improve the model of the player by specifically using task designed to evaluate the strengths and weaknesses of each student individually. Content customization will not be focused solely on difficulty or mathematical weaknesses. Using affective computing techniques, E-rebuild will evolve into to the game each student wants to play while effectively targeting their deficiencies.

Currently, the game is being play tested at Florida State University Schools. The information collected from the twenty something student surveys is being used to work out bugs and tweak the design and appearance of the game. The game itself logs information about the players actions and choices throughout the game. This information is being used to train the Bayesian network associated with E-Rebuild. Gameplay data is also being collected with those close to the games development to be used as expert data in the Training of the network.

Two levels have been constructed to focus on different Common Core State Standard competencies. The first, pictured top right, focuses on building with large scale objects. The main task is to provide enough shelter for all of the displaced refugees. Secondarily, the player must reconstruct building as faithfully as possible given the large materials at hand, in this case shipping containers. The construction here draws inspiration from Christchurch, New Zealand's Project ReStart, which made a mall and city center from shipping containers. The lessons learned focus on ratio and proportional reasoning. The second level, pictured middle right, the granularity is greatly reduced and focuses on building with smaller building blocks. The level is staged in the historic rural southwestern U.S., as such adobe blocks are the main material used. The main task is to plan your building in such a way to maximize the amount spent on materials. The secondary task is to place the refuges in homes given constraints given by their personalities.

In the coming months, Earthquake Rebuild will expand to include a third level. Each of these levels will be expanded to have many sublevels with varying difficulties. These levels are being designed to be generated by varying parameters given the expertise of the player.

On this island, all the buildings have been leveled by a large earthquake. Replace the city center, based on Ando's Row House, with a building of shipping containers before the next one hits. Fitting the families into these containers with limited space won't be a simple task.
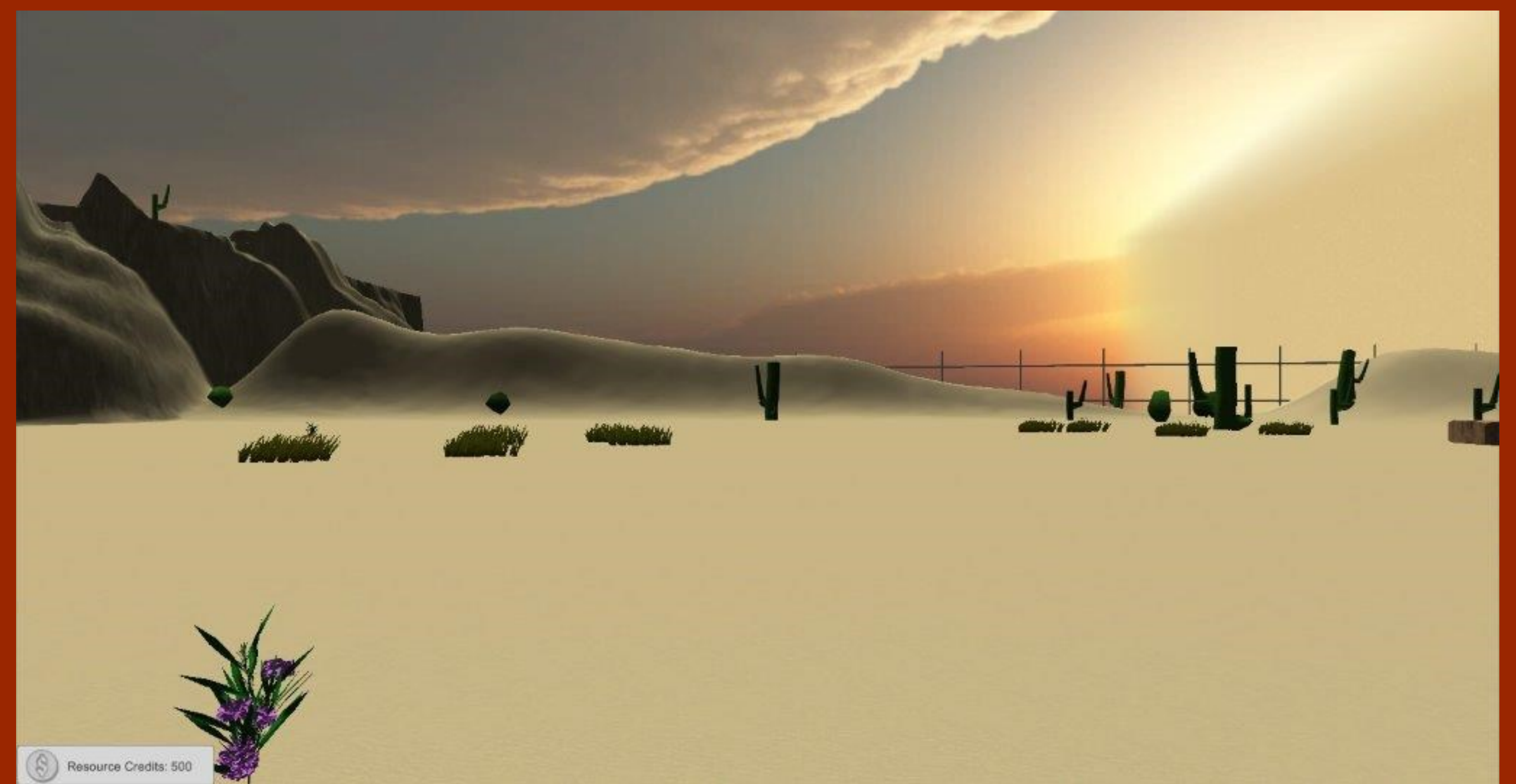
Sandstorms keep striking this disaster site in the southeastern U.S. Use the materials from the area to build classic adobe structures to house victims as they get found. Unfortunately, there are a lot of grudges between people in the area, and they want to live in very particular places.
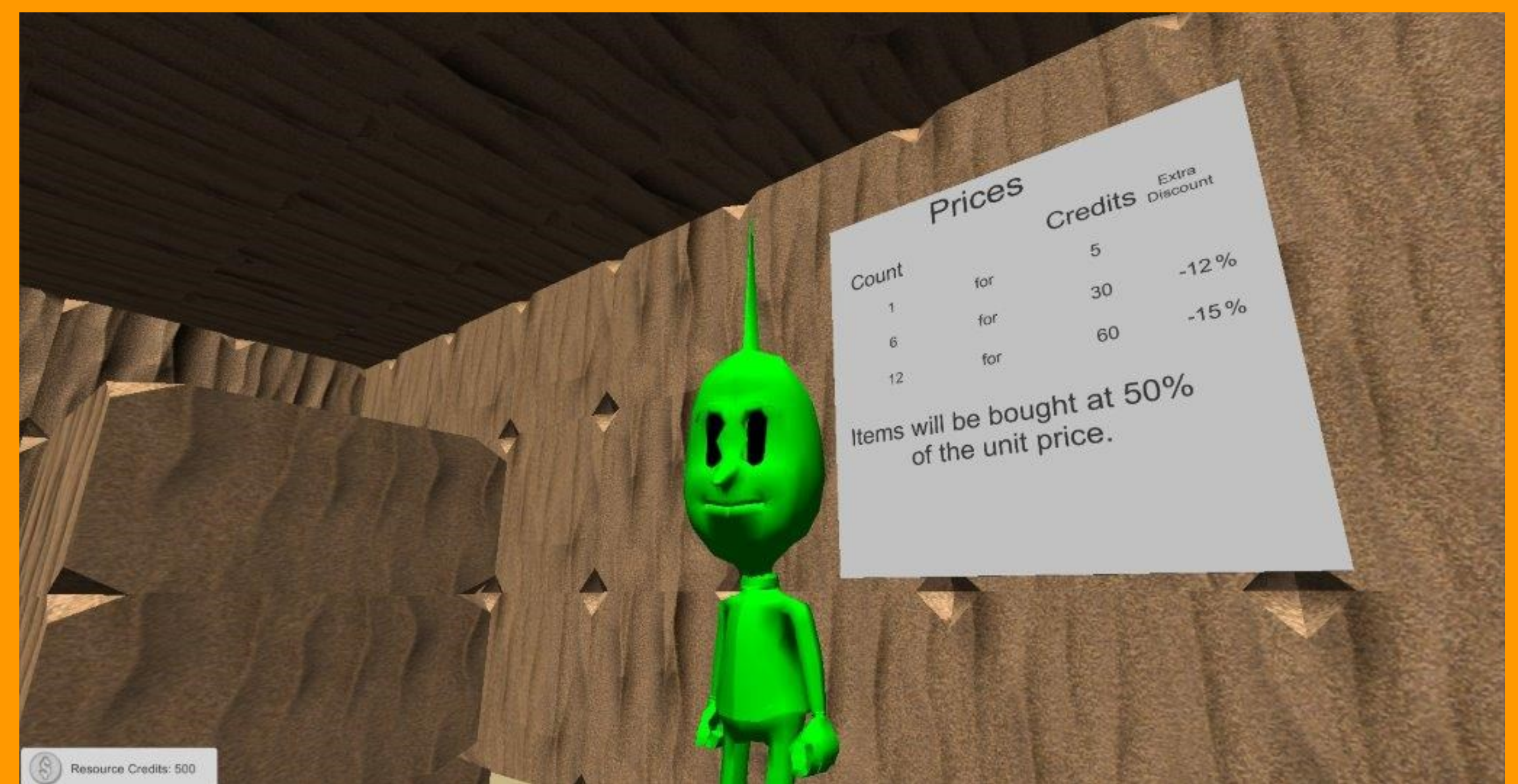
Buying and selling materials will be a large part of most levels. The salesperson is a dishonest crook that won't give you change if you over pay. Calculating the correct price involves multiple mathematic operations to get the best deal.