Chemistry in Life

Game Design Documentation

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Version One

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Introduction

Game Title: *Chemistry in Life*

Designer: Erin Weaver

Subject Area: Chemistry, Science

Learning Domain: Cognitive

Summary:
Chemistry in Life is a simulation style game that invites players to explore changes in everyday objects and analyze and interpret their findings to determine if a chemical or physical change has occurred.

Target Learners:
The target audience for this game is middle school aged students. A basic understanding of computer operation is required to play, including how to use a mouse, and utilize keyboard controls. Familiarity with introductory digital game mechanics such as maneuvering characters with keyboard controls is also required. No specialized subject knowledge is required. This game is most appropriate for players who are motivated by achievement, those who like exploration, and those who enjoy story immersion and narrative-based games.

Objectives & Goals

Learning Objectives:
By the end of this game players will be able to
  ● Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. *NGSS Standard MS-PS1-2*

Evidence of Learning:
In order to demonstrate this learning objective, players will observe examples of chemical and physical changes in everyday life. They will analyze the properties of the object before

and after a change in property occurs. Players will use this information to decide whether the change represents a physical or chemical change

This objective will be scored by keeping track of the player's interpretation of the change. Players that give an incorrect answer will be provided with immediate feedback on their response, but allowed to continue the game. .

This objective aligns with the subject areas chosen because understanding how to identify a chemical reaction is a key concept in chemistry.

Game Goal:
The main goal of *Chemistry in Life* is to find and observe changes in all designated game objects, and to correctly categorize them as physical or chemical changes.

Game Description

Game Concept:
Understanding the place that property changes in objects hold in everyday life can be a complicated concept for learners to grasp. The ability for learners to interact with objects and view the changes as they happen is vital to this understanding, but this hands-on interaction is often not possible in science classrooms due to time, safety, and budgetary restraints. Due to these difficulties, *Chemistry in Life* seeks to provide users a virtual environment with which to explore and interact with objects.

Environment:
This game will take place in a small home environment. The environment will include a basic kitchen, a living room, one bedroom, a laundry room, and a single bathroom. The surroundings will feel comfortable and homey, including a fireplace and brightly colored furnishings.

Narrative:
The narrative component of this game will be introduced at the start of gameplay. Players will be presented with a scenario to facilitate their desire to explore the environment and given instructions to do so.

Characters:

The main character represented throughout *Chemistry in Life* is a young, cartoonish African American female. She wears brightly colored pants, tennis shoes, and wears her hair tied up. Additional characters may be added as the game expands.

Gameplay

Core Loop:
Players will continually cycle between
1. Exploring their environment to find objects of interest
2. Observing and analyzing object property changes
3. Interpret finding to make a choice of change type

Core Dynamic:
There are two primary core dynamics at play in *Chemistry in Life*. The first is "exploration." Players spend a large portion of the game walking around their environment and interact with objects they find along the way. The second core dynamic at play is "solution." The overarching game goal invites players to solve a problem by analyzing observed changes and categorizing those changes. These two core dynamics are applicable to the learning objectives because they aid players in relating object property changes to objects in everyday life and encourage them to draw conclusions based on observations.

Scoring, Rewards, & Assessment:
The achievement of learning objectives is assessed by the player's ability to successfully categorize the changes they observe in each game object. The number of objects the player still needs to find will be displayed on screen so they can monitor their progress.

Correctly categorizing all object changes results in meeting the learning objectives. Users will be able to incorrectly categorize objects which will result in feedback. The total number of categorizations correctly identified will be displayed as the player's score at the end of the game.

The motivation within the chosen assessment/scoring system is provided by game rewards. The key "reward" players receive is text feedback and encouragement driven by completion. Additional surprise responses to exploring the game environment and clicking on new objects will also exist to motivate players.

Application of Gee's Principles:
Chemistry in Life addresses two of Gee's principles of learning in games- interaction and production (Gee, 2008). Interaction is addressed because the player communicates with

the game through manipulating objects and receiving feedback for actions. Production is addressed because the interaction that players have with the game helps to further the narrative.

Prototype Link:
https://eaweaver.itch.io/chemistry-in-life

Prototype Representation:
The prototype version of Chemistry in Life depicts the environment, character, and allows users to interact with objects to make choices. The core loop is depicted in a simplified version. Instead of viewing animations depicting property changes in objects it currently relies on text to describe these changes. The end goal is to have users manipulate the objects to facilitate these changes and view the results. Additionally, the prototype does not currently contain a mechanism for players to keep track of their observations. This will be included in the final version.

References

Kapp, K. (2012). The gamification of learning and instruction: Game based strategies for training and education. 177-178.

Gee, J.P. (2008). What video games have to teach us about learning and literacy. Palgrave Macmillan.