Building Chemistry Together

Joe Leon

CST-451 Capstone Project Proposal

Grand Canyon University

Instructor: Professor Mark Reha

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**ABSTRACT**

Building Chemistry Together is a standalone application that will allow users to pick a element from the Periodic Table of Elements and then select where they can add it in depending on the balancing of the previous elements.

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| History and Signoff Sheet |

**Change Record**

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| --- | --- | --- |
| **Date** | **Author** | **Revision Notes** |
|  |  | Initial draft for review/discussion |
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| **Overall Instructor Feedback/Comments** |

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| **Overall Instructor Feedback/Comments** |

**Integrated Instructor Feedback into Project Documentation**

☐ Yes ☐ No

**Project Approval**

☐ Professor Mark Reha

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**Project Overview and Project Objectives**

Building Chemistry Together, (Referred to as BCT) was original inspired while talking to GCU medial graduates when asked for feedback on tools that would have been convenient while studying for their major. One of the ideas that were brought up by one individual and greatly expanded upon by another was a tool that would allow a user to see what a chemical structure would appear as.

**Christian Worldview**

This program will help give others a better understanding on how God’s world is put together.

**Project Objectives**

The objective of BCT is to accurately display atomic structures and allow users to add to these structures or subtract from it to see firsthand what would happen if these same conditions existed in the real world.

**Challenges**

Insuring that Unity will know how to incorporate each script and task.

**Benefits and Opportunities**

This project will provide resources needed to create more intuitive education software. As well as the experience gained from working with this kind of software in terms of design and infrastructure can be applied to future products and projects.

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| Project Scope |
| In Scope: |
| BCT will allow users to drag any element from the Periodic Table of Elements and place it onto a 3D model and see how it will react. |
| An option to view information about individual elements, including their atomic number, mass, and any unusual characteristics. |
| Users and grab elements already attached and pull them out. If the removed atom structure becomes destabilized, then it will be removed from the program. |
| Ions and isotopes of elements can be created or edited before adding them to the atomic structure.   * Ions are when elements have a different electron charge. * Isotopes are when an element has a different neutron mass. |
| Out of Scope: |
| Acids |
| Radioactivity |
| Half lives or decomposing structures |
| Out of Scope: |
|  |

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| Project Success Measures |
| The foundation will balance any atom that is selected when compared to the rest of the atomic structure. |
| The model can be fully rotated 360 degrees. |
| Ions and neutrons can be added or subtracted and the balancing equation will reevaluate the new element. |
| The program can successfully save and load a previous project as it was left off. |

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| --- | --- | --- | --- |
| ID | Assumptions and Constraints | Status | Date |
| 1 | Unity will allows for an easy way to display 3D models and provide the framework for creating atomic structures. |  | 9-6-2018 |
| 2 | Unity requires information on how to apply scripts to |  | 1-22-19 |
| 3 | Each element will be stored in its own class. | Solved. | 1-22-19 |
| 4 | Being able to transfer variables from one class to another using polymorphism. | Solved | 5-10-19 |
| 5 |  |  |  |

Project High-Level Solution

**Introduction**

The primary purpose of Building Chemistry Together is to balance equations and display the resulting atomic structure in a way that users can easily comprehend. This project came about after consulting with formal GCU students about tools or resources they wished they had access to while studying in the medical field. One of the subjects that came up was the idea of creating a program that would display how certain chemicals and elements would bond.

The objective of BCT is to allow users to pick any known element within the Periodic Table of Elements and use it as a starting point, or add it to existing structures so long as it is able to form a valid chemical bond. For example, when a user drags an oxygen atom onto the main tray, and then add on a hydrogen atom, it will latch on, but the program will notify the user that is it incomplete and how many outer electros are missing for it to become stable. And adding a second hydrogen would complete the molecule.

**Solution**

**Project Controls**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Risk Management | | | | |
| Event Risk | Risk Probability | Risk Impact | Risk Mitigation | Contingency Plan |
| Prefabs | Medium | Each atom is composed of a spherical prefab that is instantiated upon each void update(). | If its impossible to create new prefabs during runtime, it would be more beneficial to store objects off screen and summon them when the user clicks on the button. | 1-17-19 |
| Collision Detection | High | If Unity is unable to detect when an atom is within a tray, then none of the elements will be able to despond and the user would experience unintended behaviors. | Research how to create a Boolean that will be toggle d when the mouse point enters certain coordinate ranges. | 3-19-19 |
| Balancing | Low | The atomic structure will still be formed, though it would be an inaccurate depiction. | Ensure that the script knows how to pull in the Valance variable from the element scripts and add them together compared to which electron level they belong to. |  |
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| 5 |  |  |  |  |