

Project Deliverable B: Need Identification and Problem Statement

GNG 1103 – Engineering Design

Faculty of Engineering – University of Ottawa

Many concepts in chemistry pose a serious challenge in teaching because they seem far removed from the experience of the students. Notably, the sub-microscopic nature of molecules and the complexity of their interactions can be extremely challenging to visualise. As a result, a virtual reality environment or game is needed to teach these concepts and to show the dynamic nature of molecular structure and interactions in a way that conventional drawings and models cannot.

The intended audience is students enrolled in first year organic chemistry and thus some basic knowledge of chemistry can be assumed to be known; however, no knowledge of virtual reality can be assumed so ease of use is paramount. To facilitate easy use by a potentially inexperienced audience a tutorial of some kind is a requirement. Furthermore, immersion is considered an important factor so the flow of the game should be smooth and easy to facilitate this. Additionally, to avoid confusion, the standard colours should be used to represent carbon, nitrogen, oxygen, and hydrogen and the model styles used should be those that are already common.

As previously stated, the main focus will be helping students visualise molecules and molecular interaction. It is thus important to dispel common misconceptions, notably that molecules are stationary rigid bodies and the collisions are mostly successful. It is important to depict the vibration of molecules and the effect of both attitude and energy on collision success. Lastly, the randomness of molecular motion and the low probability of collisions should be emphasised.

Ultimately, whether implemented as a game or a more abstract environment, the product will still be educational software. This means that the player should be made aware of the specific learning objectives and the completion of these objectives should be assessed in-game by some means.

Problem Statement

A tool is needed to help chemistry students visually understand the motion and scale of molecules and the probabilistic nature of molecular collisions.

Brief

	Need	Identification
Immersion and interactivity	-Gaming options	<p>That are more creative than the current 2D static drawings and allow for an experience in which the user can be immersed in the material in a fun and productive way.</p> <p>Examples of similar products include Odyssey and Vischem</p>
Easily being able to comprehend and Understand the learning outcomes	<p>-Retention and comprehension of material.</p> <p>-Measurement criteria to evaluate user</p> <p>-Easy visualization</p>	<p>By using the 12 principles of multimedia learning</p> <p>Point system or levels in game could be implemented</p> <p>Use standard colors for molecules</p>