

3D Biochemistry Lab

Stone-3D

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Problem being addressed

- Develop a 3D biochemistry virtual lab
- Assist student from biochemistry lab course BBMB 102
- Simulate the experiments
 - (Module 1 : Determine Protein Concentration by the Bradford Assay)
- Game like feeling
- Completely web-based, accessible from the internet
- Continue developing from the given environment
- Adding more model and features
- Chain the experiment process to have a complete cycle of work flows

Module 1: Determine Protein Concentration by the Bradford Assay

- Labelling test tube (8 in total, 6 sample and 2 unknown solution)
- *Pipette different volume of solution into test tube (Ex: Protein, Dye and NaCl)
- Add parafilm on top of test tube and mix the content in test tube
- *Put the test tubes into the spectrometers to measure the absorbance
- *Plot the graph of absorbance of each of the sample against the final concentration of the protein in the test tube.
- Plot the absorbance of the unknown sample on the graph

How (Design & Development)

- Back and forth process between developers and product owner
- We ask for details on how PO would like features implemented
 - Some members will keep notes of specifications listed by PO
 - Other members might give examples of how it may be implemented, asking if that sounds correct
- Tasks are created on gitlab boards for members to pick up.
- We create a branch for the task and develop on it
 - Changes pushed to branch, then merged into development branch
- We demo the features with PO and ask if there are any changes they would like to be made to implemented features. Rinse & repeat

Issues: ...? Our code is perfect, we have no issues :)

- Last minute bugs arise from last minute merges into the development branch
 - Solution: Always need someone at the ready to push hotfixes
- Miscommunications:
 - A feature was implemented that didn't need to be, result = time wasted

How?

Development Practices & Tools

- Agile Workflow
 - We worked in an agile methodology by continually meeting with the client for requirements, developing based off the requirements, and then deploying for testing.
- Git/GitLab
 - GitLab is our source control as well as our problem board. We work off of multiple branches and merge into one Dev Branch. The Dev Branch gets tested and published.
 - Git Pages is being used to host our WebGL build for the game.
- Unity
 - The game engine we are using.
- Blender
 - Software we are using to develop models for the 3D lab.

Current progress status

- General bugfixes and quality-of-life improvements have been made to inherited code
 - Brighter textures, lighting fixes, control inputs, and more
- Realism improved via animations and more detailed lab steps
- Lab steps completed through step 2 part 3
 - Interactions added for pipette, test tubes, test tube rack, flasks, dye
- All necessary 3d models have been created
- Build is published and hosted on an github website for demonstration & testing
- Meeting minutes, design documents recorded for future reference

Remaining Work Plan

Week 11	Week 12	Week 13	Week 14	Week 15	Week 16 (Prep Week)
<p>Implement part 2 step 4 and 5</p> <p>Fix pipette plunger animations</p> <p>Adding physics to test tube</p> <p>Improve physical boundaries</p> <p>Deploy production build to server</p>	<p>Implement part 2 step 4 and 5</p> <p>Test tube shaking animation</p> <p>Change glass material</p> <p>Dynamic Task List</p> <p>Deploy production build to server</p>	<p>Implement part 3</p> <p>Integrate Pipette tip box animation</p> <p>Error Notifications</p> <p>Deploy production build to server</p>	<p>Deploy production build to server</p>	<p>Deploy production build to server</p>	<p>Deploy production build to server</p>

Key: Bo Sheng Lee, Jesse White, Hung Truong, Bryce Hall, Kaitlyn Hoopingarner

Demo

<https://truonghung27.github.io/Stone-Chen-3D/>

Kaitlyn's Contributions

Major	Medium	Minor
Implemented part 2 step 2 of the lab (#5)		Added on start controls message (#34)
Added functionality for drawing and dispensing with the pipette (#38)		Changed keys for interaction and pickup
Started work on part 1 step 2 and 3 of the lab but issue was scrapped by client (#7)		Note taking during meetings
		Updating issue board in GitLab with new issues
		Setup of GitLab

*Numbers are the issue numbers/IDs in GitLab

Bo Sheng Lee's Contributions

Major	Medium	Minor
Labelling the test tube in order	Interaction between test tube and the test tube holder	Change the item color
Fix the physics of the test tube	Change the test tube texture	Adding extra test tube
Pop up warning module		Complete the meeting minutes
Full task Instruction Sheets		

Jesse White's Contributions

Major	Medium	Minor
Pipette has to be over object to draw/dispense liquids	Pipette at center of screen	Fix Lab Colors/Make Lab Brighter
Pipette moving freely over lab table(simulating arm moving over table)		Re-do room textures to look more professional.
major bug fixes(not able to interact with objects, test tubes incorrectly snapping, null references)		

Hung Truong's Contributions

Major	Medium	Minor
Implementing/Changing Movement	Adding Notebook interactivity	Adding Controls Menu
Publishing the Build. -Utilized Unity Hub and GitLab pages.		Researching methods of publication.
		Modified in-game cursor speed and size.

Bryce Hall's Contributions

Major	Medium	Minor
Creation of new 3d assets - test tube holder, pipette tips/box, notebook	Integrating new assets into Unity as prefabs rigged for animation	Animation of pipette plunger, pipette tip box, notebook
Proportional test tube liquid height	Modeled weigh boat and digital scale (scrapped by client)	