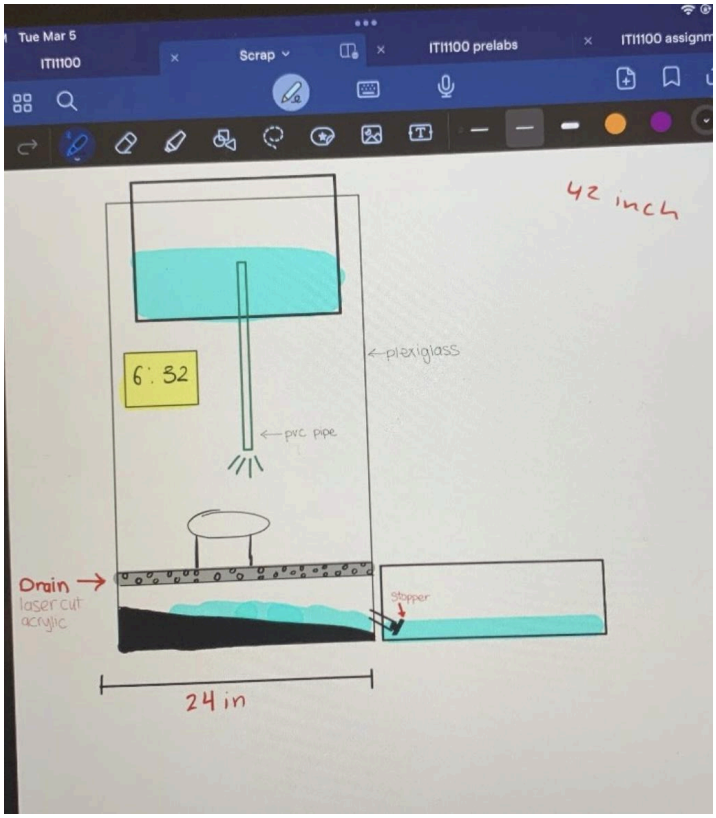
Prototype Objectives:

Why: The prototype aims to demonstrate the effectiveness of the water erosion process in a sped-up environment.
What: The prototype will simulate water erosion on a chalk material to speed up natural erosions.
When: The prototype will be developed to validate the feasibility of using water erosion for chalk materials

Prototype Development:
The design includes a water tank, a hand pump, and a filtration system. It incorporates sensors and a camera to capture each step of the erosion process.

This is a simple prototype of our final design. As you can see here, gravity is utilized in order to erode the object given (chalk) and a hand pump is then added to add more pressure for quicker erosion.



This is the first rendition of our final drawing, and it utilizes all the same features as our basic prototype.

Documentation:

Document the design and construction process of the prototype, including schematics, materials used, and assembly instructions.
Record the water erosion process parameters and the corresponding analytical data collected during testing.
Capture images or videos of the prototype in action, showing the erosion process and the integration of analytical measurements.

Gathering Feedback:

After we met with the client, we decided that having a fixed pressure, and the only changing variable being salt water was not enough for our project. We have decided to add different variables such as temperature change or pressure change rather than a fixed one. These can be implemented by adding a cooling system and also a coded pressure gauge for easy pressure control.

Update Specifications and Designs:

Based on feedback and test results, we revised the design specifications to improve the performance and accuracy of the erosion machine's practical and analytical aspects. This includes different independent and dependent variables, and also more technological advancements such as a cooling system, coded pressure gauge, and sensors within the machine.

Measurements:

For our analytical features, we decided to measure the erosion rate at different pressures and also change the salt concentration as well.

Pressure:
Low flow (0.5 L/min): 0.3 mm/min
Medium flow (1 L/min): 0.5 mm/min
High flow (2 L/min): 0.8 mm/min

Concentration:
For 10% salt water concentration:
Erosion rate = (0.2 cm erosion depth) / (30 minutes) = 0.0067 cm/min
For 20% salt water concentration:
Erosion rate = (0.5 cm erosion depth) / (30 minutes) = 0.0167 cm/min
For 50% salt water concentration:
Erosion rate = (0.8 cm erosion depth) / (30 minutes) = 0.0267 cm/min

This means the chalk eroded faster at a higher concentration and a higher pressure. The way these were measured was to set up your erosion machine and time how long it takes to erode a specific depth of material. Then, divide the depth of material eroded by the time to get the erosion rate (e.g., mm/min) for pressure, and the same thing except changing concentrations for salt.