When designing the dispenser, we initially needed to figure out how the biscuit would be dispensing out of the container. We came up with many ideas including trap doors, a conveyor belt or an Archimedes screw We liked the idea of the biscuit being pushed out of the box like a vending machine as it was the most recognisable motion for dispensing food. From our initial individual research into components, we analysed any potential limitations our components would have; in particular, servos and motors. The final decision was to use servos as our moving part, because the servo has higher accuracy and control within its moving motion. It is also a lot slower than a motor, therefore the user would not have a biscuit being projected at them at high speed. The next problem that arose was trying to create a non-destructive hopper mechanism that wouldn't break or crack the biscuit. Potential breakages would be from pushing the biscuits by the servo or them falling or breaking. The solution was to add on a 'drop zone' where the biscuit can slide into as dropping the biscuit causes uncertainty and no control within the movement. The next stage of the process was making a prototype to see whether out design would work, unsurprisingly we had a problem occur. Once a biscuit had been pushed out the servo couldn't return to its original position as the other biscuits stacked on top fell down and got in the way of the servo returning back to the position. A servo can only travel through 180 degrees so therefore we couldn't just swing the arm back round the other way. We got around this by looking into linkages to turn circular arm motion of the Servo into linear where we then put a foot on the end that interfaces with the biscuits. The height and shape of the foot is designed so as it pushes the bottom biscuit through the gap, the ones above are raised out of the way, so they don't cause a blockage.

The code is simple and straightforward. The button is coded onto pin3 to then Actuate the servo causing it to sweep from 0 to 180 degrees of motion. We combined code from class and our research to create this [https://docs.arduino.cc/learn/electronics/servo-motors]. This is connected to linkages and guide rails that translate the circular motion into linear. There is some R&D still required to make sure servo doesn't over rotate as well as varying the lengths of the linkages to create a slim and compact system, but the theory works in practice.

To depress the button we have designed an interactive system where you use coins. These coins are what interface with the button upon entry to the slot of the desired biscuit. This is a simple 1:1 solution to allow the coins to tell the Arduino what to do without over engineering or adding additional components

For this model instead of adding a DHT11 humidity sensor we reduced the life time of the biscuit by trying to keep them as covered as possible. We added a cover to the drop zone that the biscuit would push through to the exit. This just limits the contact with the air so the biscuits would have a longer life span.