

The Impact of Different  
Fabrics and the Resistance of  
Mosquitoes:

**Which Types of Fabrics Let  
Mosquitoes Go Through?**

BY OLIVIA AHN

**An In-Depth Analysis of Results**

**The Question Being Asked:**

*Which types of fabrics  
let mosquitoes go  
through?*

# Materials

100% Premium Novelty Cotton

100% Durable Cotton

90% Polyester 10% Spandex

100% Linen

80% Polyester 16% Rayon 4% Spandex

65% Polyester 35% Cotton

100% Denim

290 micrometer needle

Spring Scale

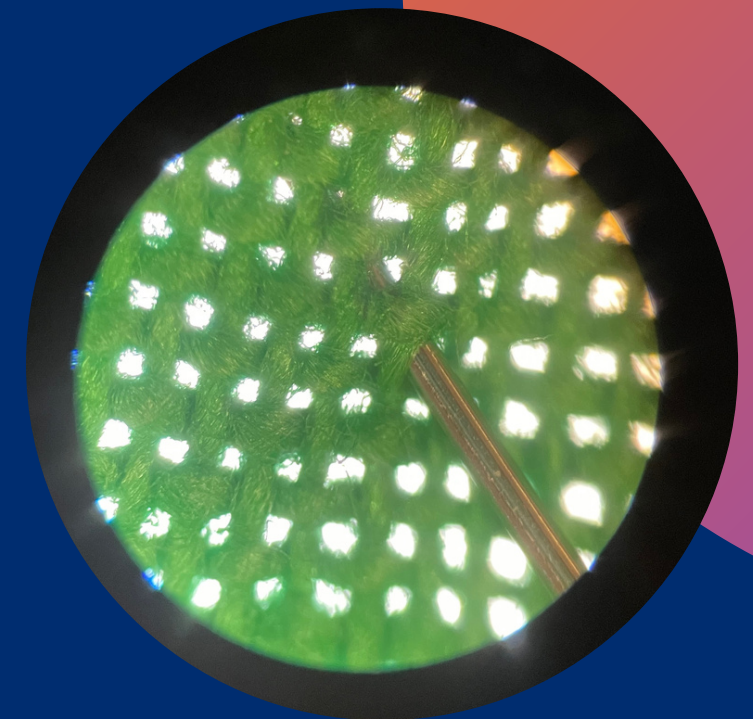
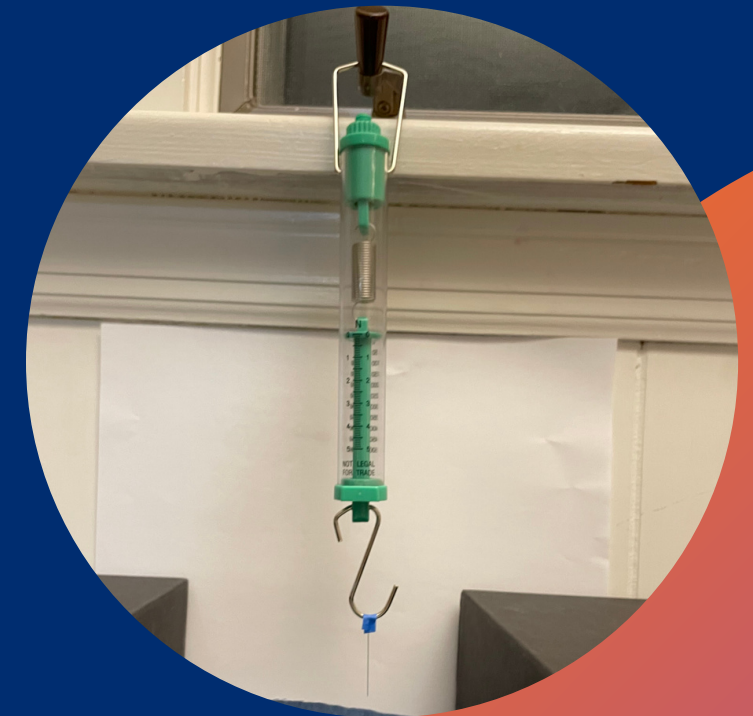
Something for spring scale to hang off of (peg, screw, etc.)

Tape

2 Heavy Objects (Rock, Box, Book, etc.)

Camera (to film video footage)

Microscope (to analyze fabrics)



# Procedure

1. Gather clean samples of 100% Premium Novelty Cotton, 90% Polyester and 10% Spandex blend, Wide Solid 100% Cotton, 100% Linen, 80% Polyester 16% Rayon 4% Spandex blend, and 65% Polyester 35% Cotton.
2. Place two boxes or other heavy, flat objects at least 6 inches away from each other and place one of the fabrics on those two boxes. The setup will look like a bridge, with the fabric connecting the two boxes.
3. Place two more heavy objects on each box, and straighten the fabric. The setup will now look more like a balance beam, with the fabric being in between the two heavier objects on the side.
4. Take a 290 micrometer wide needle, which mimics a mosquito's proboscis, and attach that needle to a spring scale with a piece of tape.



100% Cotton Denim

65% Polyester 35% Cotton

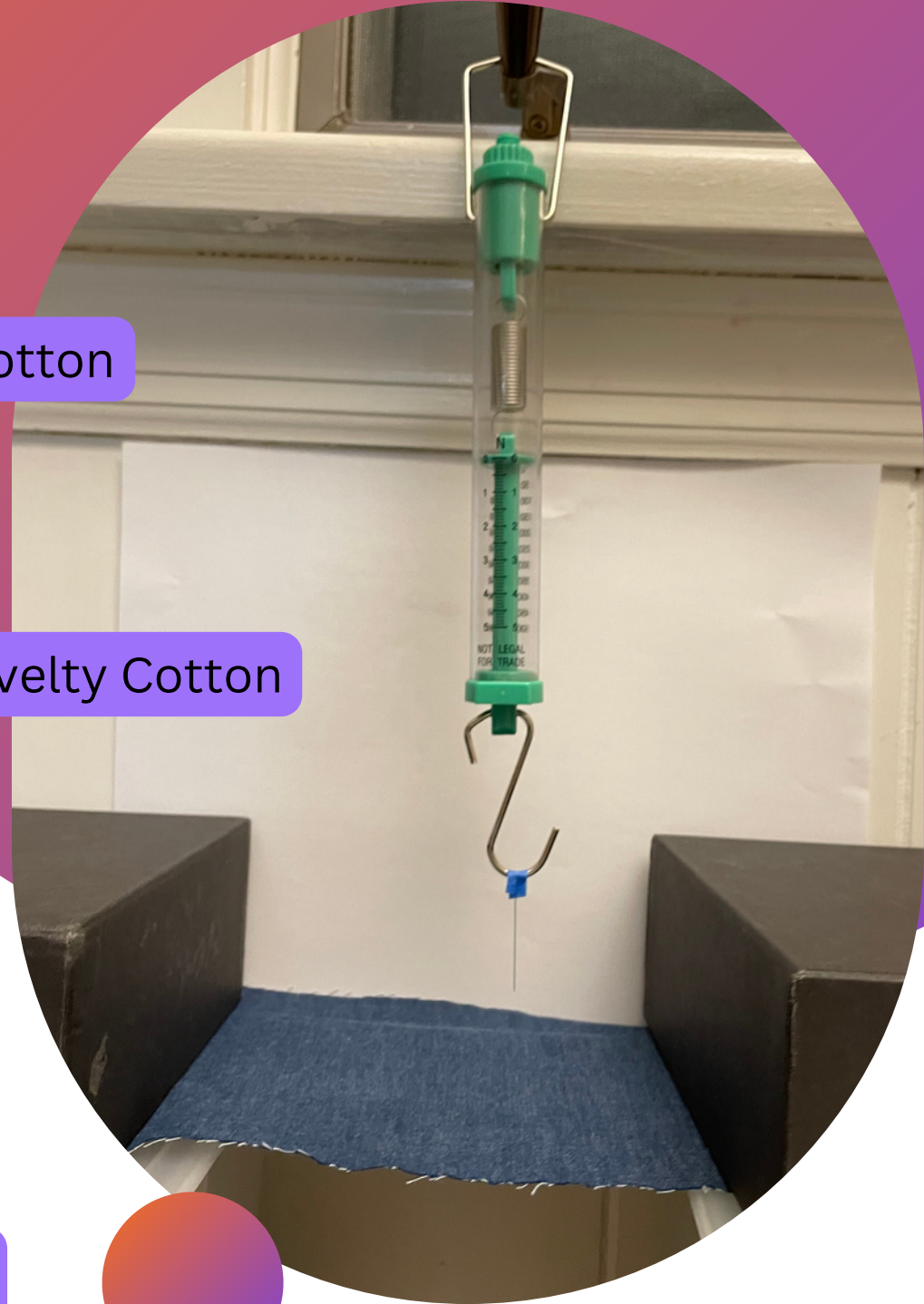
90% Polyester 10% Spandex blend

100% Premium Novelty Cotton

100% Wide Solid Cotton

100% Linen

80% Polyester 16% Rayon 4% Spandex



# Procedure (continued)

5) To easily measure the force needed to poke the fabric, set up a camera for filming a video.

6) Hang the spring scale in a position where it will stay the same for each attempt, such as on a peg or screw. Ensure the tip of the needle has some space between itself and the fabric.

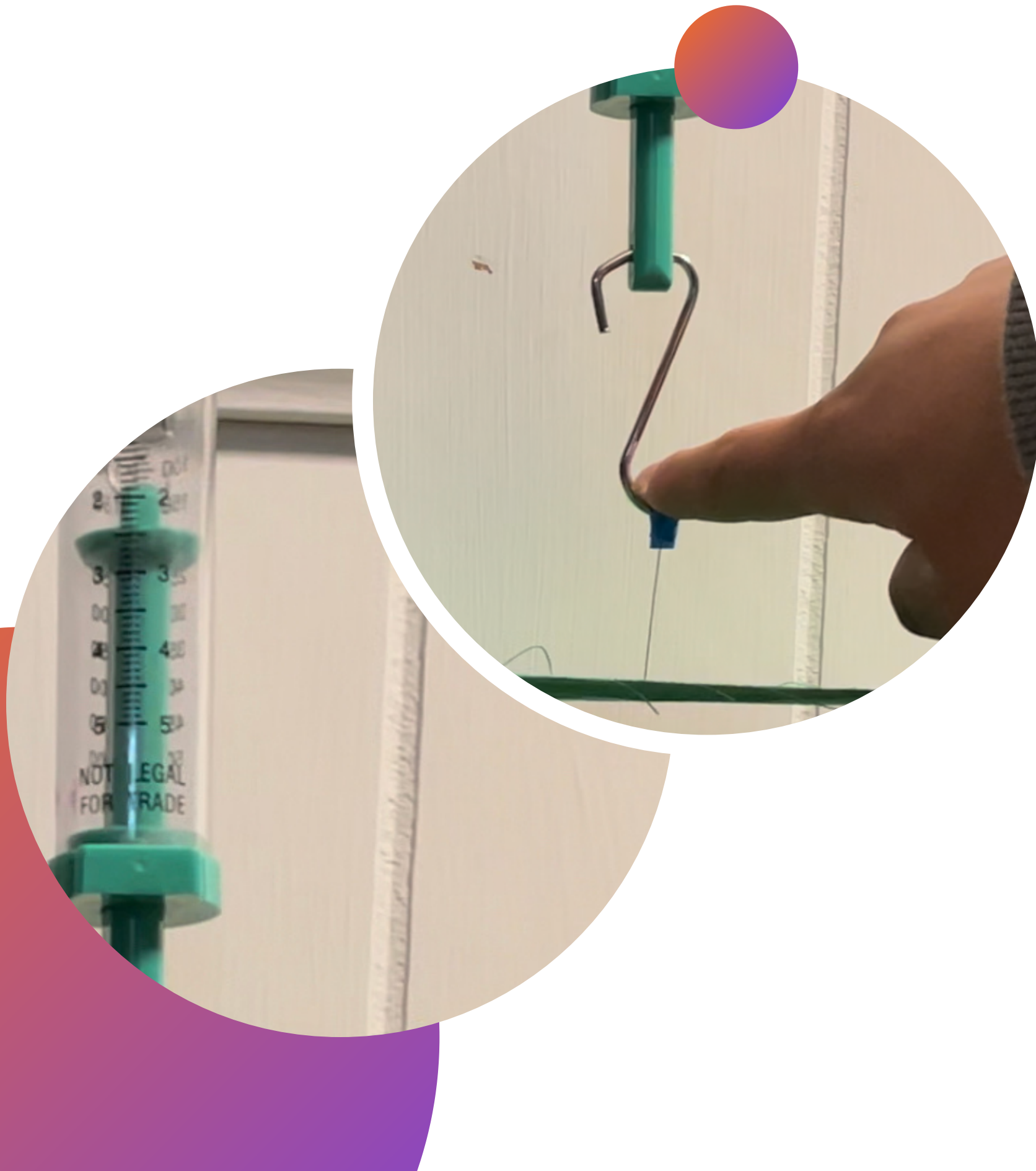
7) Poke the needle through the fabric, and release soon after. Stop the video footage

8) Identify whether the needle could go through the fabric.

9) To see the force necessary for poking the fabric, look at the video footage to see how many newtons were used when the needle poked through the fabric.

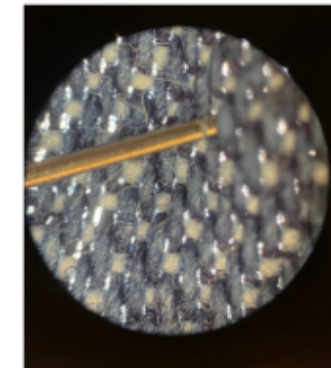
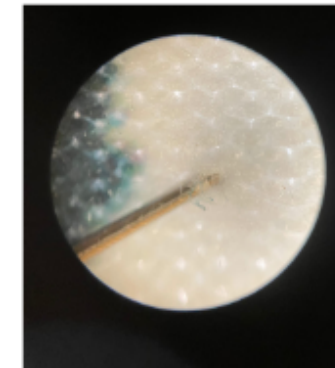
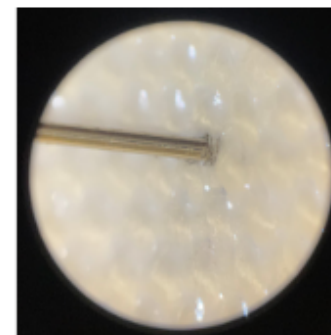
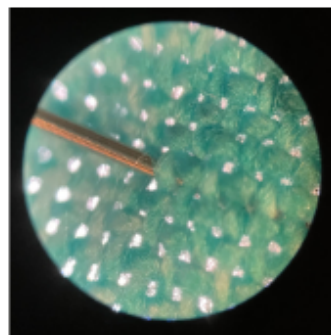
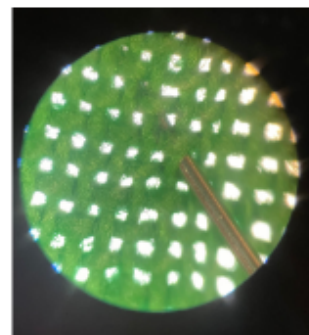
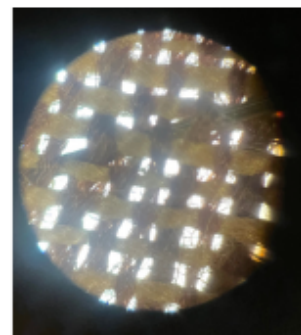
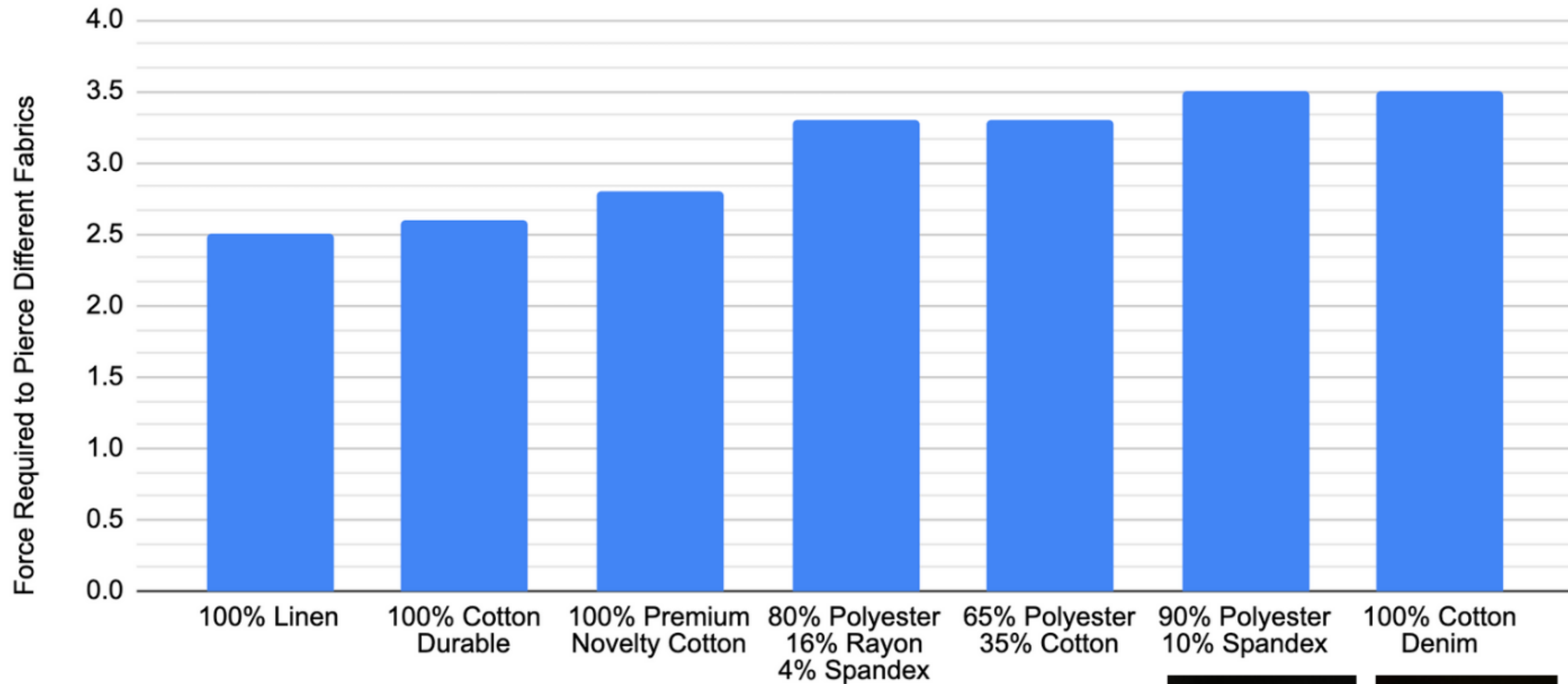
10) Repeat with each fabric, and change or clean the needle if necessary. Do not change the piece of tape so the weight of the needle and tape combination stays the same and doesn't interfere with the amount of newtons.

11) Use the amount of newtons needed to measure how well the needle could go through. Another way of analyzing data is to look at the fabric under a microscope, with or without the needle inserted.

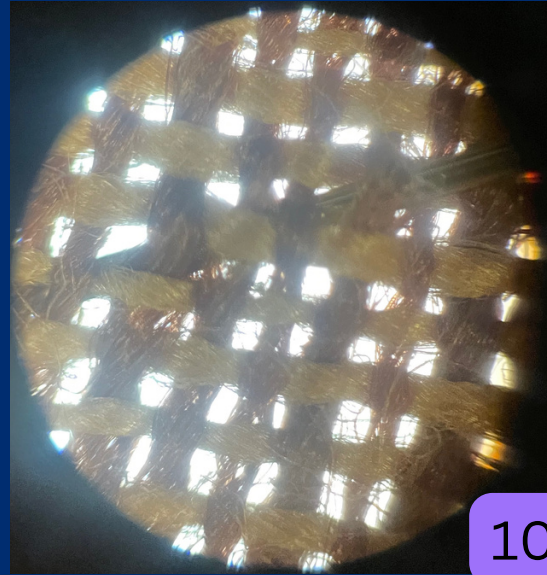


# Results

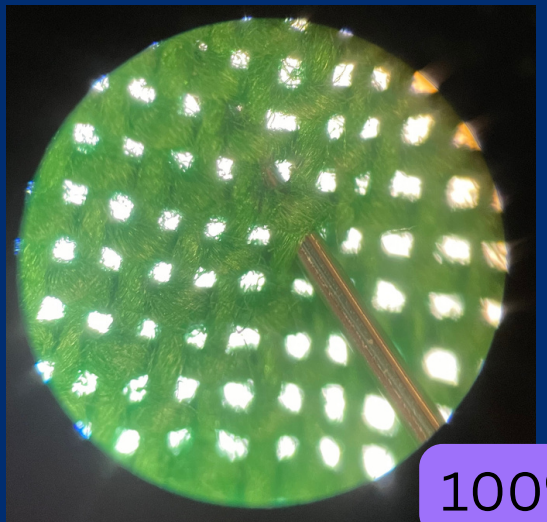
Force Required to Pierce Different Fabrics vs. Type of Fabric



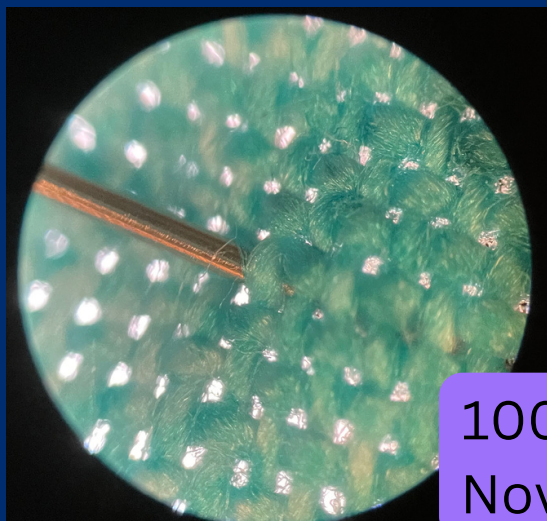
Type of Fabric



100% Linen



100% Durable Cotton



100% Premium Novelty Cotton

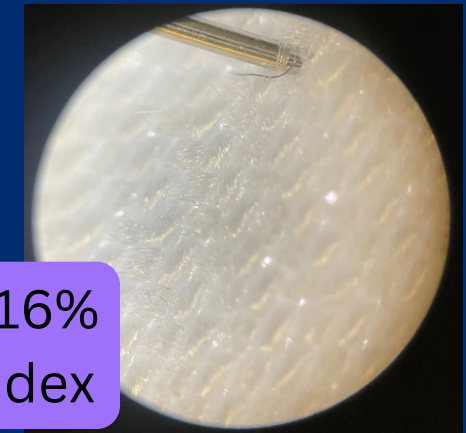
# In-depth analysis of results

These are pictures of the fabrics that required the least amount of force. The fabric that required the least amount of force to go through was the linen. When looking under the microscope, linen, requiring 2.5 newtons, had more holes in its weave, and the light shining through the fabric is very visible. The 100% Durable Cotton required 2.6 newtons and the 100% Premium Novelty Cotton both required 2.8 newtons. These two fabrics, with a similar amount of force needed, both have similar fabric structures.

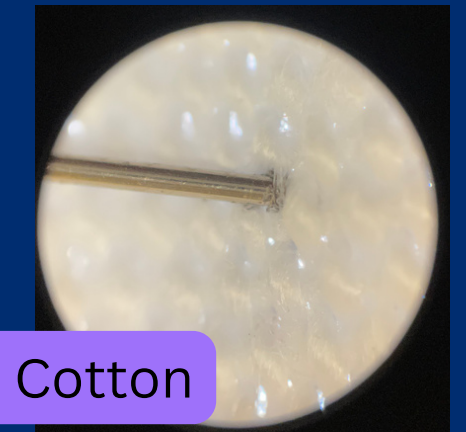
# In-depth analysis of results (continued)

These four fabrics required more force compared to the other fabrics. The 80% Polyester 16% Rayon 4% Spandex blend and the 65% Polyester 35% Cotton blend have similar fabric structures and properties, both requiring 3.3 newtons. The two fabrics that required the most force was the 90% polyester and 10% spandex blend and the 100% Cotton Denim. 90% polyester and 10% spandex and 100% Cotton Denim had minimal holes, and the holes were very small in size.

80% Polyester 16%  
Rayon 4% Spandex



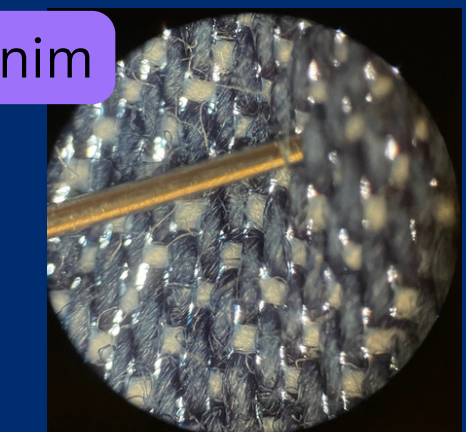
65% Polyester 35% Cotton



90% Polyester 10% Spandex blend



100% Cotton Denim





# Main Takeaways from This Project

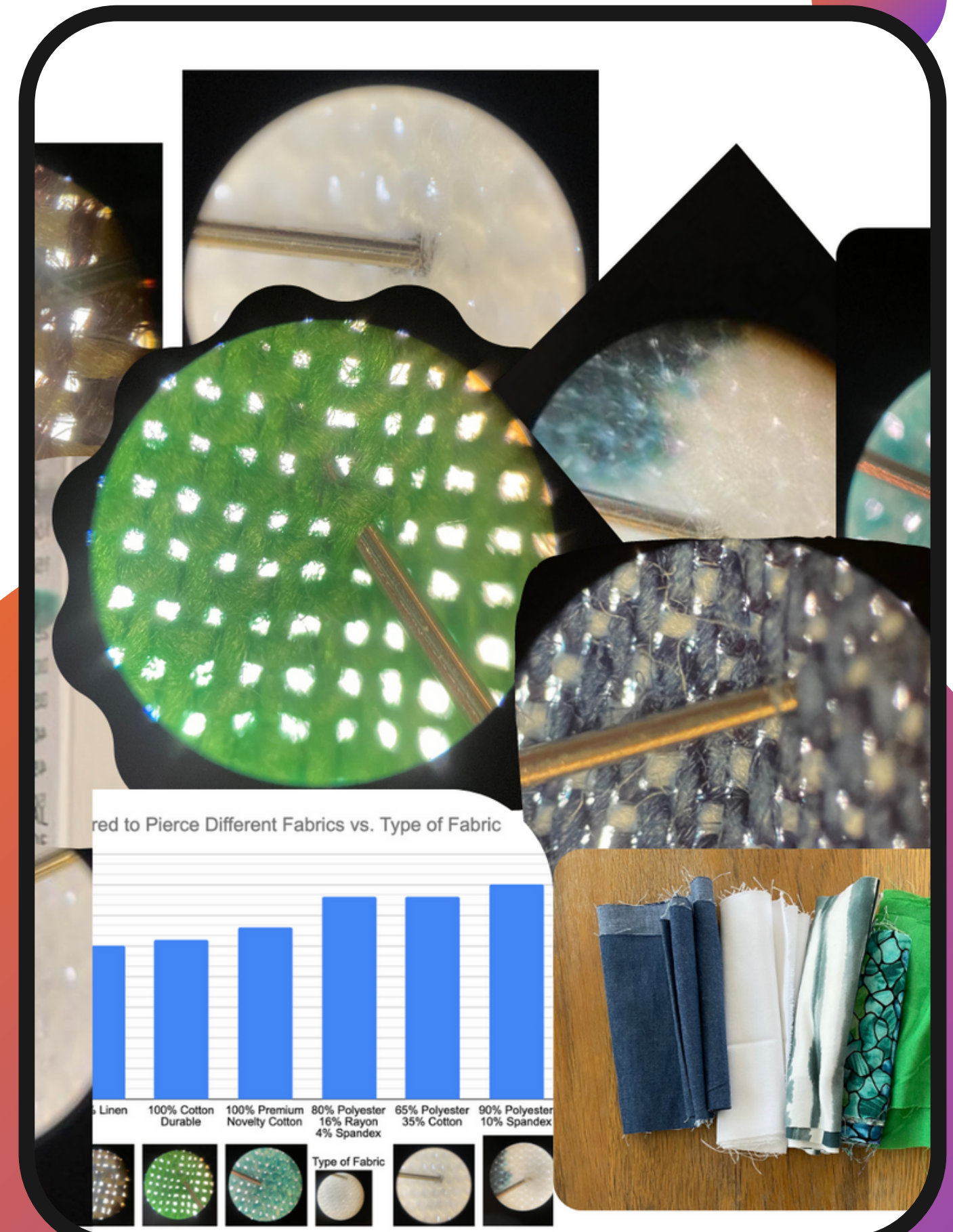
- Discovering which fabrics prevent mosquito bites the best
- Aiming for a deeper analysis
- Being creative and working with what I have
- Using this project to help people

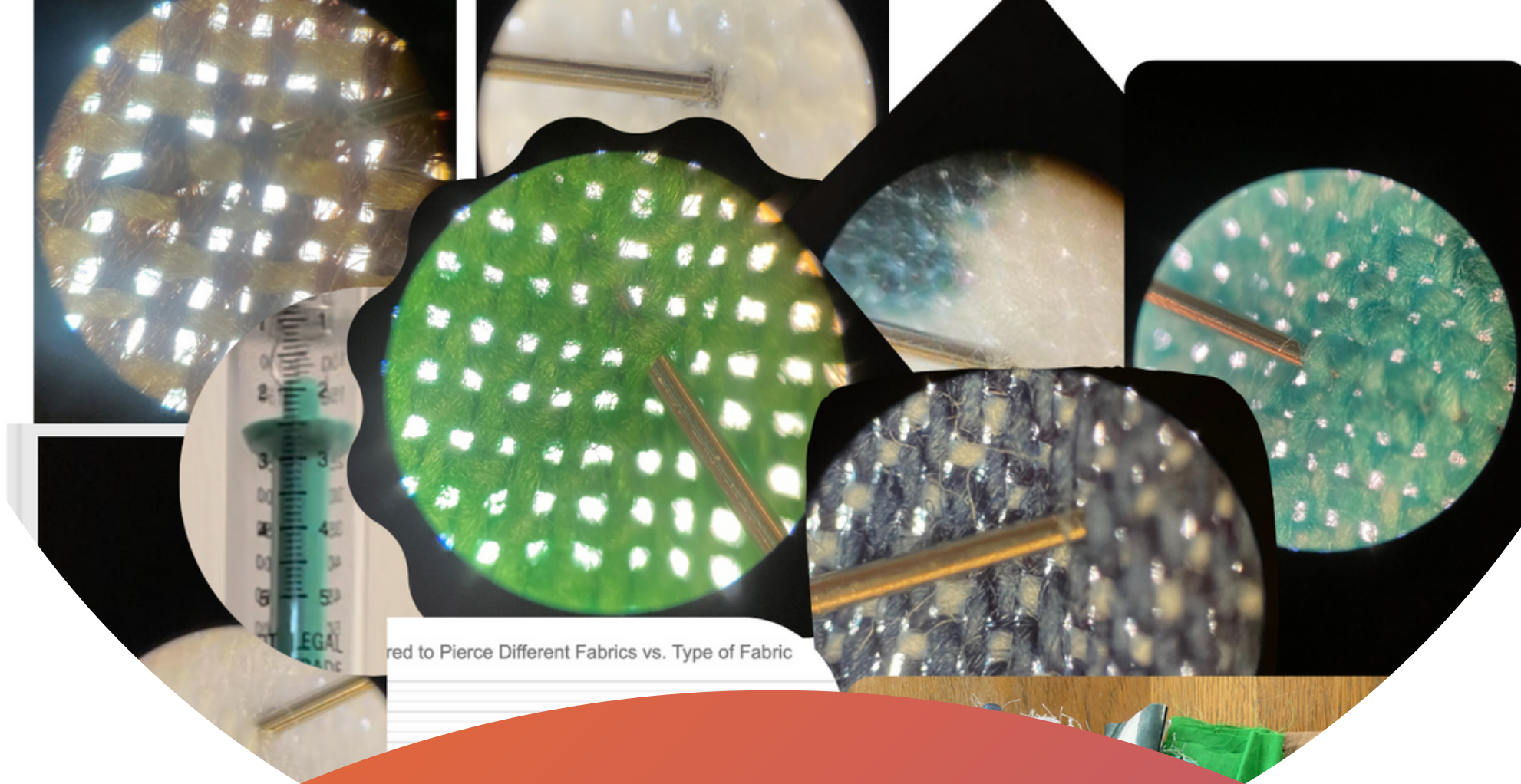


# Bibliography

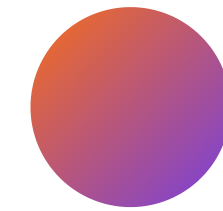
Whelan, Corey. "Can Mosquitoes Bite Through Clothing?" Healthline, 24 Aug. 2020, <https://www.healthline.com/health/can-mosquitoes-bite-through-clothing>

Quiros, Gabriela. "WATCH: Mosquitoes Use 6 Needles To Suck Your Blood" NPR, 7 June 2016, <https://www.npr.org/sections/health-shots/2016/06/07/480653821/watch-mosquitoes-use-6-needles-to-suck-your-blood>





...red to Pierce Different Fabrics vs. Type of Fabric



**Thank You!**