Team 06: Optogenetics Device for Introducing Neurotechnology to High School Students

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Need:

Neurotechnology Module in BIOMED Summer Academy:
- High- cost stereoscope
- Unstable phone mount
- Tedious setup
- Unreliable

Stereoscope
Camera Mount
Smartphone
Motion Sensor
Arduino Board
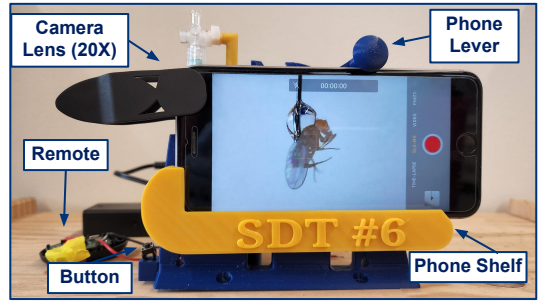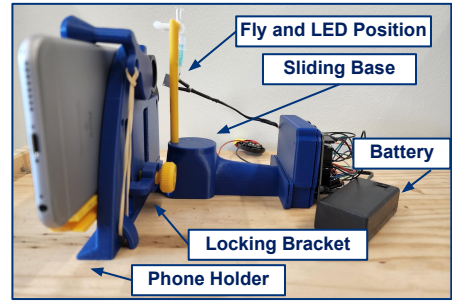Tethered Fly and LED Module

Goal:

Develop a cheaper, sturdier, and more reliable optogenetics device for high school students

Design Inputs:
- Fully and accurately record behavior
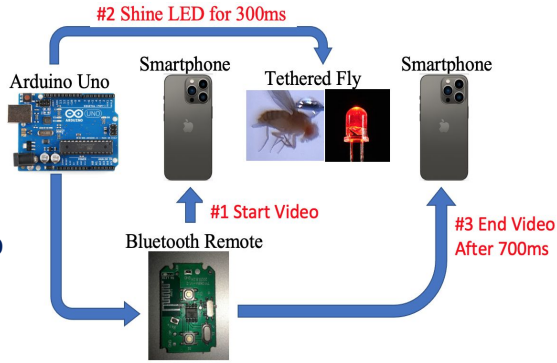- Simultaneous LED and phone camera activation

Solution:

- Utilized affordable attachable lens and a smartphone camera
- Simplified setup by integrating a 3D-built phone holder

Fly and LED Position
Sliding Base
Battery
Locking Bracket
Phone Holder

Camera Lens (20X)
Phone Lever
Remote
Button
Phone Shelf
SDT #6

Approach:

- Smartphone is paired to Bluetooth remote
- Arduino automates video recording and delivery of LED stimulus

#2 Shine LED for 300ms
Arduino Uno
Smartphone
Tethered Fly
Smartphone
#1 Start Video
Bluetooth Remote
#3 End Video After 700ms

Testing & Results:

Test	Range	Result
Successful Recording	700 ms total, > 240 fps	Pass
Light Intensity	16 ± 2 mW / cm^2	Pass
Accurate Placement of Fly to LED	< 1.0 cm	Pass
Accurate Placement of Fly to lens	1.5 - 2.1 cm	Pass
Reduced Setup Time	$< 8.3 \pm 3.4$ min	Pass

Impact

- Allow high school students to perform high level neurotechnology experiments
- Bridge the gap between high school neuroscience exposure and professional opportunities
- Provide low-cost alternative to laboratory grade equipment