**Project Title:** *ECRL (Eye Comfort Reading Light)*  
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**Project Progress Update**

Since our last report, we have made significant advancements across theoretical, practical, and software components. Most notably, we implemented a **dual-LED system**, where **each LED independently adjusts brightness and color based on ambient light intensity and temperature**. This feature is functional but requires **further software refinement**. Hardware, as tested, has reached its practical limits for improvement.

As outlined in **Reports 2 and 3**, our focus shifted to **color blending** based on environmental conditions. Our goal remains to **combine yellow and white LEDs** to create a reading light that is both **visually comfortable and biologically appropriate**. We transitioned from a **non-linear photocell** sensor to a **TCS34725 RGB** sensor for more precise light readings.

We developed two software versions: one managing temperature alone, and a second integrating both **intensity and temperature** control. Testing revealed several logic flaws, particularly around **boundary conditions**, which are discussed below. Over the past 48 hours, we restructured and optimized the software, significantly improving its functionality.

A key breakthrough was reducing hardware dependencies: we **eliminated the photocell**, relying solely on the **TCS34725**. Additionally, we **overcame a previous limitation** where LED brightness was capped at 50 (out of 255). Through **software optimization**, we achieved full-range control (0–255), vastly improving performance.

As stated in **Report 3**, “These software modules are currently prepared for upcoming testing phases.” We have now **completed** those practical tests. The **TCS34725 has been fully integrated**, addressing the previously reported **sensor availability issue**.

**Challenges Encountered**

**1. Hardware Limitations**  
 As described in earlier reports, **non-linear responses** from standard LEDs and photocells limit precision. While we’ve mitigated visual flicker using rapid stepwise adjustments in the Arduino loop, the **underlying issue remains unsolved** due to inherent LED hardware constraints.

**2. Software Logic Flaws**  
 Boundary conditions are not yet fully optimized. For instance, under **low-light conditions**, the system compensates incorrectly by **increasing the dimmer LED’s output instead of decreasing the brighter one**, leading to an **imbalance** between output light intensity and environmental darkness.

**Future Objectives**

Our immediate goal is to refine the **software logic**, particularly around **boundary management**, to ensure ideal environmental compatibility. While the **project is functionally complete**, these final refinements will enhance performance and polish.

**Upcoming Milestones**

* **Software Refinement:**  
  Estimated time: **1–2 days**

Next report submission is anticipated in 2 days at most. It will probably be our last report on about this project. We will demonstrate our project for our supervisor right after.