An Interactive, Learning-based Simulation of Light Pollution

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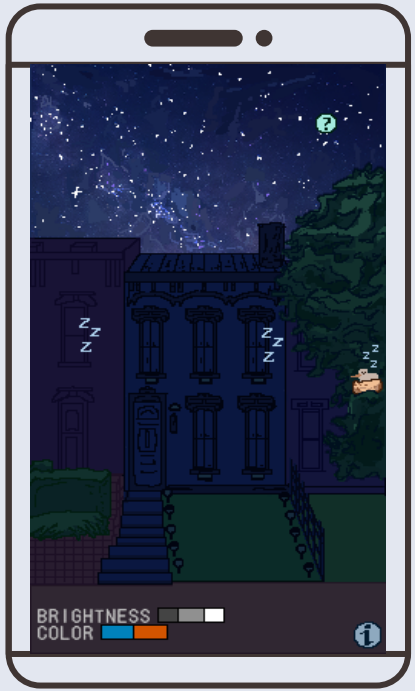
Proposal

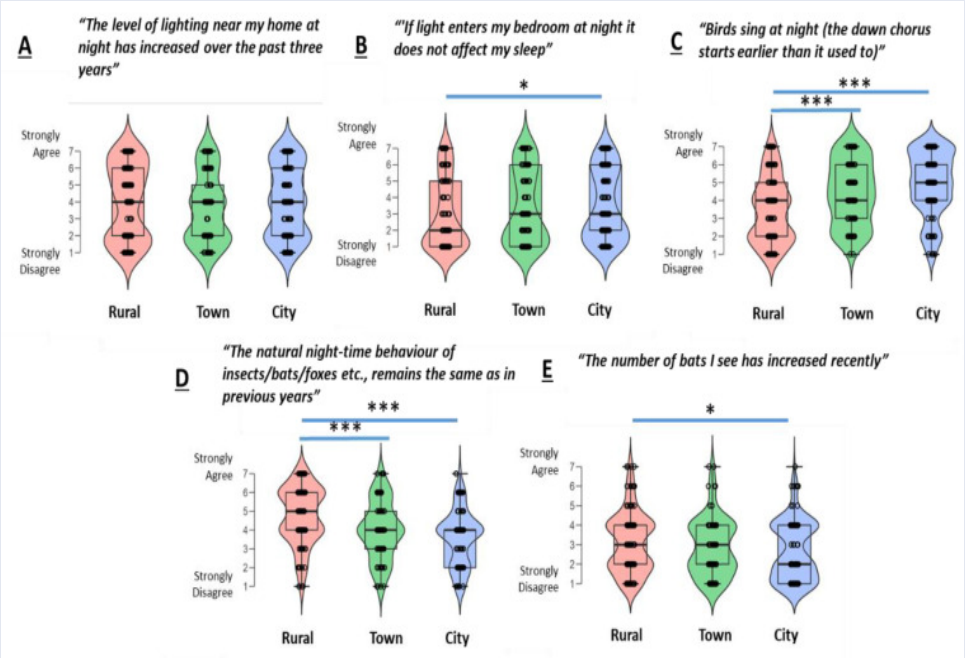


- Product: an interactive website or exhibit where a user controls residential lighting and learns about light pollution in the process
- Audience: Adult Environmentalist
- Goal: Inspire users to make light pollution-friendly lighting decisions in the real world

Interactive exhibits are more effective for learning because they are personalized and engaging (Women Tech, 2025).

Why this Project?

- Adults, especially older (55+) adults, tend to underestimate the dangers of light pollution (Coogan et al., 2020).
- In most highly populated areas like cities, private property takes up more space than public property and thus has the potential to generate the most light pollution.
- In many parts of the world, light pollution regulations lag behind scientific research, so it is up to the consumer to make light pollution-friendly decisions (Law et al., 2024).



Survey results, International Journal of Environmental Research and Public Health

How It Works

01

User clicks lights to toggle them on/off

02

User switches lights between cool- and warm-toned options

03

User controls the brightness of lights

04

User observes their surroundings as they make their lighting decisions

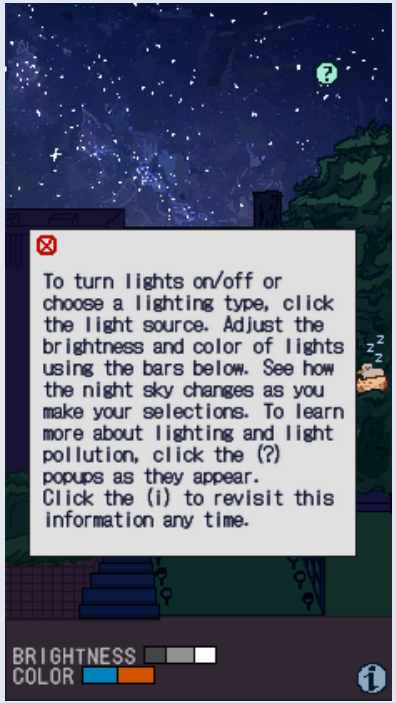
05

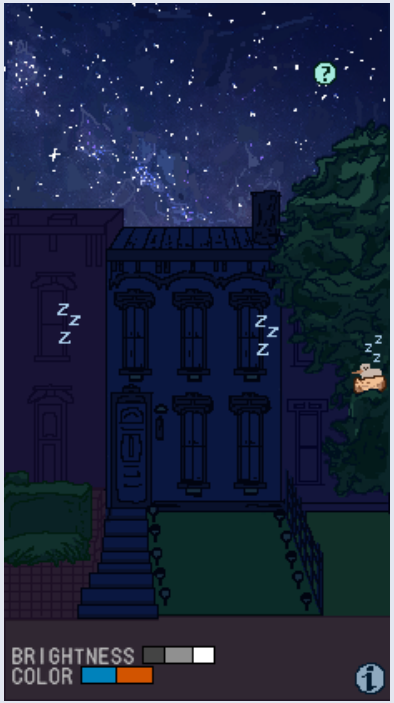
User clicks on (?) popups as they appear to learn specific information about their choices

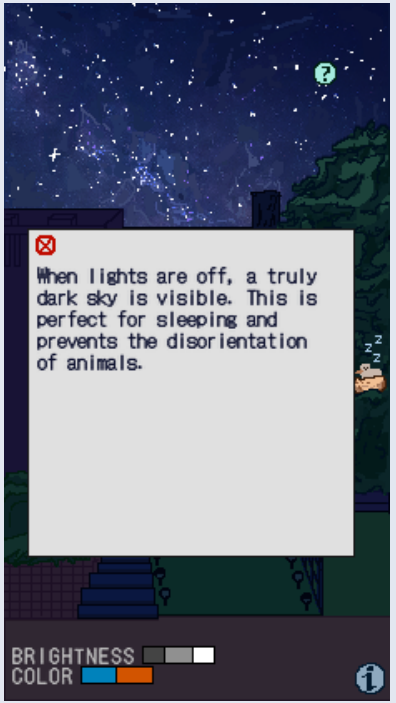
06

User takes the information learned during the experience and applies it in the real world

Introduction







Light Pollution and Humans

Light Pollution Disrupts Sleep

ALAN:

- **Suppresses melatonin production**
- **Disrupts the circadian rhythm**

These disruptions are linked to cancer (Haim and Zubidat, 2015) as well as heart disease (Mason et al., 2022).

Blue Lights' Effects on Sleep

While ALAN in general leads to poor sleep, blue lights are the most significant suppressor of melatonin and should be avoided (Harvard Health, 2024).

Light Trespass Disturbs Others

Light trespass is defined as light spilling into areas it is not wanted (Dark Sky International).

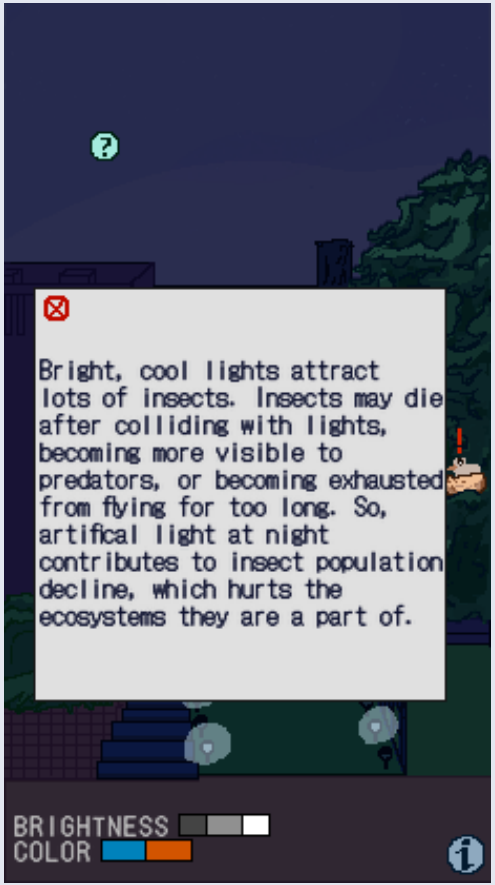
This frustrates neighbors and makes entire communities more susceptible to sleep issues.

Light Pollution and the Ecosystem

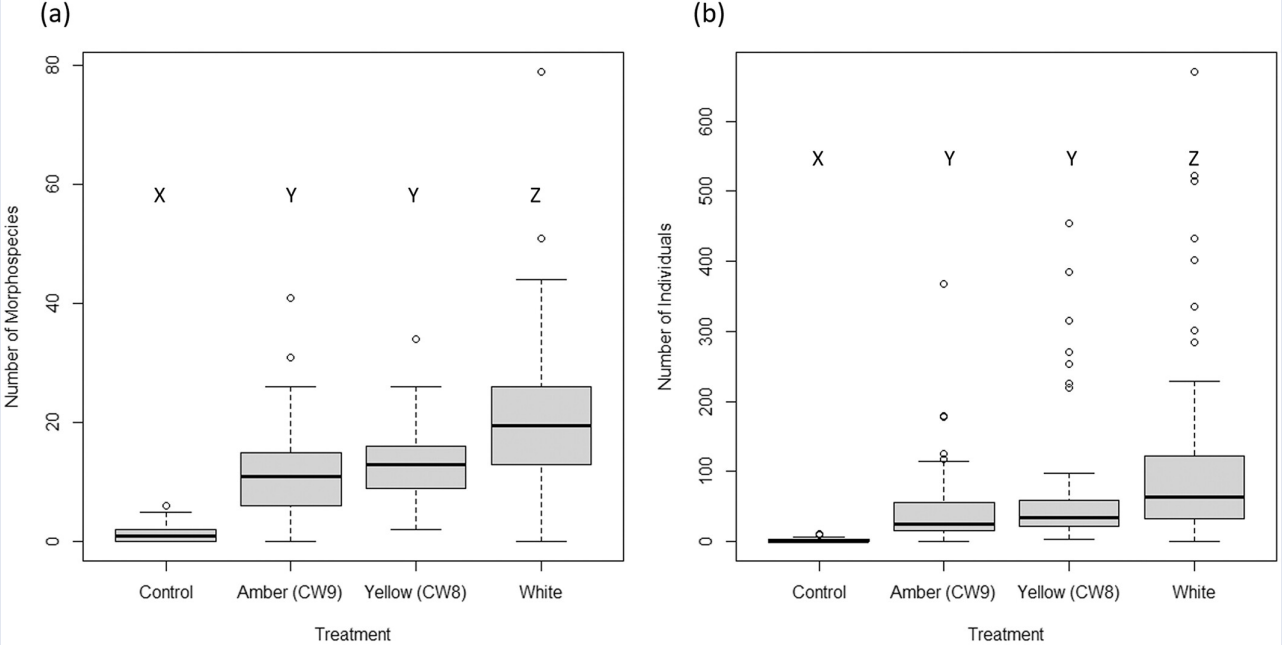
Insects and ALAN

Insect populations are declining, and ALAN is contributing to that decline

- Most insects greatly prefer cool-toned lights (Deichmann et al., 2021)
- Greater attraction means greater ALAN-related insect deaths



Insects Prefer Blue Light

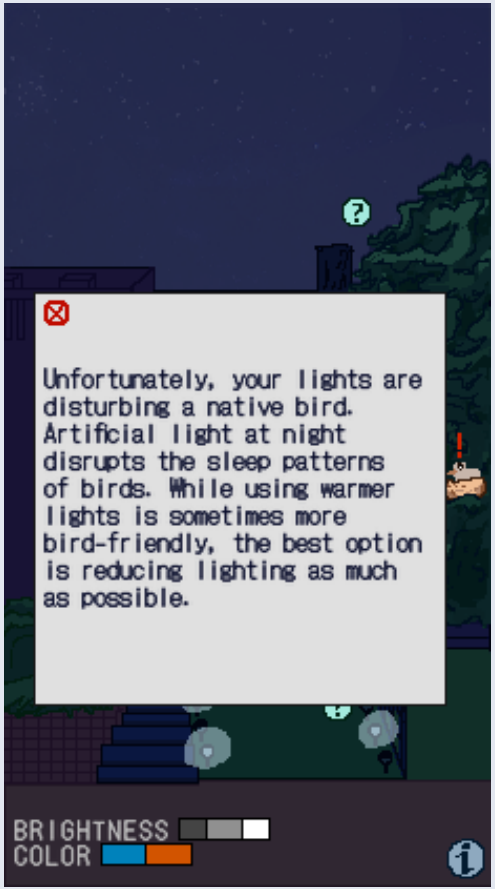


Royal Entomological Society

Birds and ALAN

Like humans, the sleep patterns of birds are disrupted by ALAN (Aulsebrook et al., 2020)

- While the long- term effects of sleep deprivation of birds due to ALAN are unclear, birds' health and survival are likely impacted.



Birds and ALAN cont'd

Birds are more likely to collide with windows when they are emitting light (Lao et al., 2020)

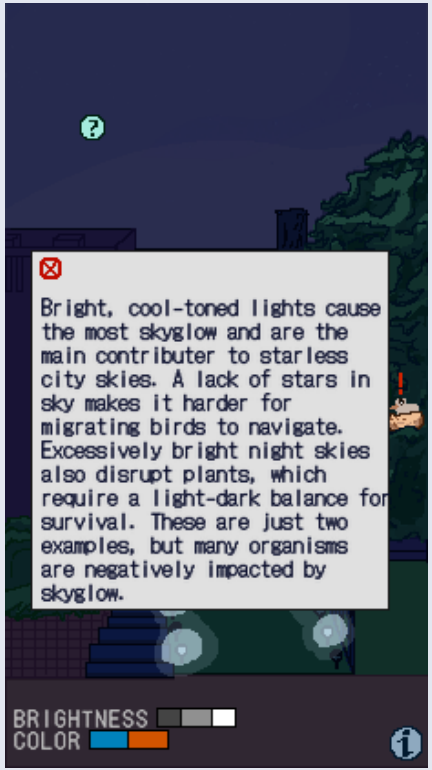
- Increased window collisions due to ALAN mean migratory birds face a greater risk during their journey

Broader Effects of Light Pollution

Residential Lighting has Far-Reaching Effects

Skyglow: the brightening of the night sky caused primarily by artificial light sources

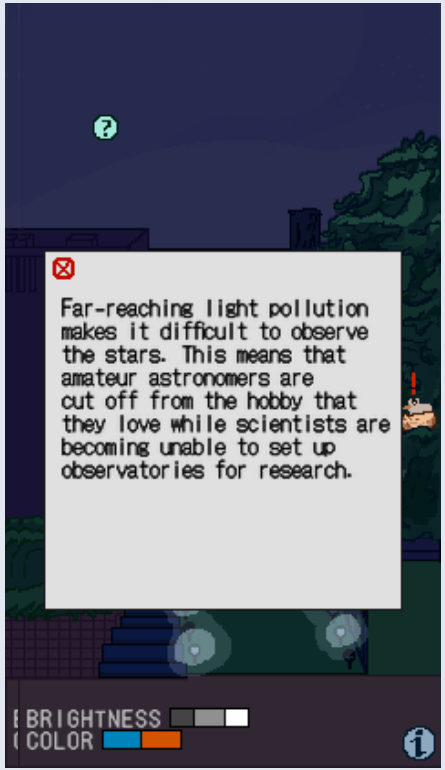
Bright, Cool Lights and Skyglow



The brighter and cooler lights are, the more they contribute to skyglow (Flagstaff Dark Skies Coalition).

- Skyglow disrupts the navigation of birds and other animals that move at night (Dark Sky International)
- Skyglow exposes plants to artificial light even if they are not directly under a light source (Solano-Lamphar and Kocifaj, 2018). This impacts their survival because they have evolved to thrive under a light-dark cycle.

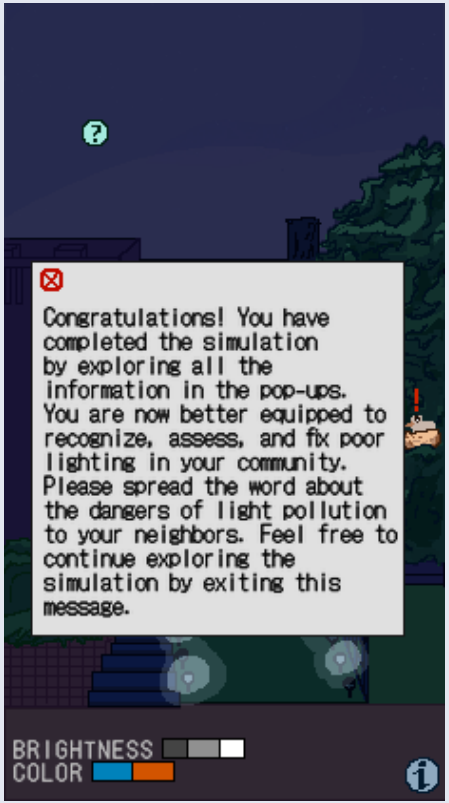
Skyglow and Astronomy



Skyglow is making it increasingly more difficult to observe the stars, which poses issues for astronomers (Falchi et al., 2023).

- When the stars are less accessible, amateur astronomers can no longer partake in stargazing.
- If the stars are not accessible, people are less likely to become interested in preventing sky pollution because they do not know what they are missing.
- Scientists who require dark skies for research are finding that the number of remote areas fit for observatories is dwindling because the reach of skyglow is so vast.

Conclusion



Once the user has opened each of the pop-up messages, the “congratulations!” message will appear.

- Giving the user a sense of accomplishment will help them feel like they learned something important.
- By encouraging the user to spread the word about light pollution, the simulation becomes a tool for broad, community-wide awareness.

Thank you!

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