Dialert:
The silent bus alarm that speaks volumes

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Problem Statement
Dialert enhances bus driver safety by reducing emergency response times and preventing violence-related death aligning with UN-SDG 16.1 to address mental and physical safety inequities.

Objectives

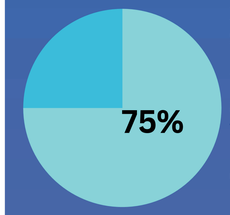
Element	Details	Factors
User	*Primary:* Enhance physical safety of bus drivers *Secondary:* Enhance the mental safety of bus drivers	• Strategically placed to allow for self-defense • Out of reach from intruders • Quick, silent within bus but alerts others outside of the bus to call for help
Prototype	*Primary:* Easy to use for bus drivers	• Single-button press to alert others of emergencies

Design Process

Notice/Empathize	A school bus driver was attacked by an intruder while picking up kids from Longfellow elementary school on September 4, 2021.
Define	The team wanted to create a prototype that would protect bus drivers and passengers by stopping all forms of violence on buses.
Ideas/Brainstorm	**Iteration #1:** Our team reviewed/researched creating a *non-silent* alarm using a CPX (Circuit Playground Express) at the front of the bus.
Design/Create	**Iteration #2:** After interviewing users, we created a *wired silent* alert system with a CPX on the *back of the bus* and built the code, resulting in a prototype that lit up when pressed.
Test/Evaluate	**Iteration #3:** After additional interviews, we tested for prototype functionality *with 2 CPXs* and performed distance tests *using infrared (IR)* to meet the criteria defined by our user.
Improve/Reflect	**Iteration #4:** After our last set of interviews, we refined our prototype to *improve accuracy of flashing lights, coding for an off button,* and ensured it provided a silent and effective solution for the user.

Testing Process
- Test 1: Team pressed button to test user satisfaction of light sequence.
  - Result: Red/white/blue flashing sequence.
- Test 2: Measured response time once prototype was pressed and when the lights began flashing.
  - Result: selected IR button to reduce response time.

Visual Data 1



3 of 4 school/public bus drivers interviewed and involved in testing reported experiencing a bus intruder threatening them

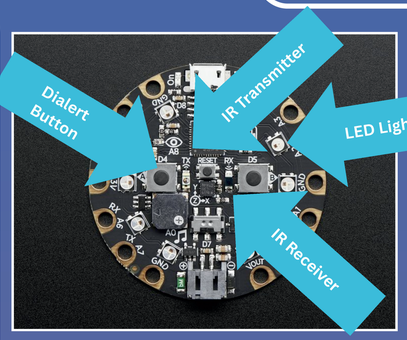
User Requirements

User Needs (Explicit Needs)	Prototype Needs (Implicit Needs)
User needs to defend themselves during an attack	Design must be near user to their left, giving them a chance to stop intruder from their right (Flores, 2025)
Reduce emergency response time during an attack	Dialert must alert citizens to call authorities silently from outside the bus (Leavitt, 2025)

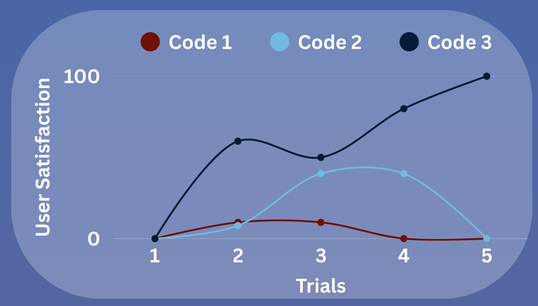
Results
Dialert functions as a silent-alarm system for school/public bus drivers. By having Dialert installed on buses, drivers can
- lessen their anxiety by having a way to alert others of an emergency inside the bus (mental safety inequity)
- have an avenue to quickly and silently alert authorities through strategic placement of the Dialert button, allowing the drivers to protect themselves at the same time (physical safety inequity).

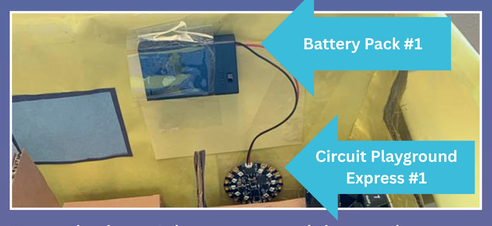
Conclusions
- Dialert has met all the user requirements including discrete and intentional location while allowing the driver to defend themselves and provides a way for others to alert authorities, decreasing emergency response times.
- Our project met the needs of users on UN-SDG16.1 (United Nations, 2025) by reducing the possibility of violence-related deaths.
- Future Improvements: Apply Dialert on a real bus with improved lighting.

Prototype Detail
1) Bus driver presses the Dialert Button
2) A signal is sent from CPX #1 through the IR Transmitter
3) CPX #2 receives signal through the IR Receiver.
4) CPX #2 flashes bright red, white, and blue lights to ensure attention in event of emergency.
5. To turn off the system, bus driver presses both A and B together on CPX#1.

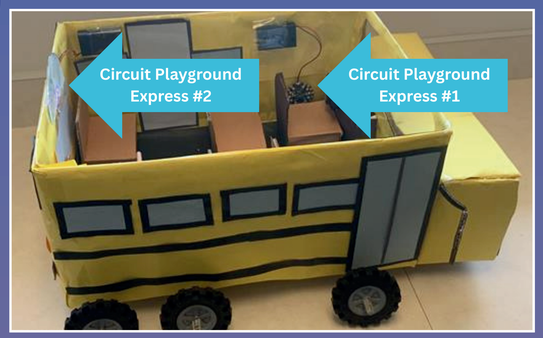


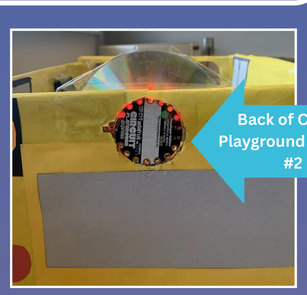
Visual Data 2
- Code 1 loud alert faced issues in volume/siren activation
- Code 2 light sequence activated better but caused delay in response time
- Code 3 used 2 CPXs -provides quick communication/rapid response time from lights on the outside of the bus.

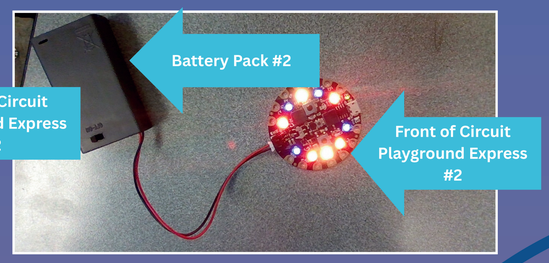




Description: A battery pack is used to eliminate disturbances in power to the alert system.







Description: Photos above demonstrate the circuit playground boards' location/distance between them.

Citations

1.Vanessa Flores, March, 2025, safety specialist *[Interview]*
2.Brian Leavitt March, 2025, Ochoa Middle School Principal *[Interview]*
3. United Nations, 2025, "Sustainable Development Goals" *[Website]*