

UW Board of Trustees Research and Economic Development Committee  
Agenda  
May 13, 2026, at 1:00 pm

**Public Session:**

Agenda #	Description	Page #
1.	<b>Research Excellence Presentations: Senior Design Projects – CEPS</b> Dr. Steve Barrett <ul style="list-style-type: none"><li>• James Willis, BS Computer Engineering, Rainier WA <i>Project Dandelion: Multipoint Portable Audio Entertainment System</i></li><li>• Hailey Litzinger, BS Electrical Engineering, Casper WY <i>Classroom Cultivator</i></li><li>• Amber Budge, BS Electrical Engineering, Jackson WY <i>Augmented Communication Device</i></li></ul>	3
2.	<b>UW Internship plans</b> <b>Interim Provost Anne Alexander, Vice Provost Michelle Hilaire</b> <b>Vice President Parag Chitnis</b>	61
3.	<b>REDD Updates</b> <b>Vice President Parag Chitnis</b>	62

**Research and Economic Development**  
**COMMITTEE MEETING MATERIALS**

**AGENDA ITEM TITLE: Research Excellence Presentations: College of Engineering and Physical Sciences – Senior Design Projects– Steve Barrett, Danny Dale**

- OPEN SESSION  
 CLOSED SESSION

PREVIOUSLY DISCUSSED BY COMMITTEE:

- Yes  
 No

FOR FULL BOARD CONSIDERATION:

- Yes [Note: If yes, materials will also be included in the full UW Board of Trustee report.]  
 No

Attachments/materials are provided in advance of the meeting.

EXECUTIVE SUMMARY:

College of Engineering and Physical Science Students present on their Senior Design Projects

- **James Willis**, BS Computer Engineering, Rainier WA  
*Project Dandelion: Multipoint Portable Audio Entertainment System*  
Current solutions are either too complex and cumbersome, or cheap and provide poor coverage. James identified a gap for outdoor education, fitness and community organizations that need simple portable options. His intended audience is teachers, small business owners and entertainers.
- **Hailey Litzinger**, BS Electrical Engineering, Casper WY  
*Classroom Cultivator: An Autonomous Greenhouse for Elementary Classrooms*  
Hailey identified a problem that limits in-classroom plant lifecycle learning and identified a need for a simple, automated solution. Her automated greenhouse system enables hands-on plant growth observation and is designed for low maintenance and safety.
- **Amber Budge**, BS Electrical Engineering, Jackson WY  
*Augmented Communication Device*  
Amber designed a wearable device that can record and playback several different messages to be used as a communication aid. This targets someone with a speech disorder and helps with fast, simple communication in everyday settings.

PRIOR RELATED COMMITTEE DISCUSSIONS/ACTIONS: **Information only**

WHY THIS ITEM IS BEFORE THE COMMITTEE: **Information only**

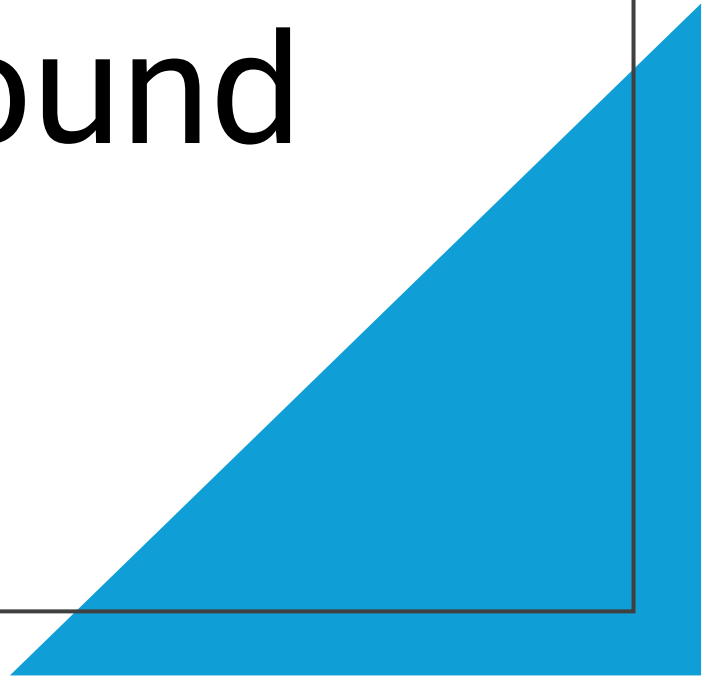
ACTION REQUIRED AT THIS COMMITTEE MEETING: **None**

PROPOSED MOTION: **N/A**

# PROJECT DANDELION: Unbound Wireless Sound

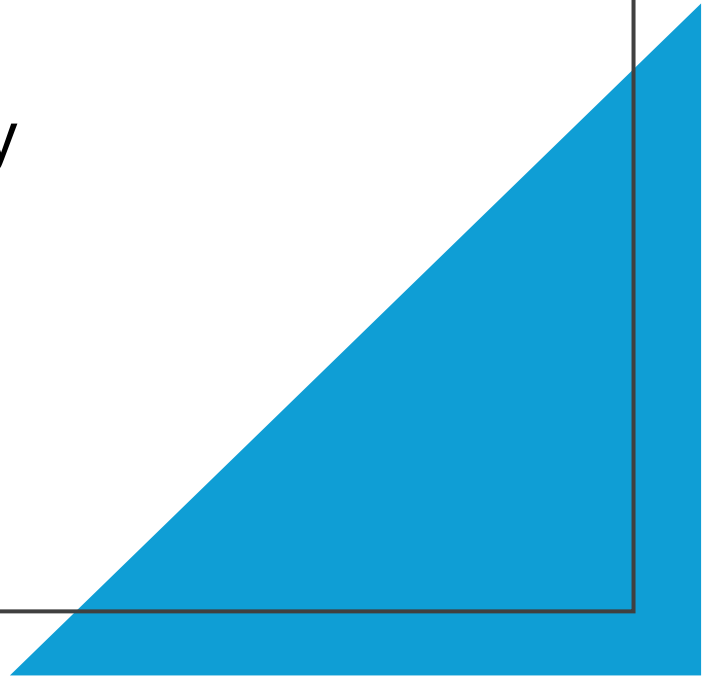
James Willis

Advisor: Jon M. Pikal

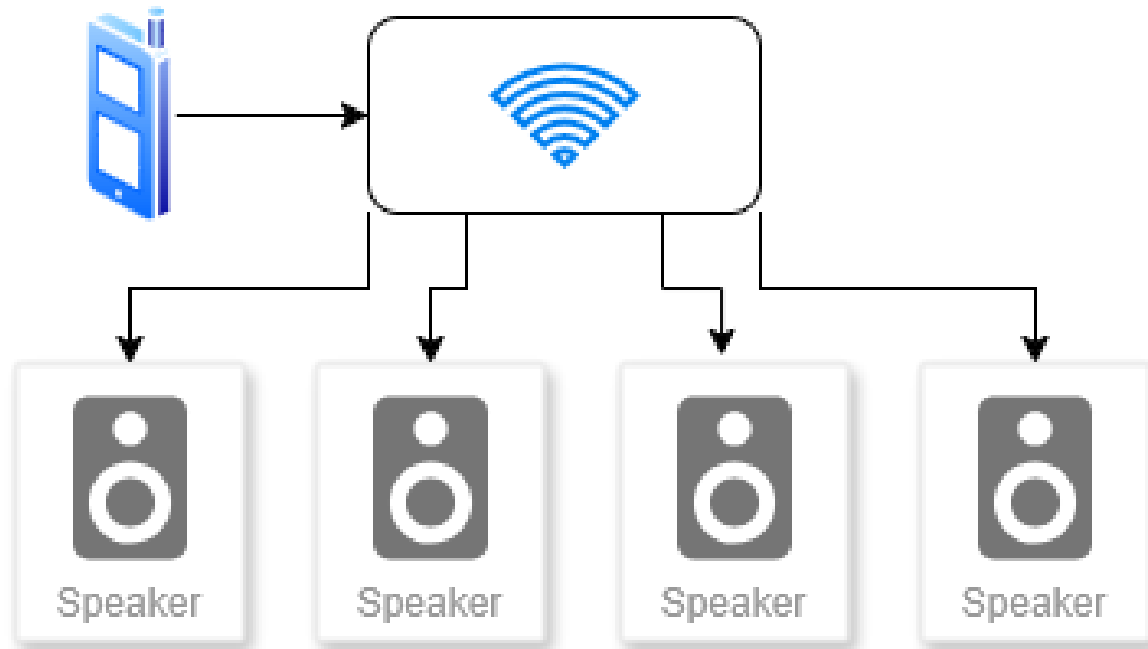


# The Problem

- Current Solutions:
  - Professional audio (complex and cumbersome)
  - Cheap portables (poor coverage)
- Gap: outdoor education, fitness, community organizations need simple portable options
- My audience: teachers, small business owners, entertainers

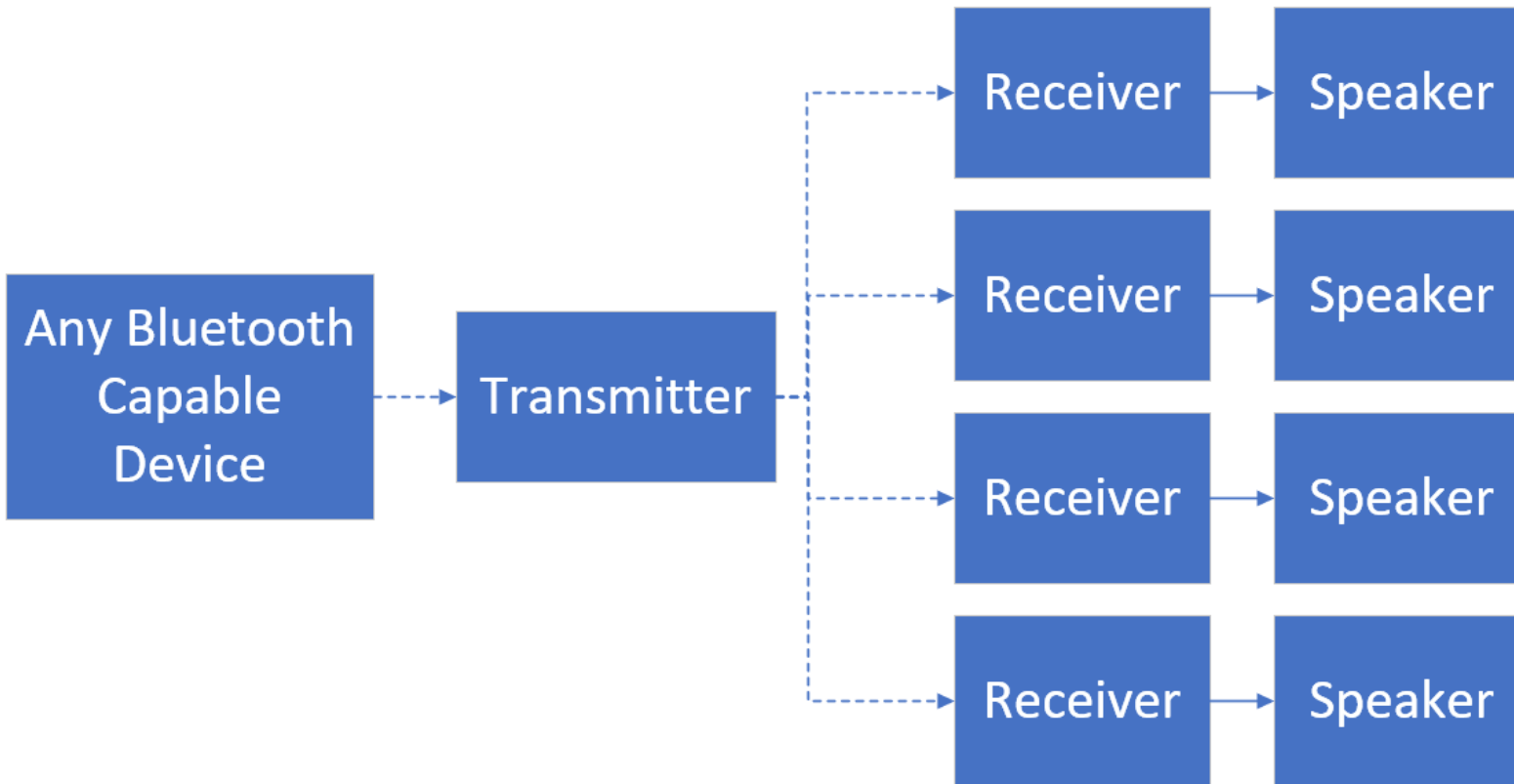


# Project Dandelion Solution

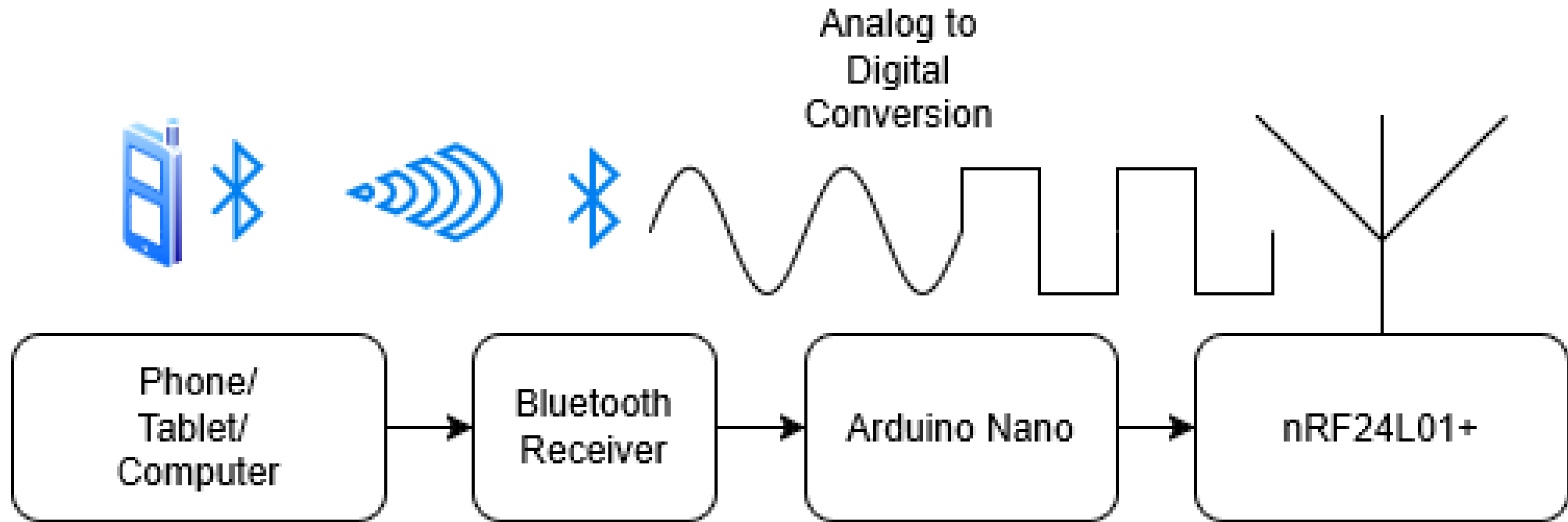


- Single, easy-to-connect transmitter
- Unlimited wireless speakers
- Battery-powered
- Long-range

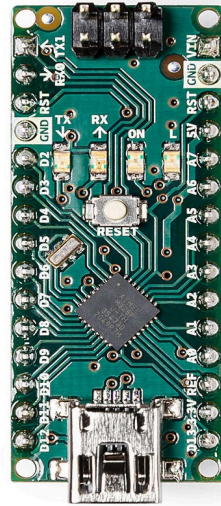
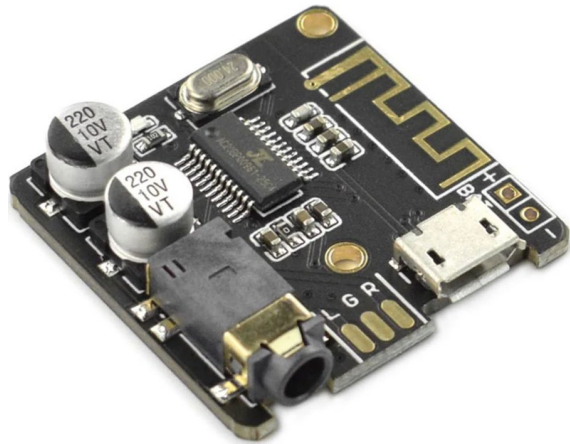
# System Architecture



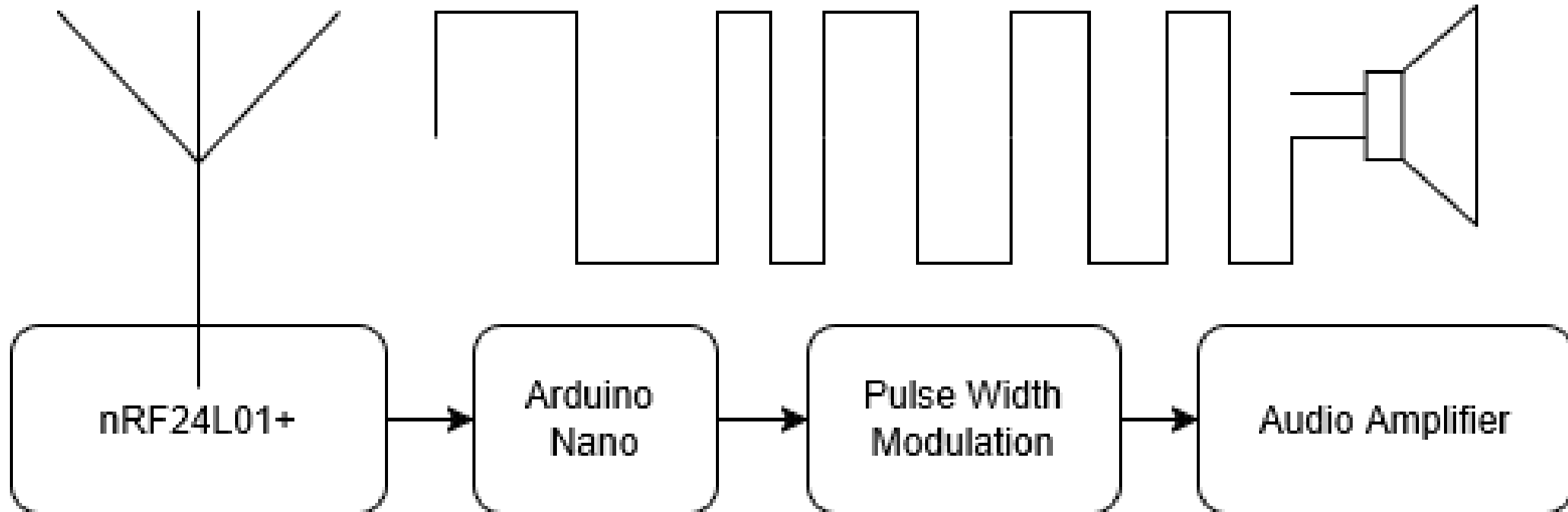
# Transmitter Architecture



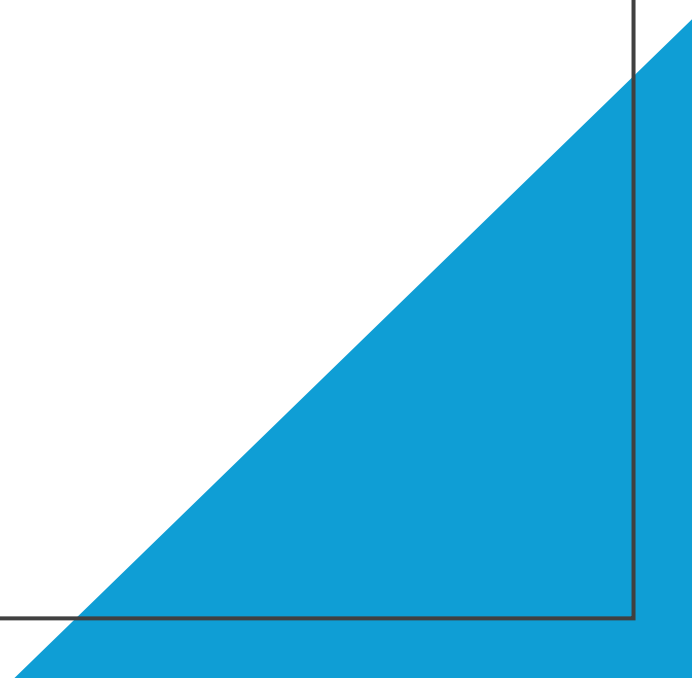
# Transmitter Architecture



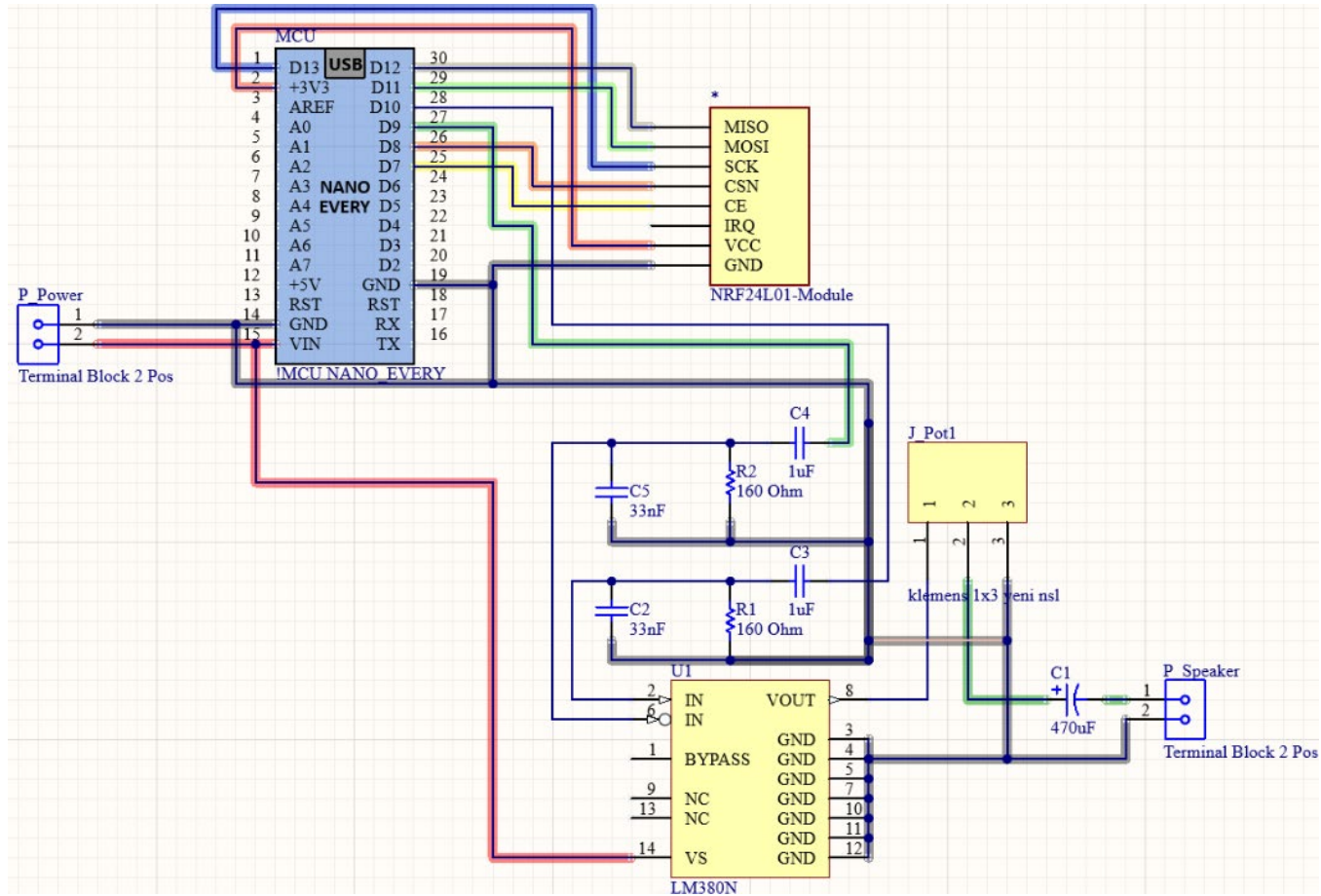
# Receiver Architecture



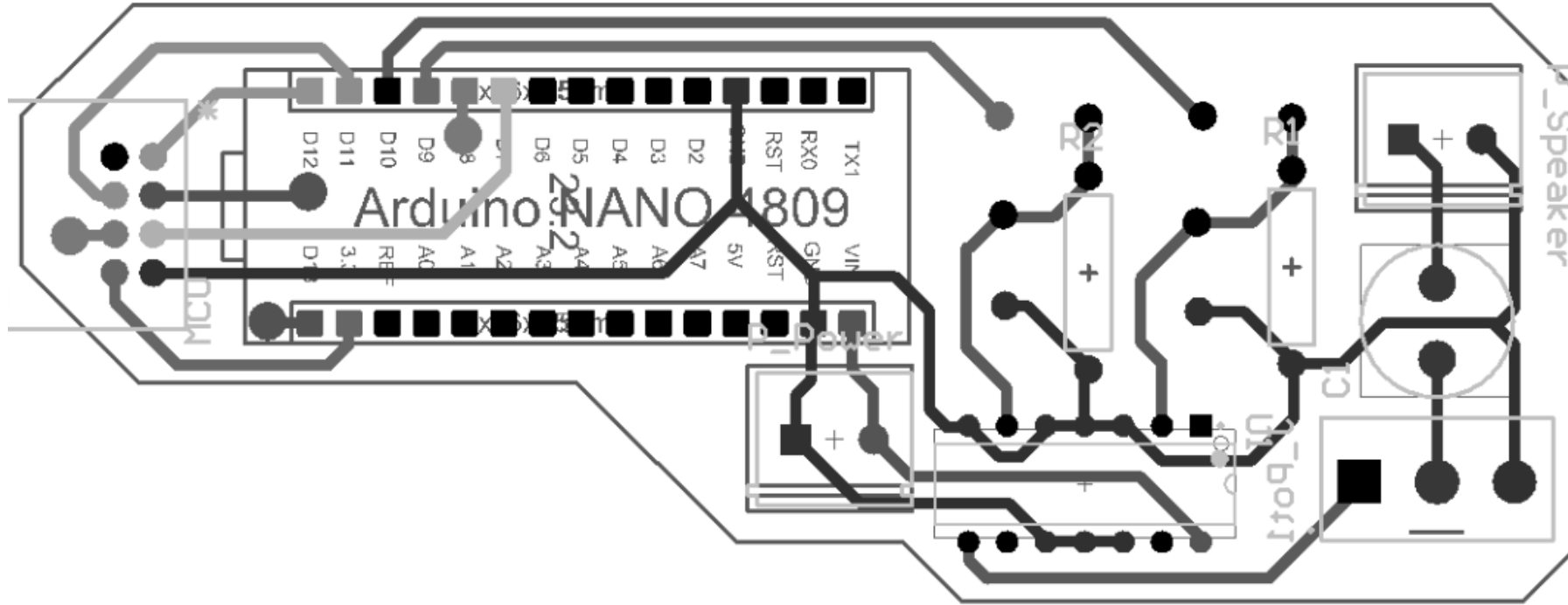
# Technical Specifications

- 8-bit analog-to-digital converter
  - 24 kHz sampling rate
  - 12V @ 6Ah Li-Po battery
  - 8W (0.697A) average power draw
- 
- A blue triangular graphic is located in the bottom right corner of the slide, pointing upwards and to the left.

# Schematic



# PCB



# COST ANALYSIS: Prototype

ITEM NAME	QUANTITY	COST PER UNIT	TOTAL COST
Speaker	4	\$ 14.99	\$ 59.96
Arduino Nano	4	\$ 3.79	\$ 15.16
12V 6Ah Battery	4	\$ 7.21	\$ 28.84
VHM-314 Bluetooth Adapter	1	\$ 2.50	\$ 2.50
nRF24L01 module	4	\$ 3.59	\$ 14.39
LM380N Audio Amplifier	4	\$ 2.00	\$ 8.00
Passive Components		\$ 5.00	\$ 5.00
Subtotal			\$ 133.85
<b>Total</b>			<b>\$ 139.20</b>

# COST ANALYSIS: Development

ITEM NAME	QUANTITY	COST PER UNIT	TOTAL COST
Sparkfun DAC MCP4725	5	\$ 2.58	\$ 12.88
Arduino Nano Every	6	\$ 12.50	\$ 75.00
JDY-08 Bluetooth Module	5	\$ 2.50	\$ 12.50
Arduino Nano	4	\$ 3.79	\$ 15.16
TPA3118D2DAPR Audio Amplifier	5	\$ 1.73	\$ 8.65 + 6.96 (shipping)
Critical Duplicates			\$ 13.59
Subtotal			\$ 144.74
<b>Total</b>			<b>\$ 150.53</b>

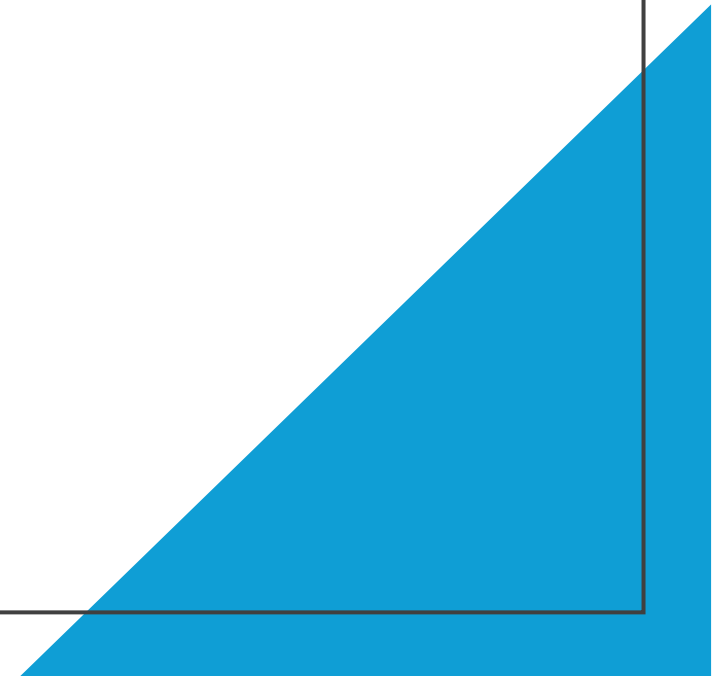
# COST ANALYSIS: Overall

Funding = \$ 250 from the Volpi-Coupal Fund  
+ \$ 39.73 personally funded

Prototype = \$ 139.20

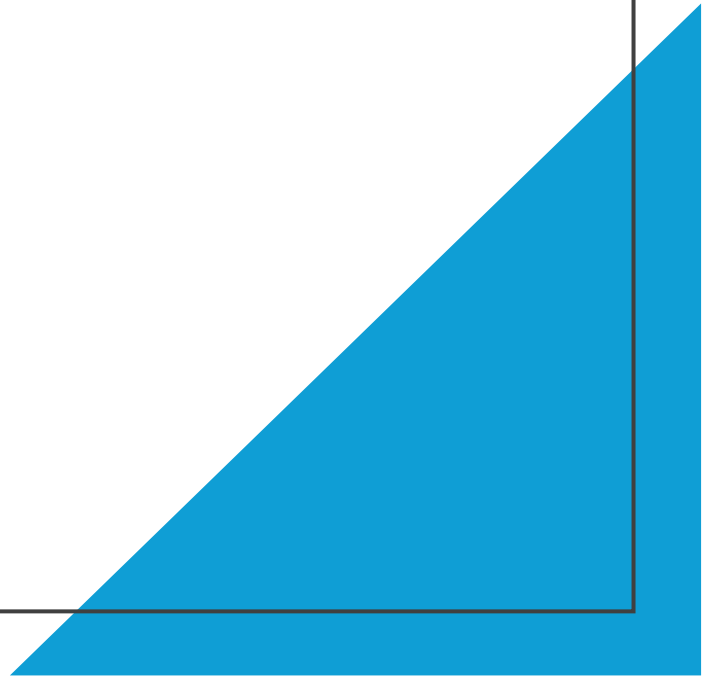
Development = \$ 150.53

True Total = **\$ 289.73**



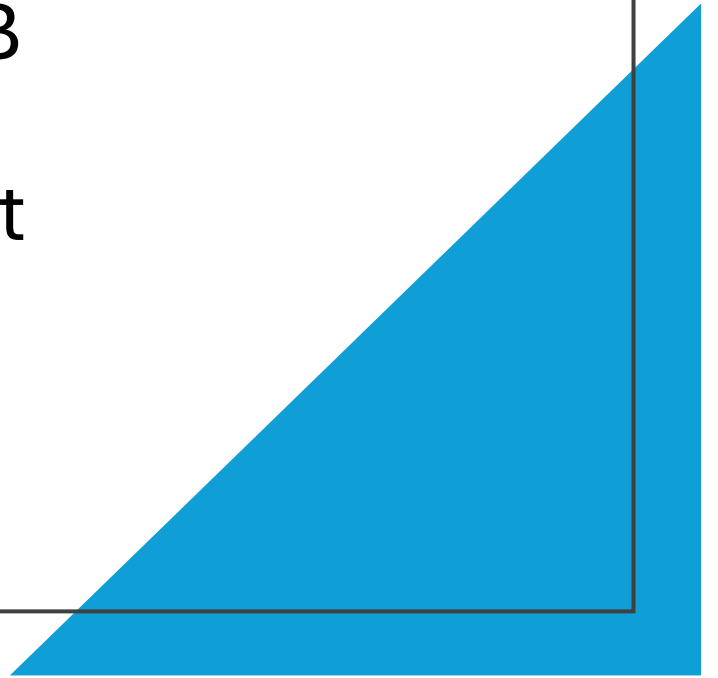
# What works well

- Audio transmission from input to output
- Custom PCB layout improved RF noise
- Clear audio achieved up to 50m
- Custom enclosure completed
- Fully battery-powered



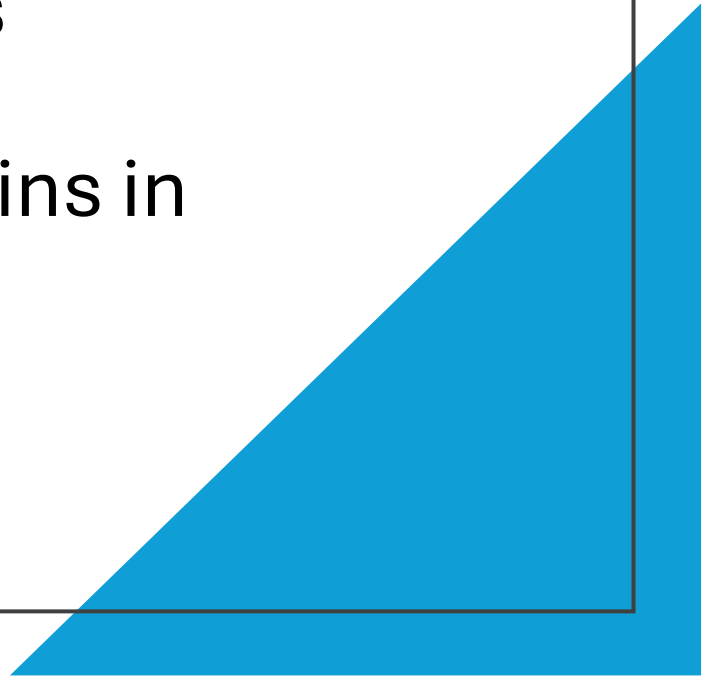
# Challenges & Solutions

- Selecting the correct MCU version
- Audio filtering implementation onto PCB
- Correct speaker and amplifier alignment

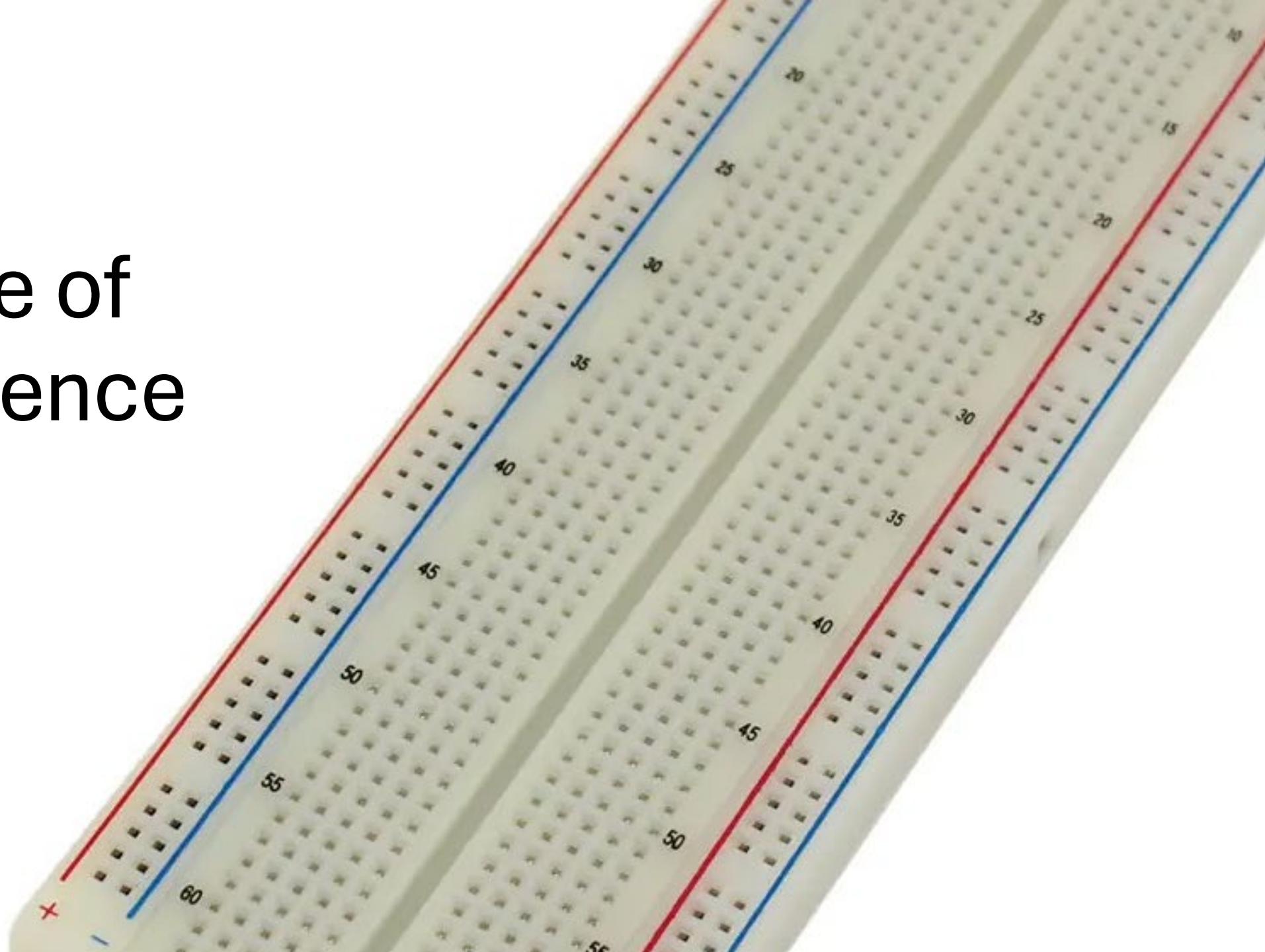


# Lessons Learned

- Sometimes the best solution isn't the most complex
- Trust your ideas, challenge the methods
- Double-check that you are putting the pins in the right direction



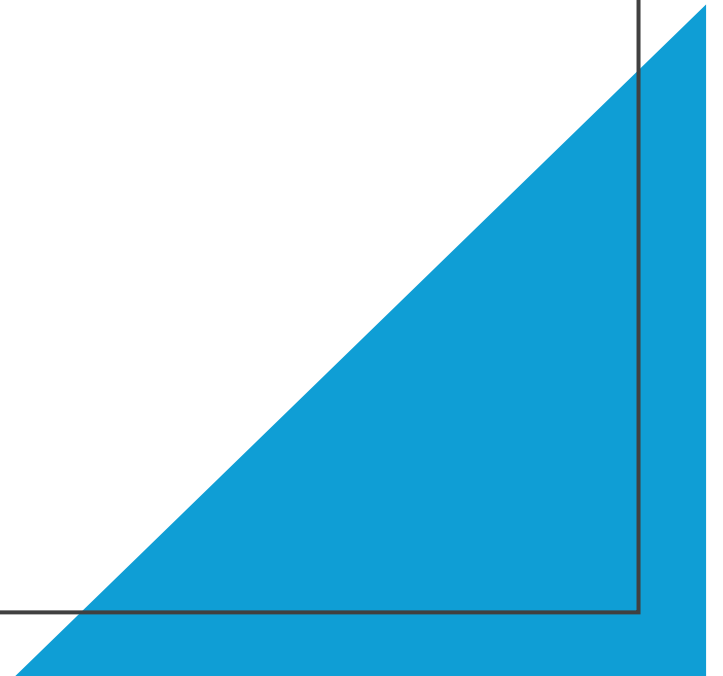
# The Bane of My Existence



# Special Thanks

Electronics Shop (James and John)

TMRh20 (github)





# Classroom Cultivator

An Autonomous Greenhouse for Elementary  
Classrooms

Hailey Litzinger

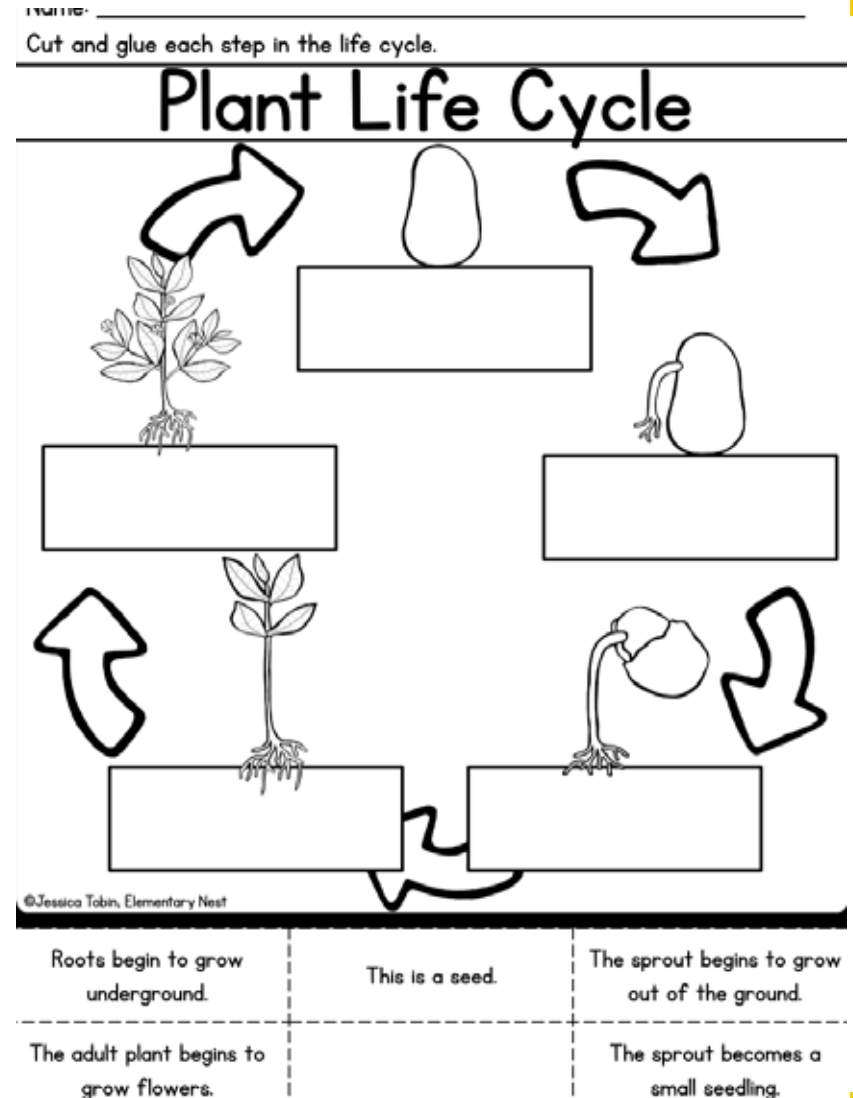
Advisor: Dr. Steven Barrett

# Project Overview

- Automated greenhouse system for elementary classrooms
- Enables hands-on plant growth observation
- Integrates sensors, control logic, and actuators
- Designed for low maintenance and safe operation

# Problem and Motivation

- Limited hands-on plant lifecycle learning
- Most systems require consistent attention from the teacher
- Need for a simple, automated solution

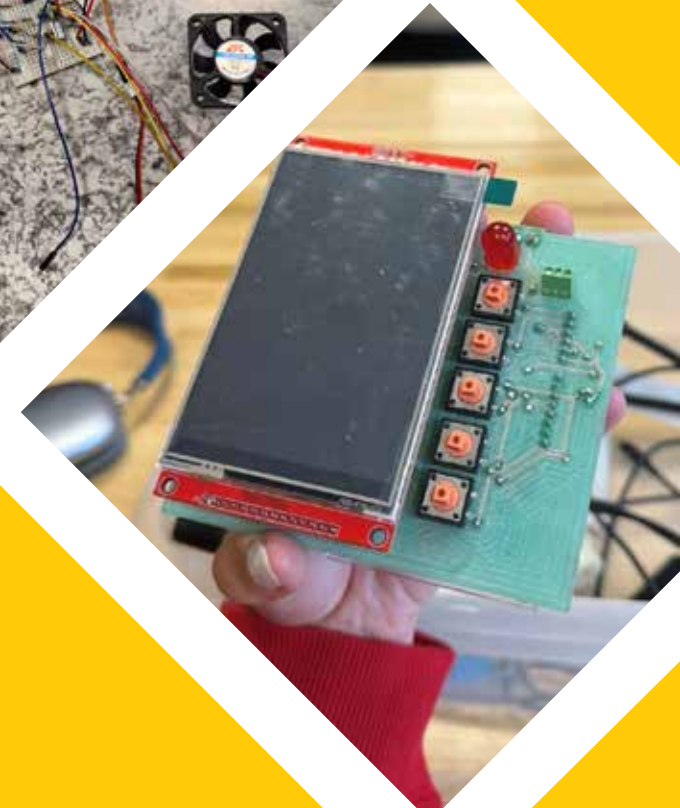
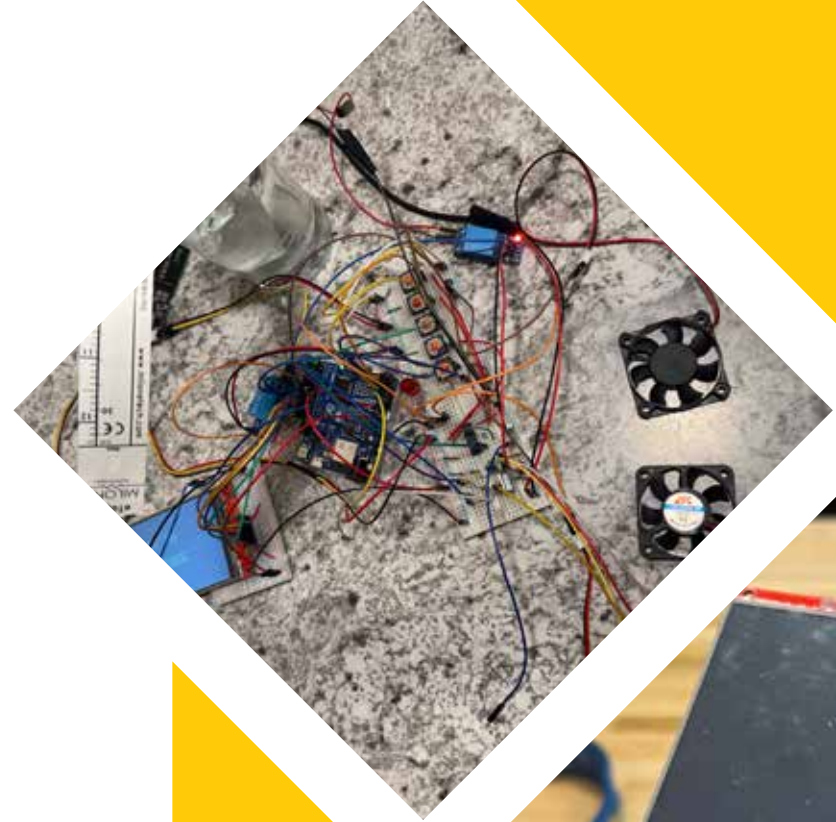


# Project Objectives

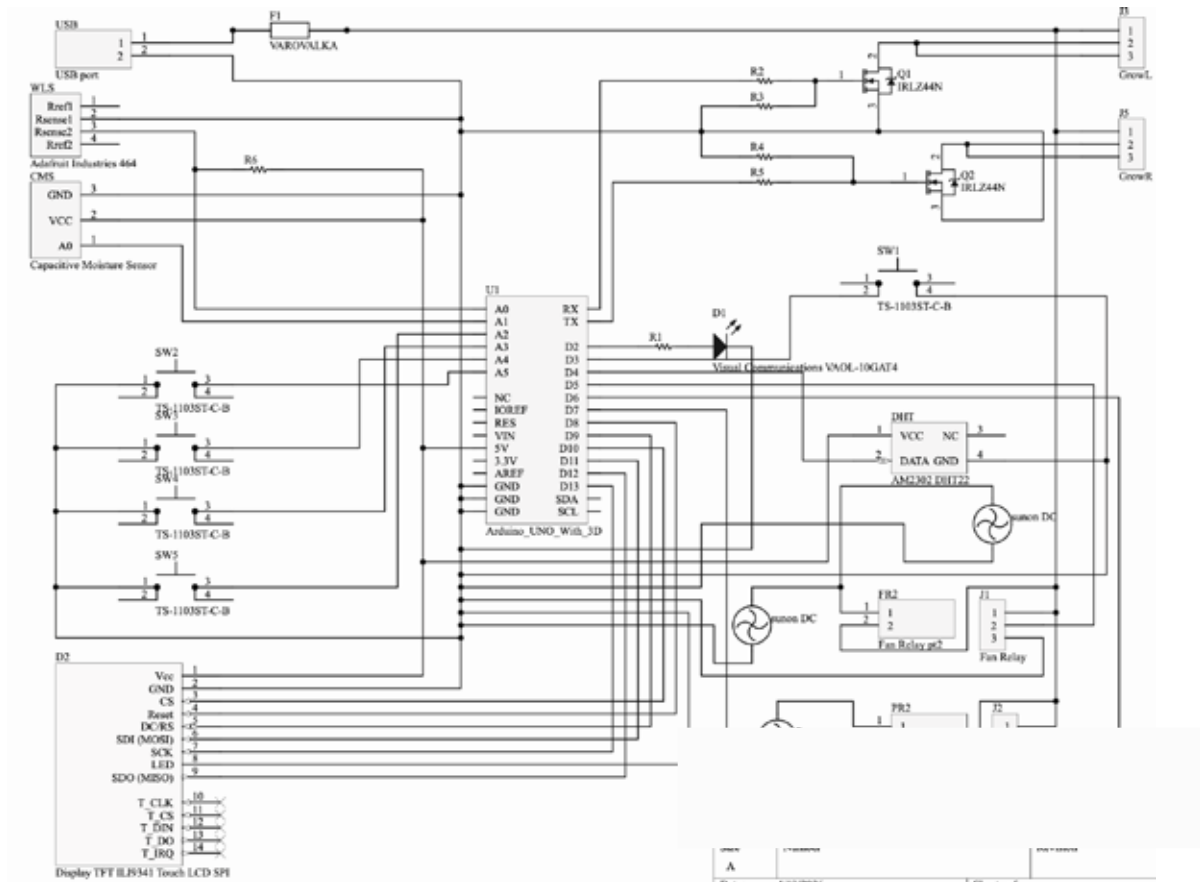
- Automatically maintain optimal growing conditions
- Require minimal maintenance from the user
- Provide real time environmental monitoring
- Ensure safe and reliable classroom operation

# System Overview

- Sensors collect environmental data
- Microcontroller processes inputs
- Actuators respond to maintain conditions



# Hardware Design



- Microcontroller
- Sensors:
  - Capacitive soil sensor
  - Temperature/humidity sensor
  - Milone eTape Sensor
- Actuators:
  - Water pump
  - Fans
  - Grow lights
- TFT display and buttons

# Software and Control Logic

- Threshold-based control system
- Fans and lights respond to desired environmental conditions
- Pump activates when soil moisture falls below a set level
- Various thresholds dependent on type of plants being grown



# System Integration

- Sensors provide real-time input to controller
- Controller sends signals to actuators based on logic
- Display updates with live sensor readings
- Operates autonomously

# Testing Methodology

- Soil moisture response
- Pump activation timing
- Sensor readings in varying environments
- System behavior over extended operation



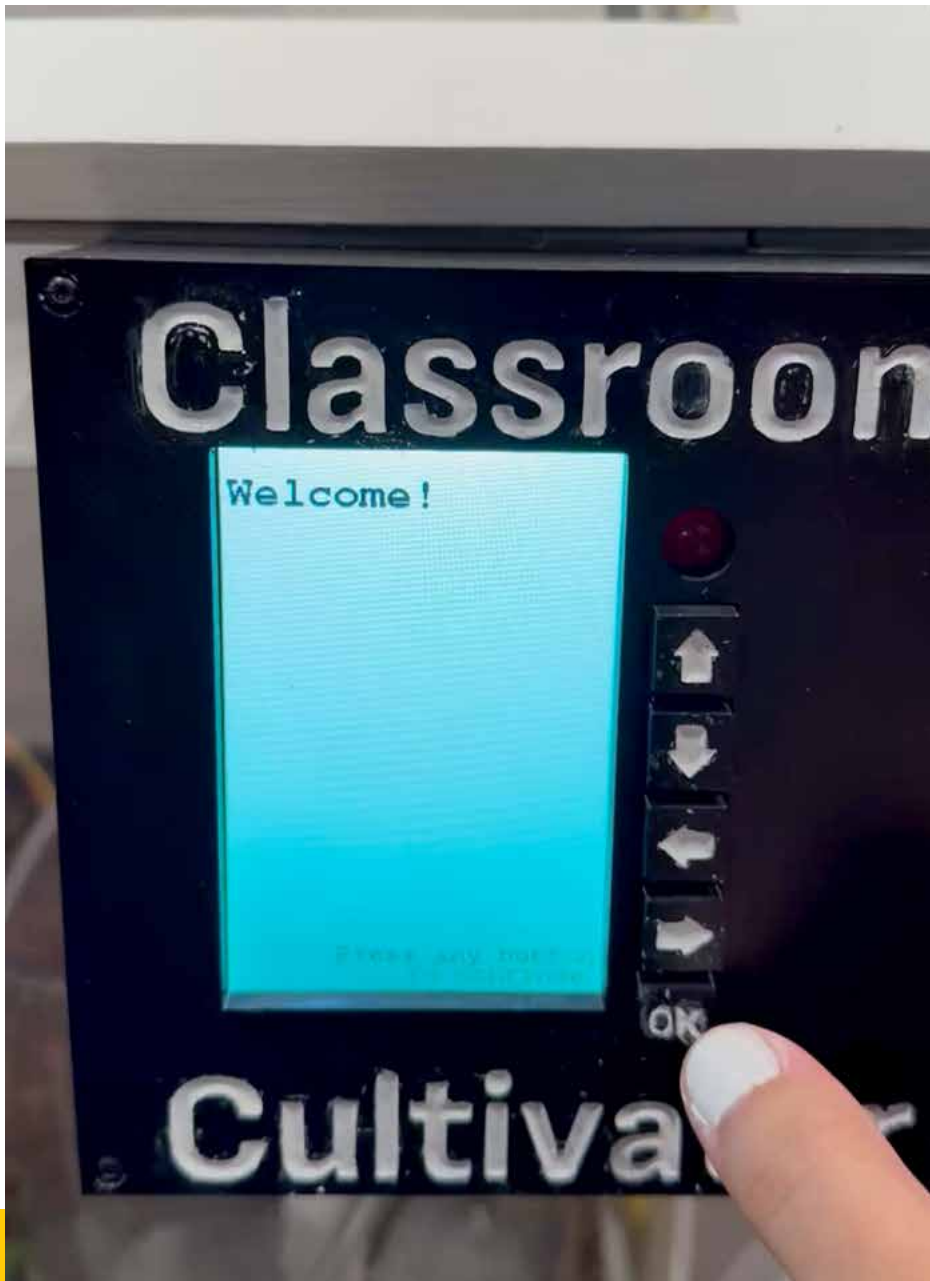
# Results

- Actuators activated when thresholds were met
- Stable operation over an extended period
- Sensors provided consistent and responsive data



# System Demonstration

- Fully functioning prototype
- Sensors correctly triggers system response
- Display provides real-time feedback to user



# Cost Analysis

- Low-cost system using easily accessible parts
- Under-budget in comparison to similar systems

Part	Cost
Arduino Uno R4 WiFi	\$27.50
5V DC Pump and Relay	\$5.00
Capacitive Soil Sensor	\$2.00
DHT22 Temperature and Humidity Sensor	\$8.00
5V Fans and Relay	\$10.00
Milone eTape Sensor	\$30.00
Grow Lights	\$10.00
4.0" TFT SPI Display	\$18.00
Misc.	\$15.00
Enclosure material (estimated)	\$115.00
<b>Total</b>	<b>\$240.50</b>

# Challenges and Limitations

- Power stability issues
- Pump control required many adjustments
- Lack of power for water system
- Noise issues with sensors


# Conclusions

- Successfully developed autonomous greenhouse
- System suitable for all students in elementary classrooms





# Future Work

- Integrate with an application
  - Add a drainage system
  - Enhance display
  - Heating system
  - Data logging
- 

# Special Thanks To

- Unique Wood Designs
- Mrs. Litzinger's 3<sup>rd</sup> Grade Class





Thank you!  
Questions?

# Wearable Augmented Communication Device

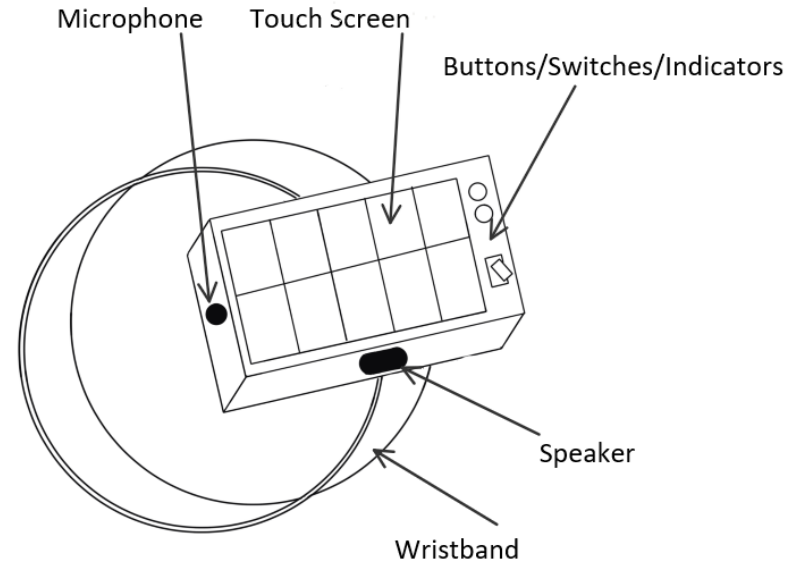
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By: Amber Budge

Advisor: Dr. Steven Barrett

# Project Overview

- Design a wearable device that can record and play back several different messages
- Used as an Augmented Communication Device:
  - Aids with communication, not replacement
- Target User:
  - Someone with a speech disorder
- Goal:
  - Help with fast simple communication in everyday settings



*Fig.1: Project Overview*

  
This project was done in  
Collaboration With:

Wyoming Assistive Technology  
Resources, and

Wyoming Institute for Disabilities



# Software Components

- Arduino MEGA
  - Compatible with touch screen display shield
  - More I/O ports than standard Arduino UNO
- ATmega328P
- Arduino IDE
  - Easy to use
  - Open source
  - Preferred by WATR

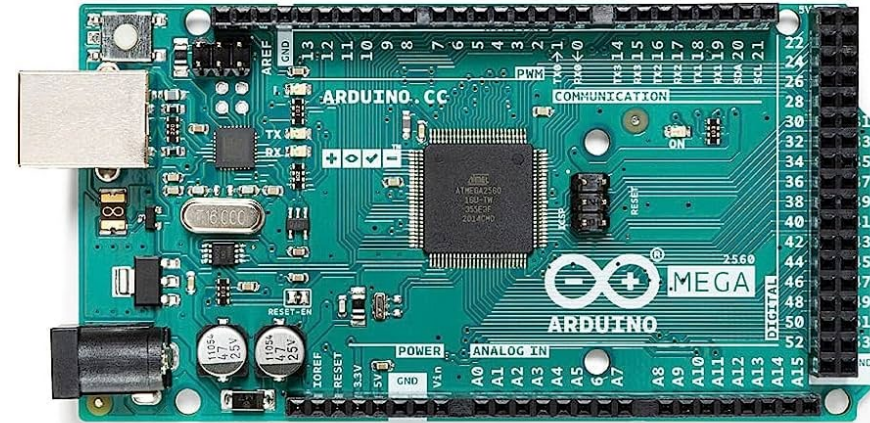
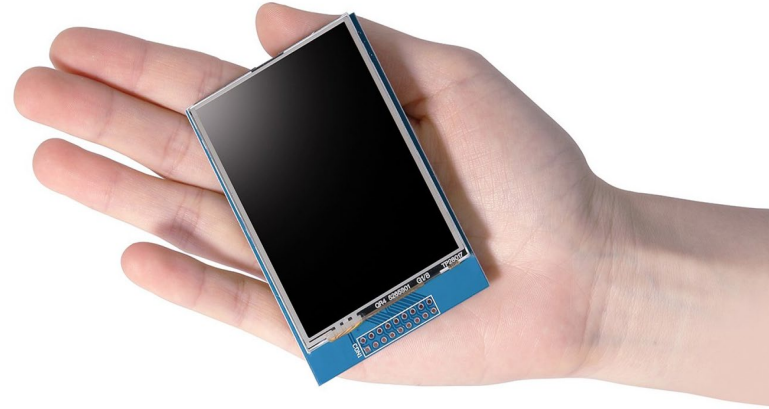


Fig. 2: Top view of an Arduino Mega 2560

# Touch Screen Interface

- TFT (thin-film-transistor) LCD Display
  - Pros: Good picture quality and affordable
  - Con: not the most sensitive touchscreen
- 2.8 Inch Screen Display
  - Small enough to be wearable
  - Large enough to easily use



*Fig. 3: 2.8 inch Touchscreen*

# Sound System

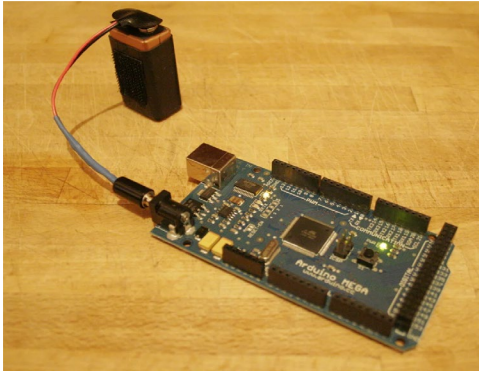
- ISD1820 Voice recorder Module
  - Buttons used for testing only
- Microphone and 8 Ohm Speaker
  - Acceptable volume and quality
- Capability to record 10 seconds of Audio
  - Each separate message requires its own ISD1820
- New Speaker
  - 3.1 inch \* 1.2 inch \* 0.63 inch (L\* W \* T).
  - 8 ohm 3 watt



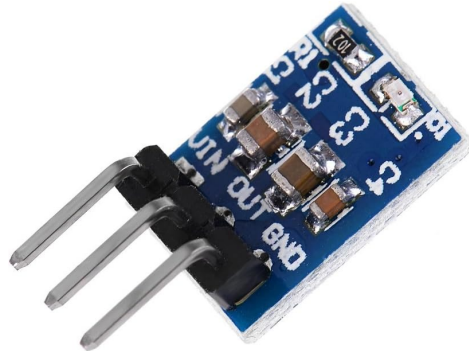
Fig. 3 a, b, and c: ISD1820, Old Speaker, New Speaker

# Other Electronic Components

- Battery
  - Needs to run on battery
  - Currently using 9V battery



- Voltage Regulator Step Down
  - 5V output from Arduino
  - 3.3V Input to ISD1820
  - AMS1117-3.3

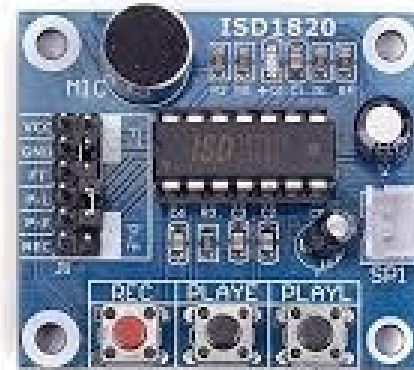


- LM386 Audio Amplifier
  - Low voltage audio power amplifier IC
  - In conjunction with a capacitors and resistors.
  - Amplifies audio signal



# Testing Sound System

- Solder speakers
- Use sound system individually
  - Run with 9V battery and Arduino power supply
  - Use onboard buttons
  - Test sound quality
- Control Sound system with Arduino
  - Connect push buttons to Arduino for inputs
  - Connect sound system to Arduino using voltage divider circuits (eventually replaced with voltage regulator step down)
- Test better speaker
  - Much louder and better sound quality



# Testing Touch Screen Display

- Create buttons on the display
  - Buttons for recording, and playing each message
  - Tested several different screen layouts and color schemes on multiple participants
- Control sound system using touch screen
  - Replace push buttons as inputs to the sound system with the buttons on the touch screen
  - Capability to play 3 different messages
  - Test length of message possible to ensure at least 10 seconds.



Fig. 4: Touchscreen Button Layout

# Working Prototype

- Constructed first prototype
  - Meets basic design requirements
- Constructed second prototype
  - This prototype was used for testing and improvement

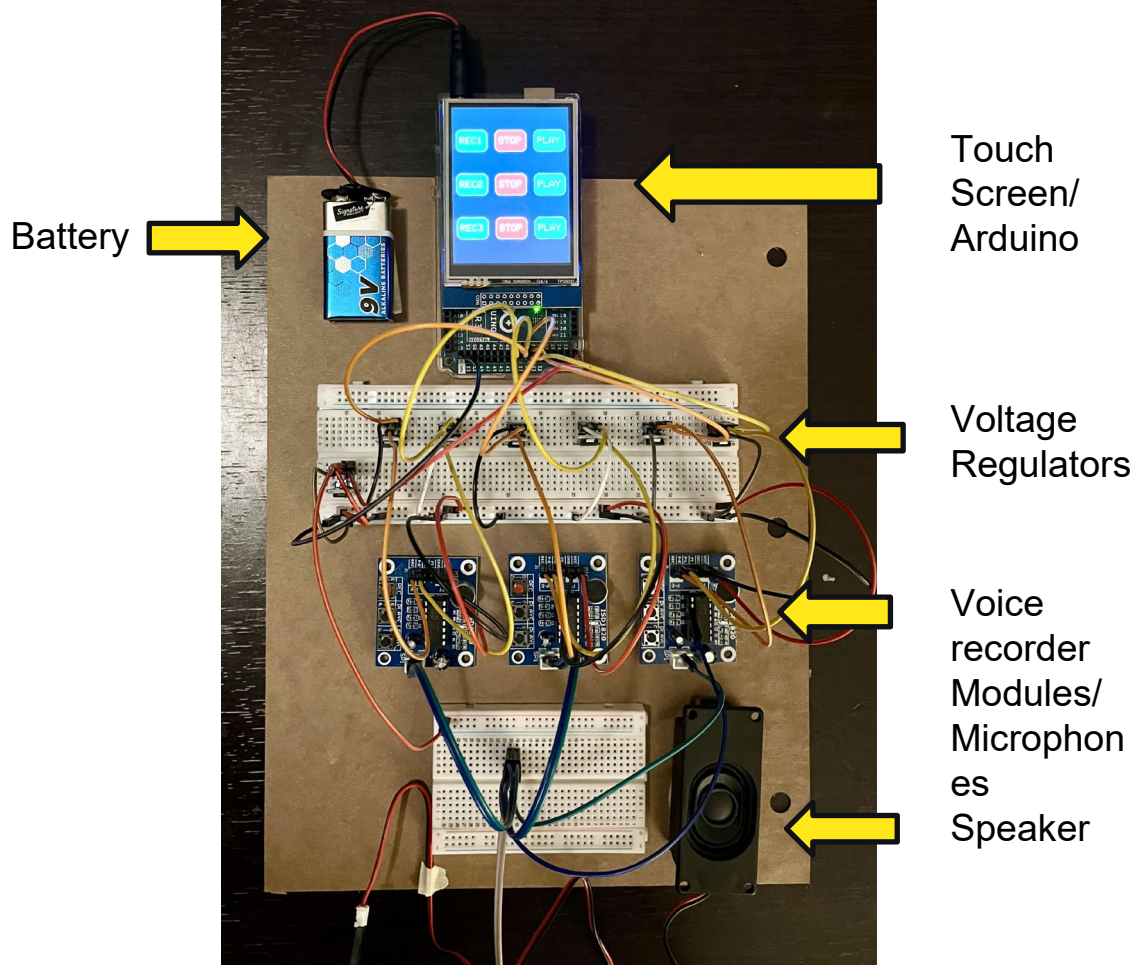


Fig. 5: Working Prototype

# Adding Audio Amplifier and Volume

- Volume Control:
  - 10K $\Omega$  Potentiometer
- Audio Amplifier:
  - LM386 IC Audio Amplifier
  - Gain Capacitor
  - Coupling Capacitors
  - Resistors
- Testing:
  - Find best combination of capacitors and resistor values to maximize noise reduction, sound quality, and volume
- Cons:
  - Overall reduction in sound quality
  - Requires much more power, battery life significantly decreased.
- Pros:
  - Louder than without
  - Volume control

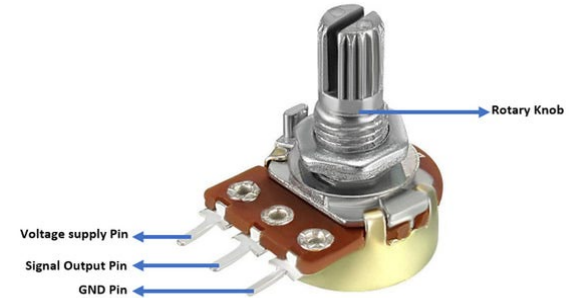
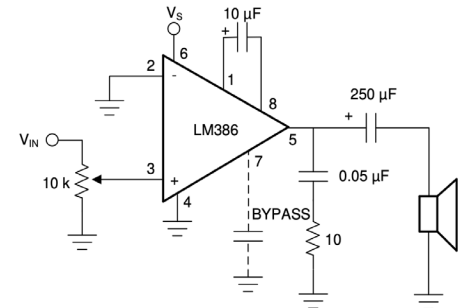


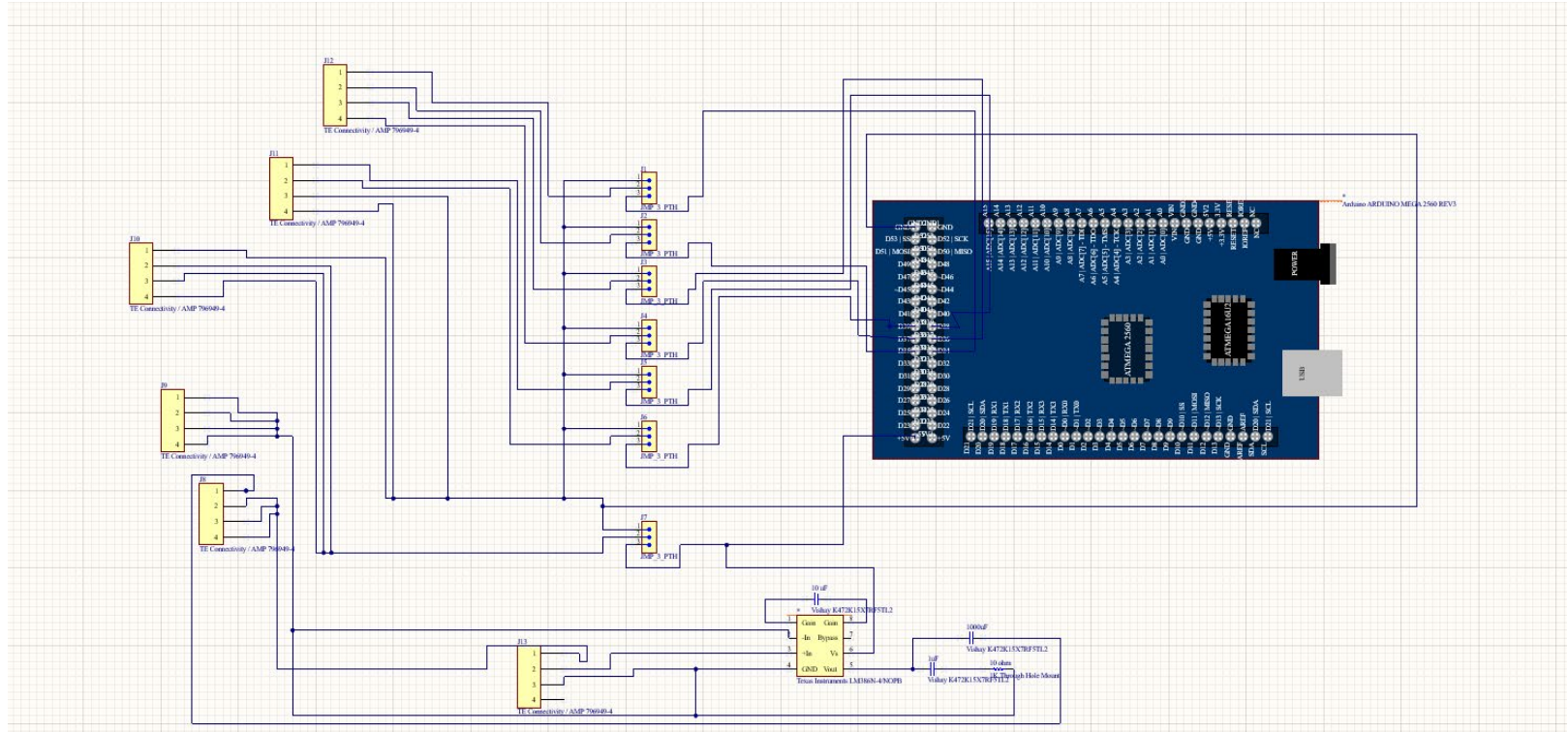
Fig. 6a: Audio Amplifier Circuit

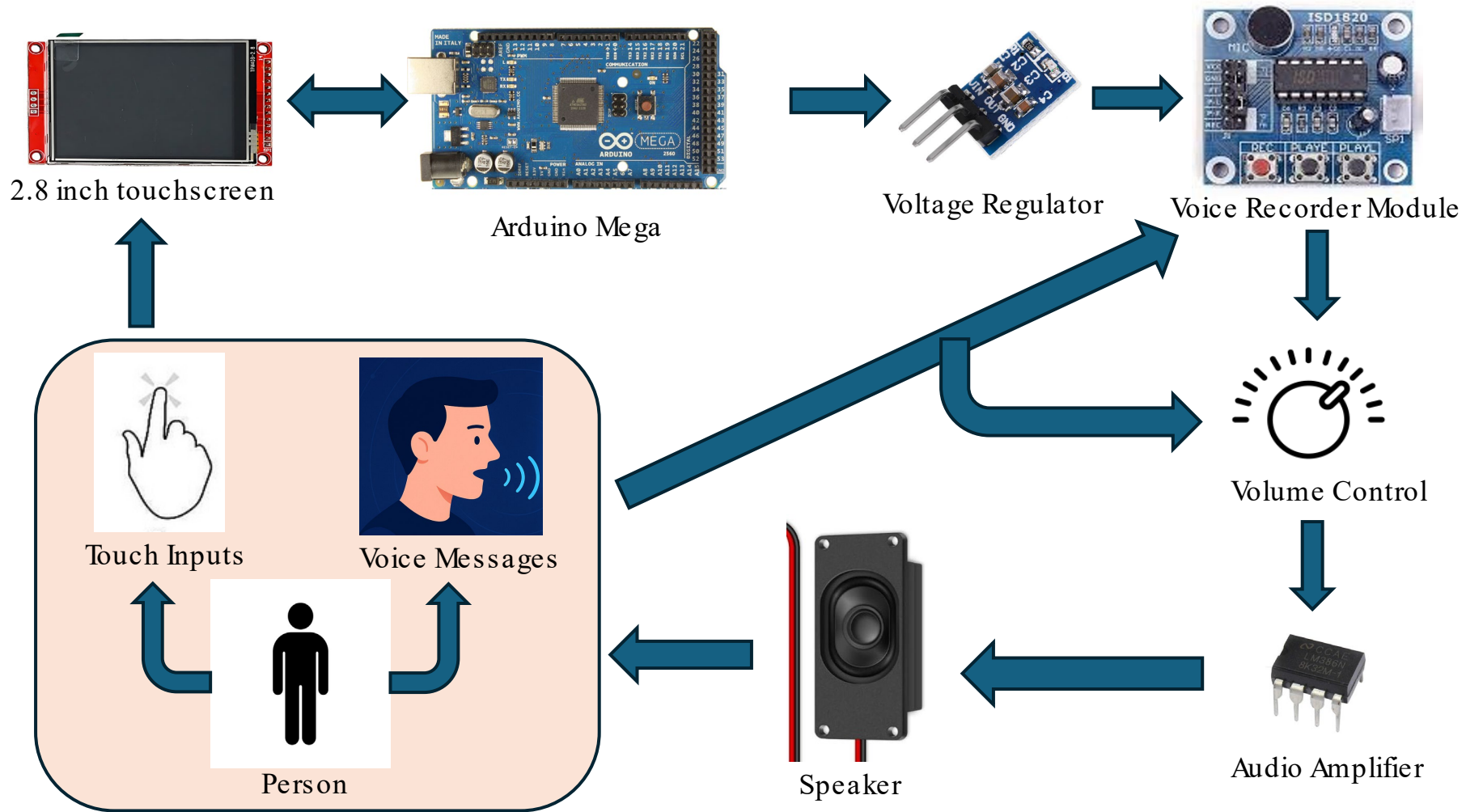


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Fig. 6b: Audio Amplifier Circuit

# Schematic





# PCB

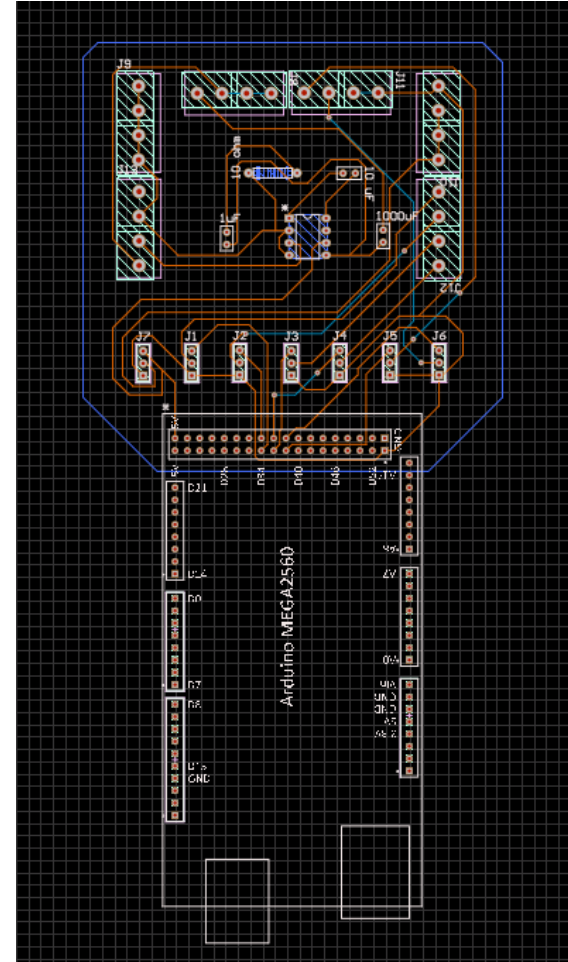
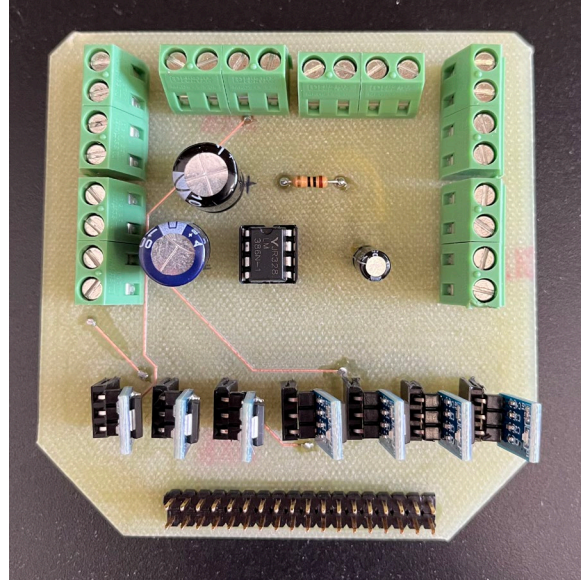
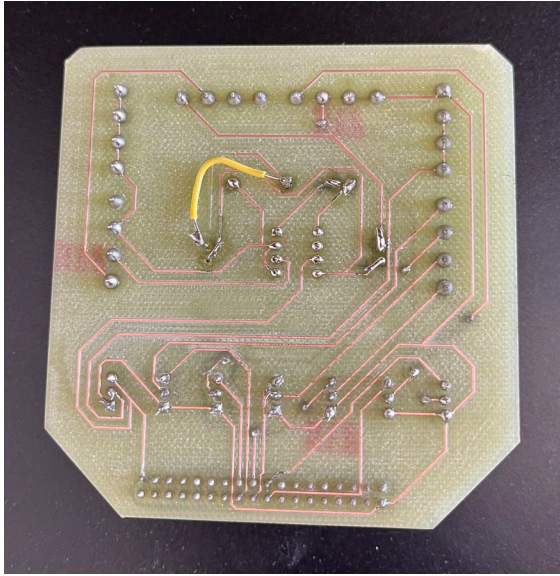
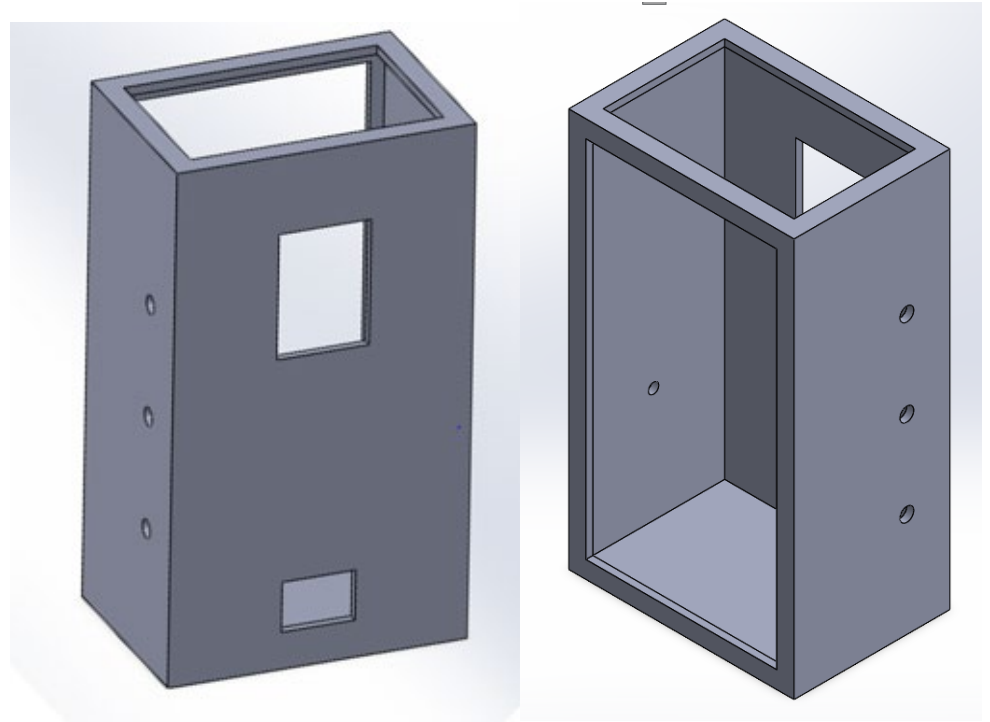


Fig. 7 a, b, and c: Top, Bottom and CircuitMaker Schematic of the PCB

# 3D Printed Packaging

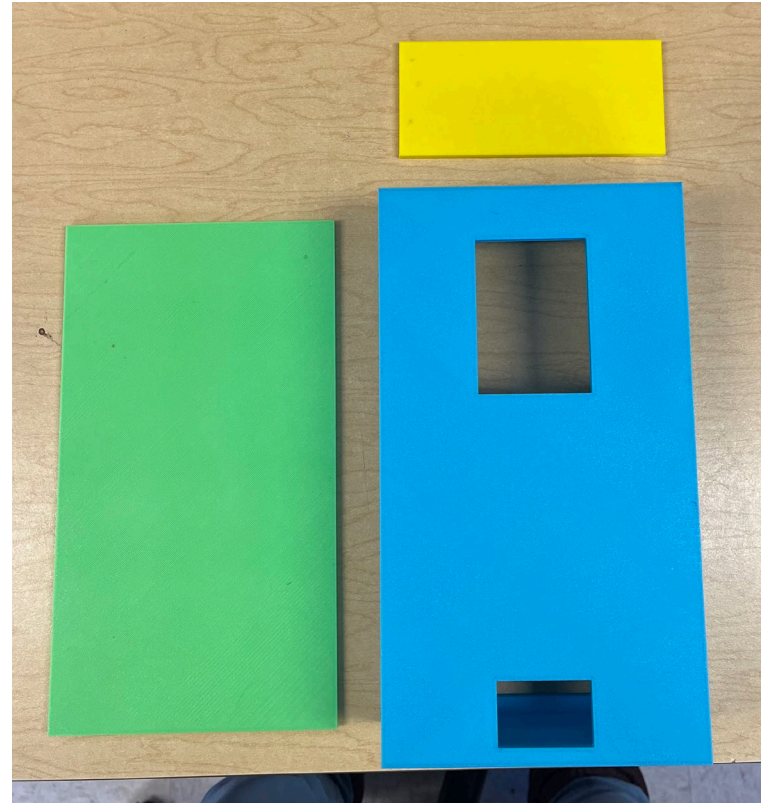
- Software used:
  - Solidworks: CAD software
  - UltiMaker Cura: Slicer software



*Fig. 8 a and b, front and back of the CAD Model*

# 3D Printed Packaging

- Printed on UltiMaker 3D Printer
- FDM (Fused Deposition Modeling)
  - Most widely available
  - Cheap
  - Not strong
- Material: PLA (Polylactic Acid)



*Fig. 9: All 3 Printed Parts*

# Final Prototype Construction

- Additional Materials:
  - Velcro
  - Elastic
  - Lanyard
  - Mounting Tape
- Removable Top and Back Panels
  - Replace dead battery easily
  - Power on Device
  - Access to all Electronic Components

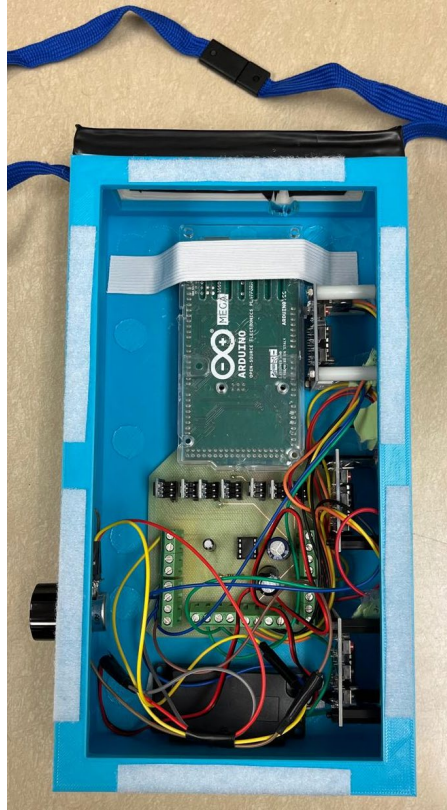


Fig. 10a: Inside View of the Final Product

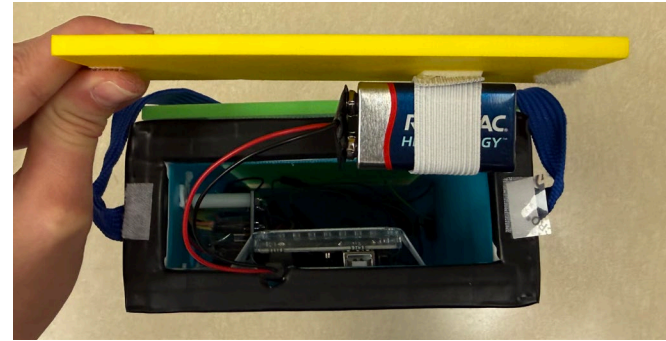


Fig. 10b: Top View of the Inside



Fig. 10c: Detachable Back Panel

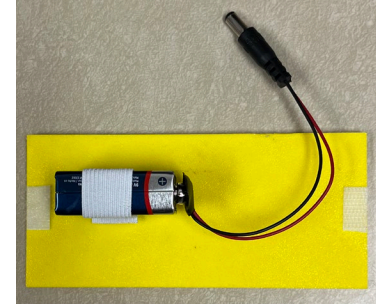


Fig. 10d: Top Panel

# Fully Assembled Final Prototype

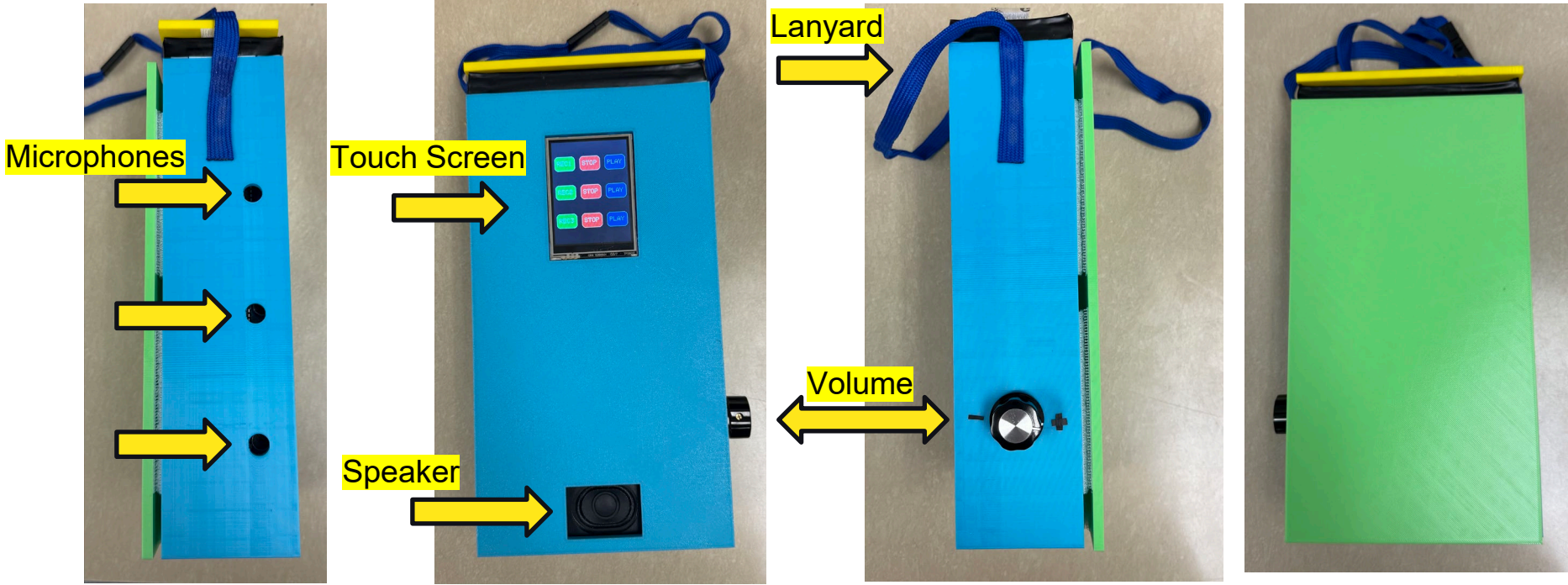


Fig. 11 a,b,c and d: Final Assembled Prototype's View from all sides

# Final Project Demonstration

- 1) Record and play 3 messages
- 2) Rerecord messages
- 3) Playback messages in any order , any number of times
- 4) Record a message up to 10 seconds long
- 5) Adjust Volume

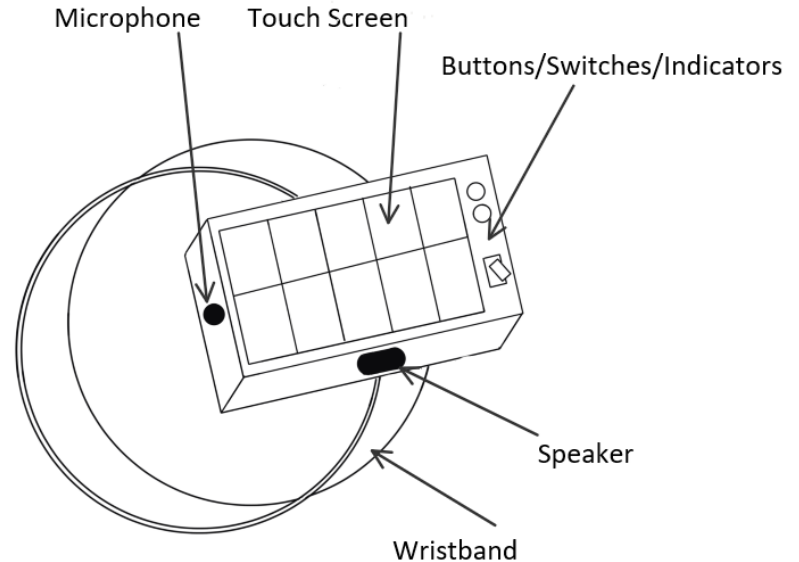


# Prototype Cost

Item	Cost
Arduino Mega	\$50.00
Other Electronic Components	\$25.00
Speaker	\$8.00
3D-Printed Parts	\$25.00
Touchscreen	\$16.00
Other Packing Materials	\$10.00
Battery	\$5.00
PCB	\$5.00
<b>Total</b>	<b>\$144.00</b>

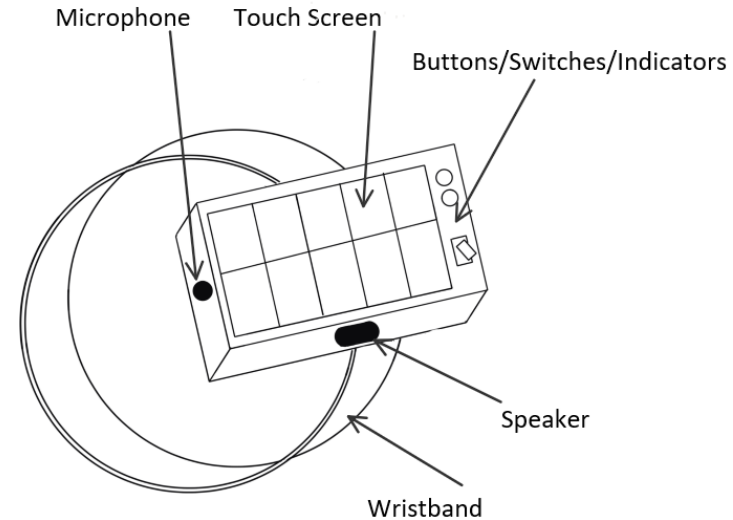
# Furthering The Project Beyond Scope of This Class

- A large part of this project is setting it up for future expansion
- Better Components
  - Longer lasting, smaller battery
  - Smaller and better speaker/ microphone
  - More sensitive/ clearer display
  - Better audio amplifier
- Elaboration of User Interface
  - Better flow to recording and playing process
  - Record more messages
  - Allow for adding text labels to each button
- Allow for Improvement on Packaging
  - Decrease size to fit on wrist



# Conclusion

- This device can successfully Record, store, and play 3 different messages up to 10 seconds long, using a touch screen
- Fully packaged Prototype
  - Wearable
  - Design Appealing to Target Audience
- Easy to Replicate
  - Open Source code
  - Easily Available Parts
  - Low Cost of Prototype



Questions?

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**Research and Economic Development**  
**COMMITTEE MEETING MATERIALS**

**AGENDA ITEM TITLE:** UW Internships plans– Anne Alexander, Parag Chitnis

- OPEN SESSION
- CLOSED SESSION

PREVIOUSLY DISCUSSED BY COMMITTEE:

- Yes
- No

FOR FULL BOARD CONSIDERATION:

- Yes *[Note: If yes, materials will also be included in the full UW Board of Trustee report.]*
- No

*Attachments/materials are provided in advance of the meeting.*

EXECUTIVE SUMMARY:

The University of Wyoming (UW) will implement a coordinated, statewide internship program to significantly expand access to paid, career-aligned experiential learning and strengthen Wyoming’s workforce pipeline. With demand for internships far exceeding current capacity, this initiative focuses on scaling opportunities, improving coordination, and reducing financial barriers for students, and increasing total student participation.

Implementation Strategy

1. Portal for employers and students- Develop a portal for employers to add their requests and students to enter their information. Both can search for what they need.
2. Centralized Coordination and Employer Engagement – developing relationships with employers and coordinating with all UW colleges and programs.
2. Student Financial Support (Matching Stipends) prioritizing Wyoming-based internships and high-need sectors.
3. Alignment with State Workforce Needs – in collaboration with employers focused on career-relevant experiences aligned with Wyoming priorities, both private industry and public-sector organizations.

Outcomes and Impact

- Increase paid internship participation
- Strengthen talent pipelines for Wyoming employers across sectors
- Improve student career readiness and post-graduation outcomes
- Enhance retention of UW graduates within the state

The program builds on strong institutional and student support and establishes a sustainable, scalable framework for experiential learning that directly connects education to workforce needs.

PRIOR RELATED COMMITTEE DISCUSSIONS/ACTIONS: **Information only**

WHY THIS ITEM IS BEFORE THE COMMITTEE: **Information only**

ACTION REQUIRED AT THIS COMMITTEE MEETING: **None**

PROPOSED MOTION: **N/A**

**Research and Economic Development**  
**COMMITTEE MEETING MATERIALS**

**AGENDA ITEM TITLE:** REDD Update – Parag Chitnis

- OPEN SESSION
- CLOSED SESSION

PREVIOUSLY DISCUSSED BY COMMITTEE:

- Yes
- No

FOR FULL BOARD CONSIDERATION:

- Yes [*Note: If yes, materials will also be included in the full UW Board of Trustee report.*]
  - No
- Attachments/materials are provided in advance of the meeting.*

EXECUTIVE SUMMARY:

Vice President Parag Chitnis will update the committee on current activities within the Research and Economic Development Division, to include updates on the recent Division Reorganization previously discussed.

PRIOR RELATED COMMITTEE DISCUSSIONS/ACTIONS: **Information only**

WHY THIS ITEM IS BEFORE THE COMMITTEE: **Information only**

ACTION REQUIRED AT THIS COMMITTEE MEETING: **None**

PROPOSED MOTION: **N/A**