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A Low-Cost Egg Incubator to Provide Zambian Churches with Income and Food Security

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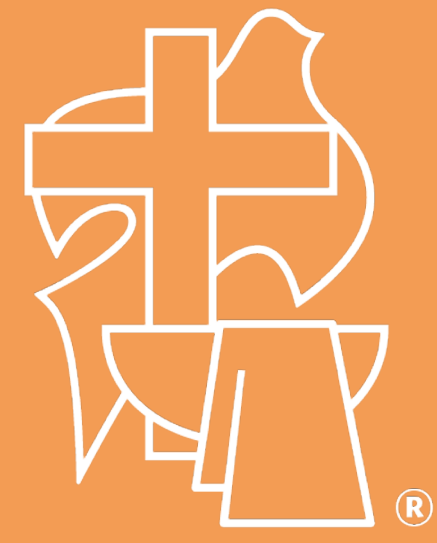
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2021 School of Science, Engineering and Health Symposium
Jacob Barton, Aaron Bashore, Matt Eells, Lydia Reber, and Claudia Tolley



Project Goal

The goal for the project is to provide a high-quality, low-cost means by which the local church community can produce chicks that can either be used as a food source or sold in town to generate income for food, medicines, and labor. The incubator design will be reproducible from locally accessible materials, and will then be distributed to rural church communities in the Choma region along with training on its use for income generation and food security.

Client



The team is serving the Brethren in Christ (BIC) Church in Zambia, through their partner, Tony Beers. Tony and his wife Veronica are serving as missionaries in Choma, Zambia with the BIC U.S. World Mission.

Client Specifications

- Accommodate 300 egg capacity
- Achieve 85% hatch rate
- Utilize modular design
- Be built with local materials
- Cost less than \$500 dollars
- Include a full set of blueprints and diagrams for reproducibility

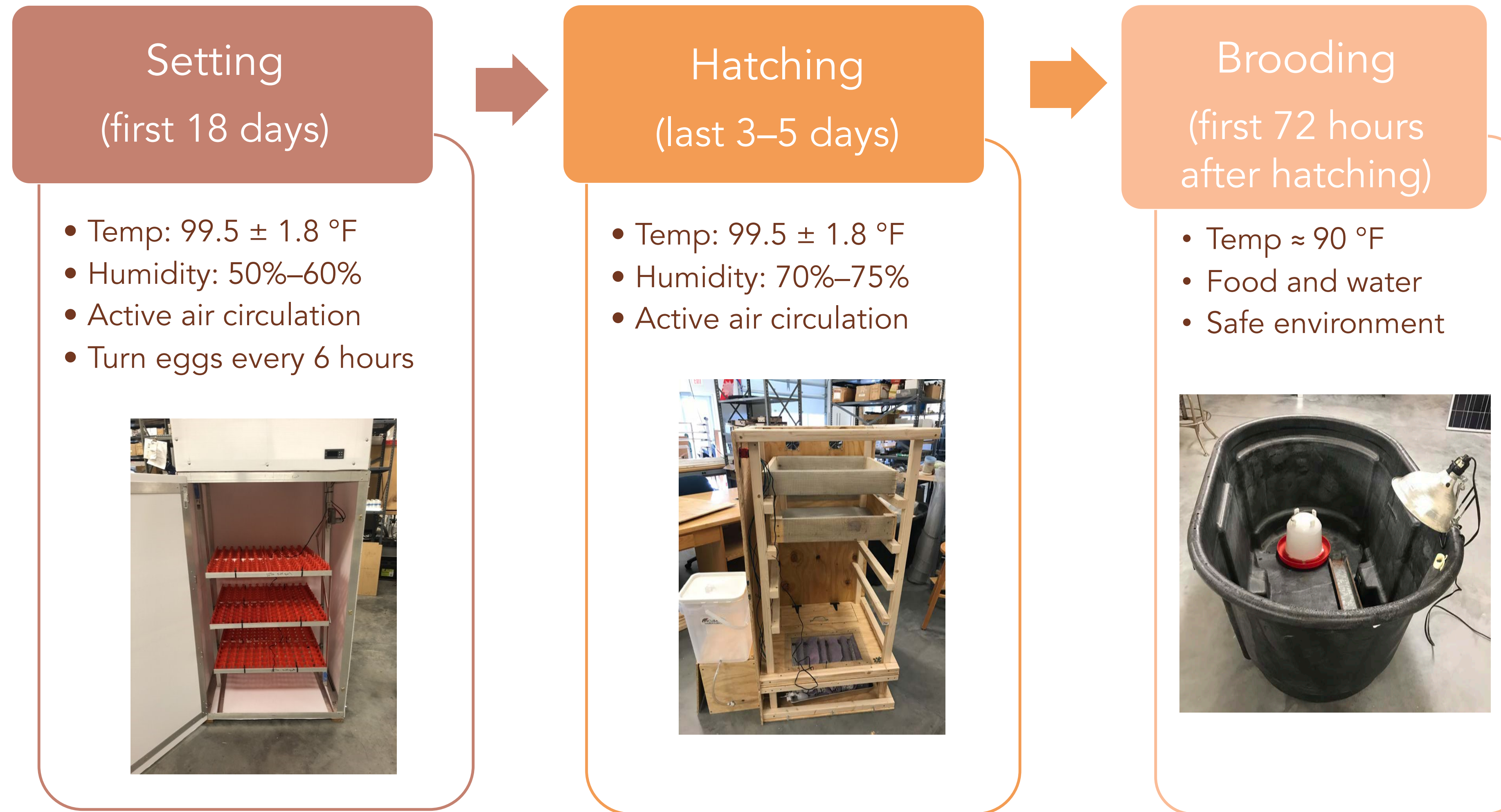
The Team



Acknowledgments

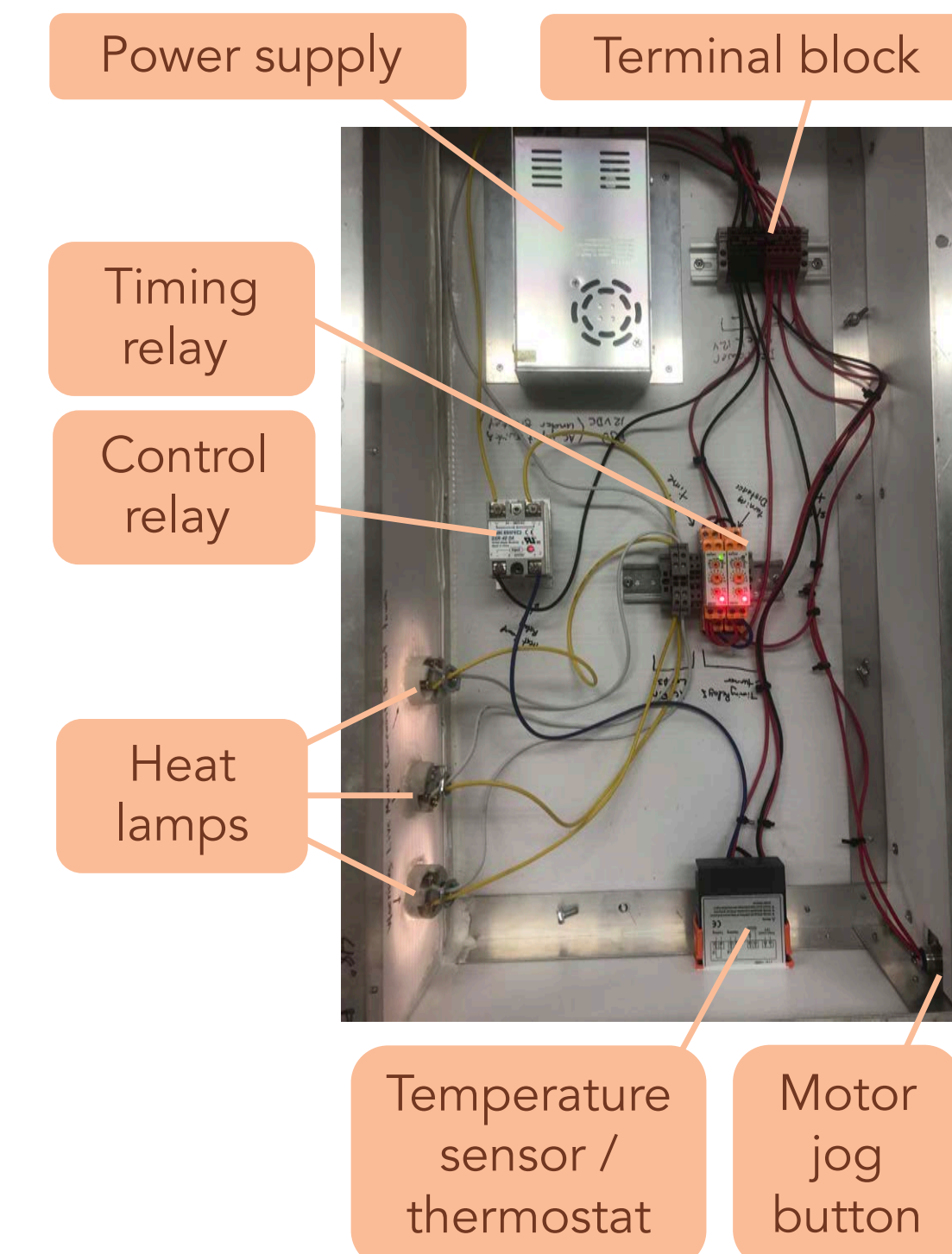
Dr. Philip Tan, Project Manager
Tony Beers, Project Partner and BIC Missionary

Egg Incubation 101



Electrical Design

The layout below shows the electrical components in the setter. For modularity, the hatcher uses the same layout.



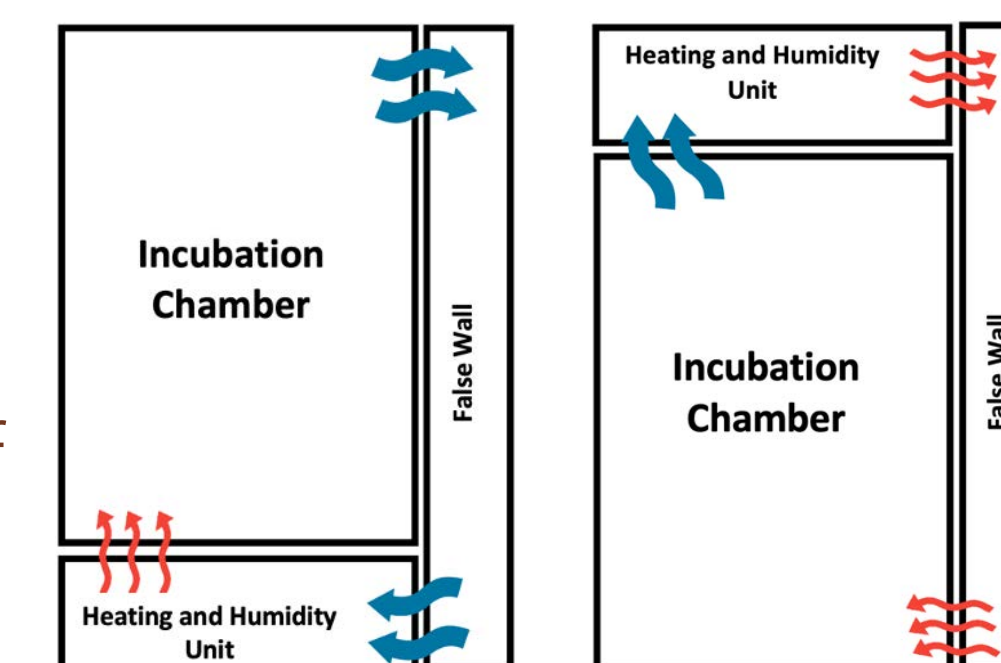
Mechanical Design

Modular Frame Design



Air Flow Design

The team is considering two layouts for heating and humidity to optimize the air flow, and are modeling both in SolidWorks. Placing the heating unit below utilizes the natural flow of air, while placing it above allows for easier access to the parts.



Problem Definition

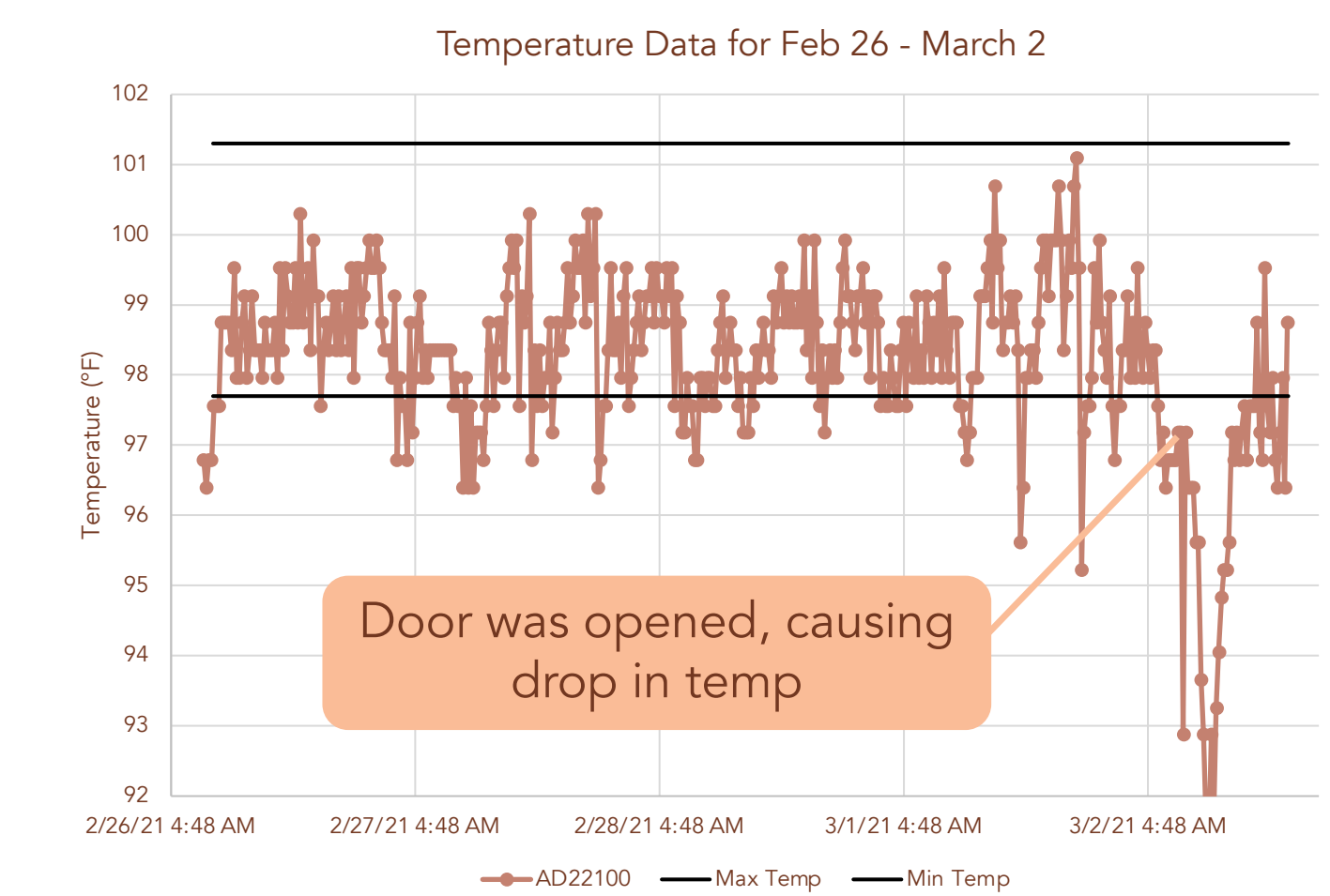
The BIC Church in Zambia is rich in spirit with over 250 churches and 15,000 church members. The BIC Church in the Choma area is led by Bishop Charles Nseemani, who is both an excellent leader and an itinerant farmer. The BIC Church has an abundance of agricultural lands, but they are not being used to their full potential. With the attempt to raise chickens to sell to the community as a more sustainable food source and in turn provide a more substantial income for the church was able to build a large chicken coop. The mission has



received 150 chickens that produce a steady supply of fertilized eggs. The problem is that there are only a few incubator operators in Choma, and many people are turned away due to high demand.

Testing

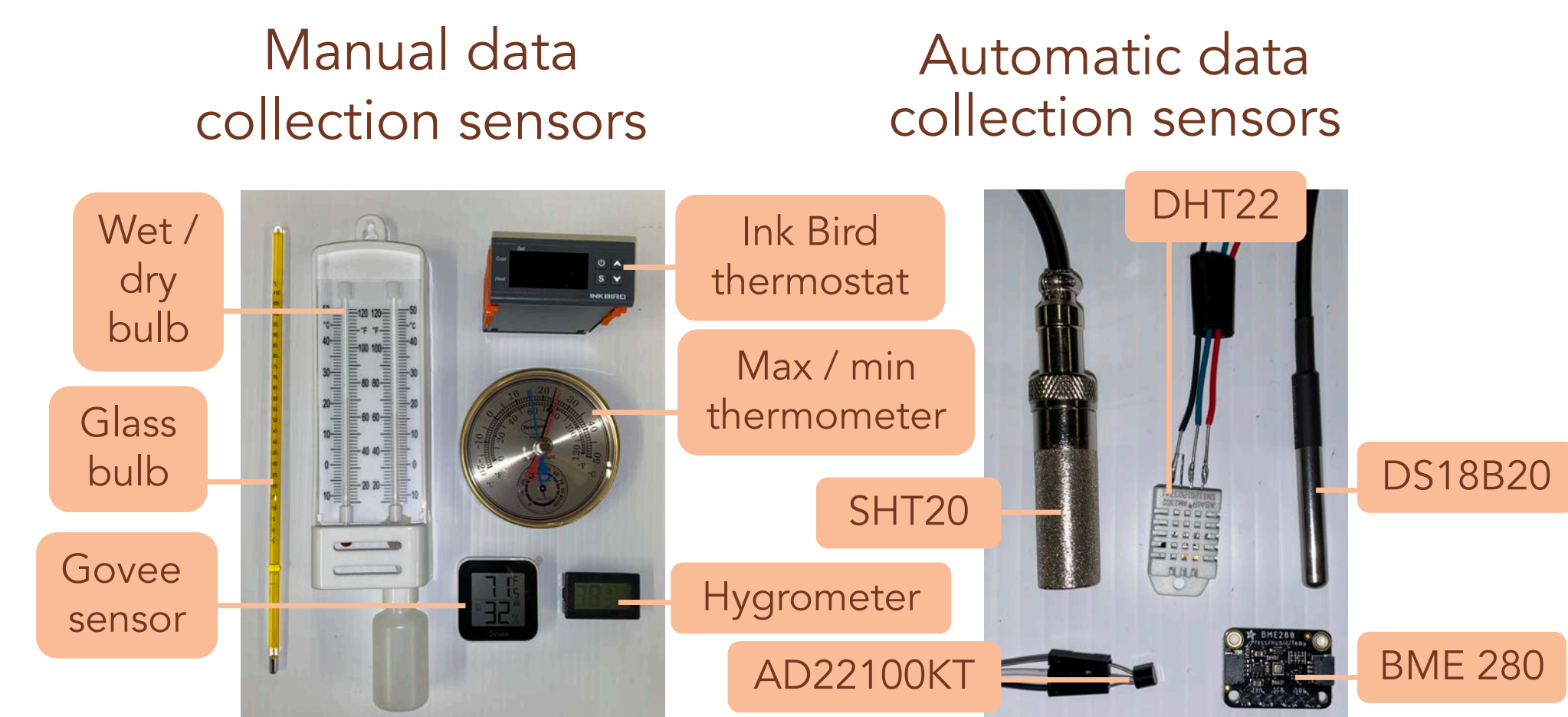
Temperature & Humidity



The team tested both prototypes for the humidity and temperature requirements needed for safe chick incubation.

Sensor Selection

The team tested a variety of sensors for temperature and humidity. The goal was to find the most accurate sensor for recording the temperature and humidity in the chamber.



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