

## SMART & CONNECTED CHILDCARE

1952231

Abbie Raikes, University of Nebraska Medical Center  
PG, FY2020

### Principal Research Investigators

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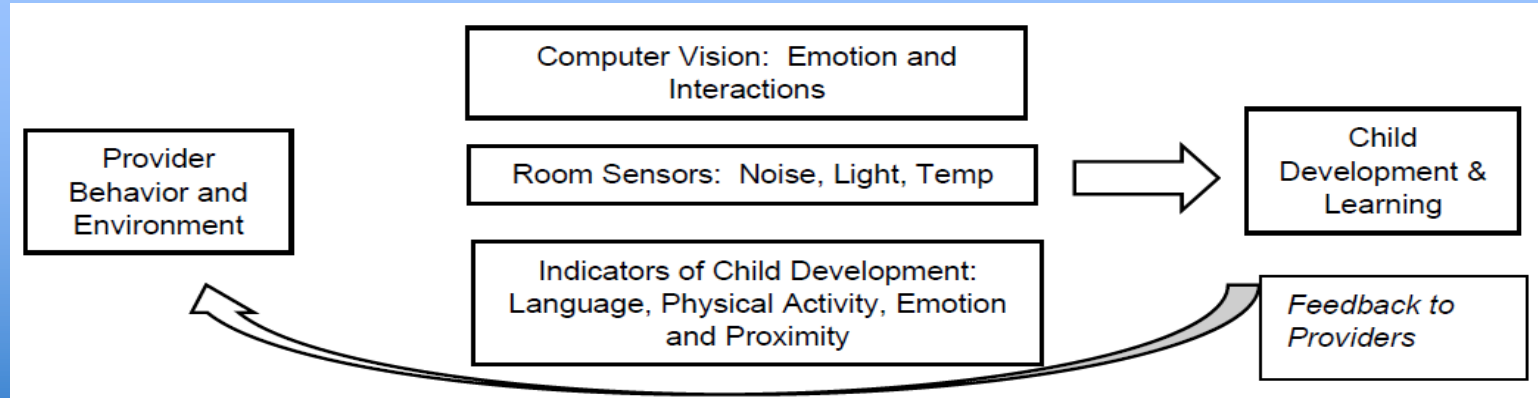
### Community Partners (Name, Institution)

**Lincoln Littles, a community-wide childcare quality improvement effort, Lincoln, Nebraska**

**Engineering + childhood development** researchers partnered with **early childcare community providers** to generate a **novel, sensor-based quality management system** that supports **quality childcare** + generates new insights into the associations between **childcare environments** and **child development**

# Project Overview

## Visual Schematic



## Project Vision

- Develop a ***novel, sensor-based system*** to monitor:
  - a) **childcare physical environments**  
*(noise, light, temperature)*
  - b) **indicators of child development**  
*(language, activity, emotion & proximity)*

*\*Utilize computer vision & machine learning*
- Develop + test the system ***with community partners*** to:
  - a) Address user **needs, tolerances, & acceptability**
  - b) Evaluate ability to improve global **child development & learning**

# Project Overview

## Use-Inspired Research

- Qualities of children's early experiences are linked to ***lifelong health, academic, & social well-being outcomes*** (Heckman, 2006)
- Smart & Connected Childcare Communities should include a system that:
  - a) Safely & efficiently ***monitors childcare quality features***
  - b) Provides ***feedback to care providers*** to facilitate quality improvement

*PG Target Community:* Omaha and Lincoln, Nebraska  
*Expansion Community:* US childcare centers

## PG Activities

- A) Investigate ***user needs, tolerance, & acceptability***, based on ***community partner feedback***
  - Engage community partners throughout project & provide final feedback
- B) Use results from (A) to inform ***design of sensor-based platform & app***
- C) Interdisciplinary team ensures ***scientific advancement*** and ***collaboration***

# Project Update

A) Investigating **user needs, tolerance, & acceptability**, based on **community partner feedback**:

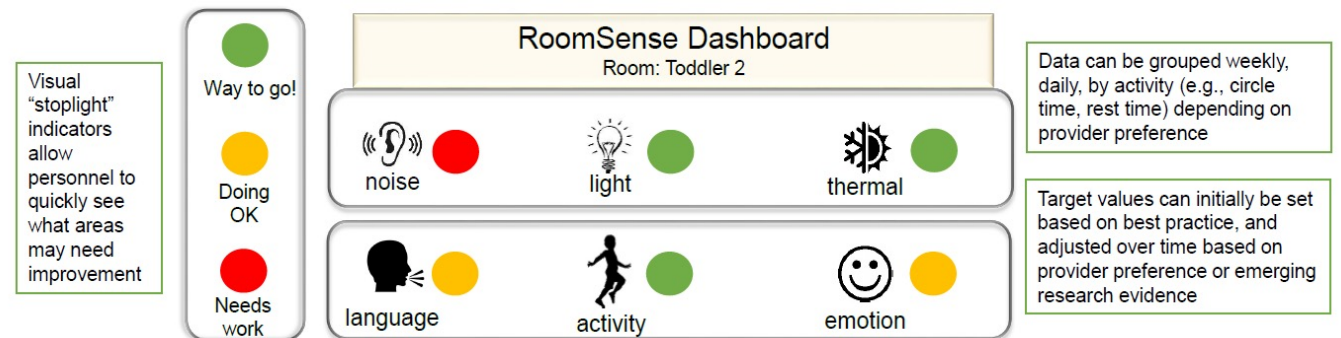
- Survey of 80 childcare providers
- Parent surveys & focus groups (Aug 2021)

B) Using results from (A) to inform **design of sensor-based platform & app**, including:

- Mapped critical criteria for system acceptance & scalability
- Identified sensor, network, & app components; pilot testing underway

C) Developing **future plans**, including:

- Critical areas of scientific expansion on PG in IRG Proposal
- Continued community partner engagement



# Project Evolution

Our Smart & Connected Childcare system has been developed with user (*community partner*) *feedback* at the core of our *system ideation, design, & implementation*

Example feedback results gathered from 80 childcare providers:

-Childcare providers are most concerned with *noise*.

*This encouraged us to incorporate aspects of **noise** & **language development** monitoring into our proposed system, as well as **expand the scope of these areas** in our IRG proposal for future research*

- Only a few providers expressed concerns regarding *security & privacy*, and believed that parents would accept the use of our sensor platform in their program with *clear communication*.

*This confirms our approach of **continued community partnerships**, and highlights the need for a **simple, clear feedback** (app) mechanisms*

- Many childcare centers are already using *continuous video* to monitor classrooms.

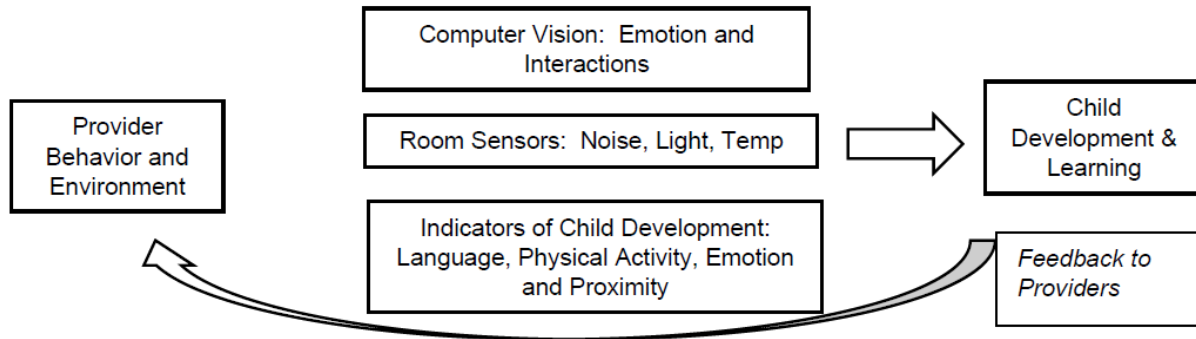
*This encouraged us to **expand our initial platform design** in future research to include novel aspects of **computer vision** to assess indicators of child development*

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## Visual Schematic



## Project Vision

- Develop a *novel, sensor-based system* to monitor:
  - a) childcare **physical environments**
  - b) indicators of **child development**
- Develop + test the system with *community partners* to:
  - a) address user **needs, tolerances, & acceptability**
  - b) improve global **child development & learning**

## Use-Inspired Research

- Smart & Connected Childcare Communities should include a system that:
  - a) Safely & efficiently *monitors childcare quality features*
  - b) Provides *feedback to care providers* to facilitate quality improvement and foster healthier childcare settings

*PG Target Community:* Omaha and Lincoln, Nebraska

*Expansion Community:* US childcare centers

## PG Activities

- A) Investigate *user needs, tolerance, & acceptability*, based on *community partner feedback*
- B) Use results from (A) to inform *design of sensor-based platform & app*
  - Critical criteria for system acceptance & scalability
  - Sensor, network, & app components

*Engineering + childhood development* researchers partnered with the *early childcare community* to generate a *novel, sensor-based quality management system* that supports *quality childcare* + generates new insights into the associations between *childcare environments* and *child development*.