



Engineering for Students with Extensive Support Needs

Ginevra Courtade, Ph.D. University of Louisville
Bree Jimenez, Ph.D. University of Texas at Arlington



Project Goals

1. To promote high-quality engineering instruction in elementary schools for students with extensive support needs (ESN)
2. To investigate elementary school teachers' development of conceptual and epistemic understanding of engineering education for students with ESN and optimal ways to support both understandings through engineering design curriculum implementation

Method

- Multiple Methods Design
- Quantitative Measures:
 - Teacher self-efficacy growth across PDs
 - Implementation logs
- Qualitative Measures:
 - Semi-structured interviews
 - Focus groups
 - Coding of over 50 hours of filmed lessons

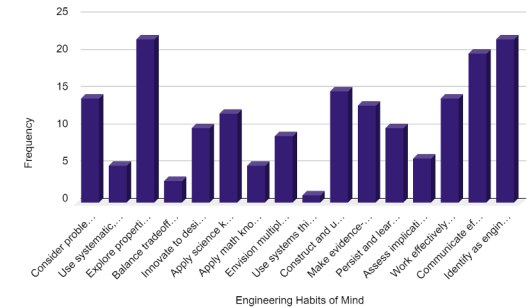
Objectives and Strands of Work

1. Empirically investigate teachers' engineering instruction using the YES! curriculum
2. Develop a framework of conceptual and epistemic understanding of engineering education for students with ESN
3. Conduct design-based implementation research to support UDL engineering instruction and instructional materials
4. Produce and disseminate the instructional support framework and materials

Project BEES Framework

| Universal Design for Learning (UDL; CAST, 2018) | Engagement | Representation | Action & Expression |
|--|---|---|--|
| | Recruit Interest Sustain Effort & Persistence Self-Regulation | Perception Language & Symbols Comprehension | Physical Action Expression & Communication Executive Functions |
| Engineering for Students with Extensive Support Needs | | | |
| Engineering Habits of Mind (YES!) | Consider problems in context | | |
| | Use a systematic, problem-solving process | | |
| | Explore properties and uses of materials | | |
| | Balance tradeoffs between criteria and constraints | | |
| | Innovate to design solutions | | |
| | Apply science knowledge to problem-solving | | |
| | Apply math knowledge to problem-solving | | |
| | Envision multiple solutions | | |
| | Use systems thinking | | |
| | Construct and use models and prototypes | | |
| | Make evidence-based decisions | | |
| | Persist and learning from failure | | |
| | Assess implications of solutions | | |
| | Work effectively in teams | | |
| | Communicate effectively | | |
| | Identify as engineers | | |

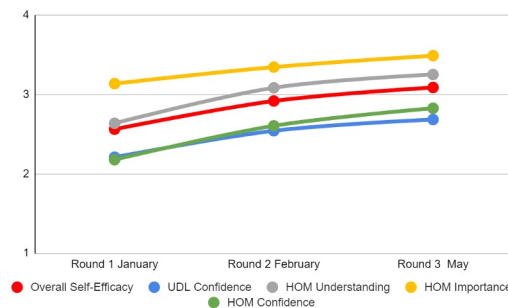
Teacher Reported Habits of Mind Across Unit



Next Steps-Year 2

- Fall 2023
 - Units 2 and 3 with Teachers
 - Begin Student Behavior Data Collection
- Analysis:
 - Student and Teacher Behavioral Coding
 - Additional Variables (Active Noticing, Student Engineering Focused Behaviors)

Teacher Self-Efficacy Growth Over Time



For More Information:



g.courtade@louisville.edu
bree.jimenez@uta.edu



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