Elementary Teacher Professional Learning in Equitable Engineering Pedagogies for Multilingual Students

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Introduction

Sustained professional learning integrates translanguaging to support elementary teachers in engineering design. It addresses limited access to engineering lessons for linguistically diverse, multilingual students in elementary classrooms.

Our Goal

To include emergent bilingual students in engineering activities and develop a professional development model.

Theoretical Framework

Language Ideologies

Beliefs, values, and attitudes about how and where language can be used in certain spaces.

Translanguaging

A practice of welcoming students to utilize all their linguistic resources—those of their home languages as well as the dominant language (i.e., English) in the classroom [1 - 5]

Research Questions

1. Do the teachers' language ideologies shift, and if so, how?
2. How do teachers' language ideologies, and possible shifts in language ideologies, map onto elements of the professional learning experience?
3. How do teachers' language ideologies, and possible shifts in language ideologies, map onto teachers' engineering pedagogies?

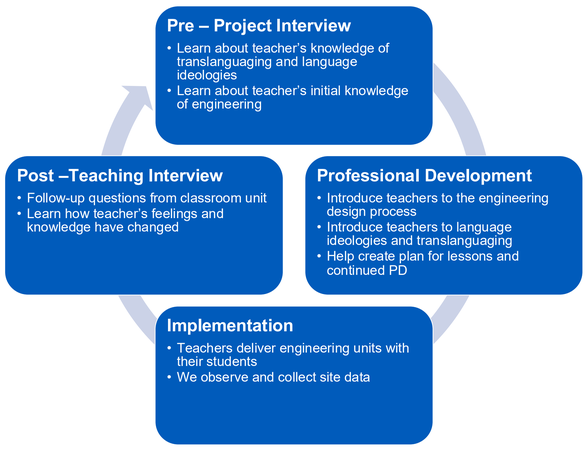
Participants

- Nine elementary teachers of emerging multilingual students
- Teachers from multiple local elementary schools serving linguistically diverse student populations
- Teachers have expanded experience with engineering through sustained Professional Learning Experience (PLE) including summer and school-year sessions

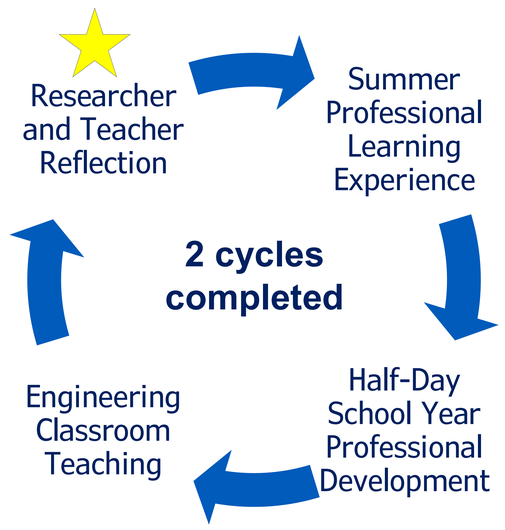
Methods

Our PLE model consists of three full-day summer meetings covering engineering, engineering design, translanguaging, language ideologies, and multimodality. Activities include project introduction, instrument collection, engineering design process, article discussions, and teacher reflections. Data were collected through case studies of third-grade elementary teachers from two cohorts [1].

Data Collection



Iterations of Professional Learning Experience Model



Data Analysis

- **Data Collection:** Gather multiple data sources including teacher interviews (before and after professional learning), classroom video recordings, and field notes.
- **Transcription and Organization:** Transcribe all audio and video data carefully and organize the transcripts and notes systematically for analysis.
- **Initial Coding:** Apply preliminary codes to the transcripts and videos focusing on key topics like engineering knowledge, translanguaging, and language practices.
- **Thematic Analysis:** Group the initial codes into broader themes to identify patterns and shifts in teacher understanding and instructional practices.
- **Cross-Data Triangulation:** Compare findings across interviews, videos, and field notes to verify consistency and deepen insights, supporting the development of detailed case studies.

Results

Engineering Lessons
- Case studies document sustained professional learning engagement of third-grade teachers.

Translanguaging & Integration
- Teachers reflected on and adapted engineering lessons during the academic year.

Engineering in Social Studies
- Ongoing iterative refinement of instructional materials based on teacher feedback.

Lesson Menu
- Teacher cohorts actively engaged in discussions on language ideologies and translanguaging.

Sustained Planning
- Multimodality concepts were integrated into teacher professional learning experiences.

Key Findings

- Teachers implemented multiple introductory engineering lessons early in the year.
- Participants initiated integration of translanguaging and cross-disciplinary content.
- Engineering was embedded into social studies instructional units by teacher themselves
- Cohort 1 developed a concept-duration engineering lesson menu to support sustained planning.

Conclusion

Our sustained PLE model supports elementary teachers in engineering integration with multilingual learners, guided by iterative reflection, collaborative planning, peer support community, and cross-disciplinary lesson development.

Next Steps

- Enhance the PLE model through continued teacher feedback and data analysis.
- Expand expert teacher involvement and curate a comprehensive video library of engineering lessons.
- Collaborate with advisory board to refine and formally present the advanced PLE framework.

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Questions?
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