

ABSTRACT

We report findings from the development and testing of a **multidisciplinary online** PD model for inservice high school science teachers. This study explores whether the PD model can enhance science teaching and learning **as narrowly focused, face-to-face models have done in the past**. We find that translation of complex analysis-of-practice PD models for a multidisciplinary audience in an online environment is not without challenges. We investigated teachers' online reflections and comments to better understand the affordances and challenges of the multidisciplinary, online model.

RESEARCH QUESTIONS

1. Do **teachers** demonstrate **improved knowledge and practice** in the year following participation in the EMAT course?
2. After participating in EMAT, do teachers help **students attain higher achievement** than they did for their prior year's students, taught before teachers' participation in EMAT?
3. Which **components of the EMAT course are most effective** in enhancing teacher knowledge and practice, and why do those components seem to be effective?

DESIGN and ANALYSES

Design

- **Teacher outcomes:** pre-post design
- **Student outcomes:** pre-post control group quasi-experimental design

Analyses

- **Teachers:** pre-post comparisons and ANCOVA
- **Students:** 3-level HLM (students within classes; classes within teachers)

EMAT COURSE COMPONENTS

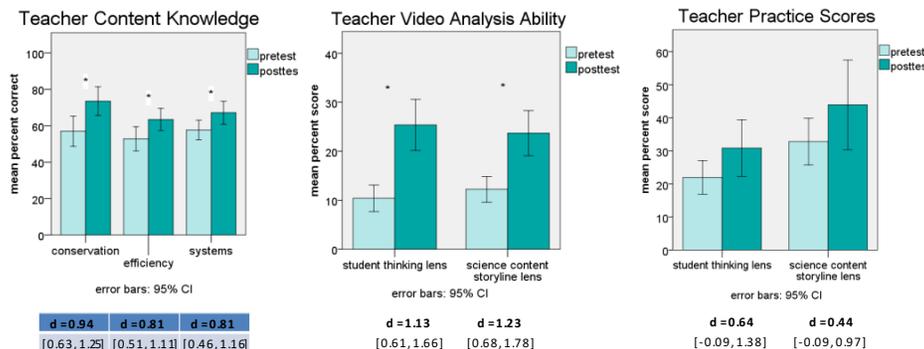
Based on Successful STeLLA PD Model (Roth et al., 2011; Taylor et al., 2017)

- 12 of 16 STeLLA Strategies
- Situated cognition through video analysis
- Active learning of science content and pedagogy
- 120 hours over 10 weeks in Summer

Three Key Energy Concepts

- Energy is neither created nor destroyed
- A systems approach is useful for tracking matter, energy, and understanding system affordances and limitations
- No energy transfer is 100% efficient

RESULTS: TEACHERS

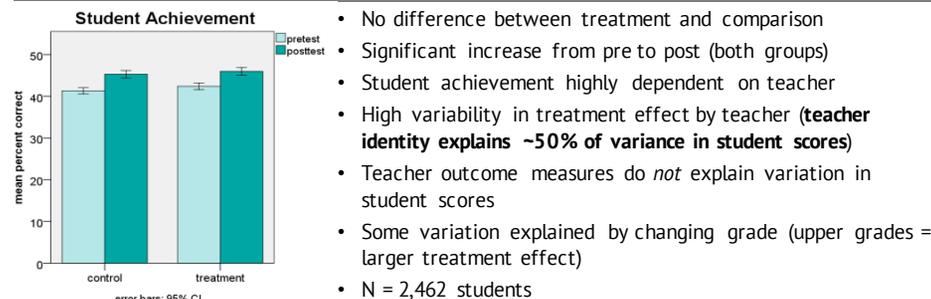


Significant change on all three key concepts (pre to post)

- Significant change on ability to analyze video (both lenses)
- Low scores
- **STeLLA 2x greater than EMAT** (pre to post)
- Increased scores, but not statistically significant
- High variability in scores
- **STeLLA 4x greater than EMAT** (pre to post)

N = 18 to 25 teachers, depending on outcome measure

RESULTS: STUDENTS



- No difference between treatment and comparison
- Significant increase from pre to post (both groups)
- Student achievement highly dependent on teacher
- High variability in treatment effect by teacher (**teacher identity explains ~50% of variance in student scores**)
- Teacher outcome measures do *not* explain variation in student scores
- Some variation explained by changing grade (upper grades = larger treatment effect)
- N = 2,462 students

TEACHER COMMENTS

Case study teachers with **positive student treatment effect**...

- Remarkd positively on active learning components (e.g. metacognition opportunities and interactives)
- Remarkd positively on video analysis opportunities

Case study teachers with **negative student treatment effect**...

- Had trouble connecting what they were learning to their daily instruction (**not sufficiently situated**)
- Remarkd negatively on video analysis and had difficulty with lesson analysis protocols (**active learning through video not sufficiently supported online**)

CONCLUSIONS

- **Narrow content focus** is likely important to efficacy of STeLLA.
- **Model curriculum materials** as part of PD may be key to enhancing student learning
- **Need additional supports** as teachers learn to use video analysis protocols online
- Intensive summer PD may be **less effective than extended over school year**

ACKNOWLEDGEMENTS

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Roth, K. J., Garnier, H., Chen, C., Lemmens, M., Schwill, K., & Wickler, N. I. Z. (2011). Videobased lesson analysis: Effective science PD for teacher and student learning. *Journal of Research in Science Teaching*, 48(2), 117-148. doi: 10.1002/tea.20408

Taylor, J. A., Roth, K., Wilson, C. D., Stuhlsatz, M. A., & Tipton, E. (2017). The effect of an analysis-of-practice, videocase-based, teacher professional development program on elementary students' science achievement. *Journal of Research on Educational Effectiveness*, 10(2), 241-271.