

# Leveraging Teacher Candidates' Knowledge and Professional Community Experiences through Lesson Study

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**ELICIT-Math**

AMTE  
Standards,  
2017,  
Indicator  
P.4.2

- “An effective mathematics teacher preparation program supports candidates’ engagement in increasingly comprehensive acts of teaching by providing coherent and developmentally appropriate clinical experiences.”

# Clinical Experiences

- Teacher education researchers have identified disconnects between methods courses taught at the university and school-based field experiences (Darling-Hammond, Hammerness, Grossman, Rust, & Shulman, 2005).
- Zeichner (2010) has proposed creating *hybrid spaces* where academic and practitioner knowledge converge, thus providing opportunities for multiple sources of knowledge to be valued.
- This notion of hybrid spaces can be useful in re-designing teacher education programs by strengthening the connections between methods courses and field experiences.

# Our Study

- We examine an innovation where teacher candidates (TCs) engaged in a lesson study cycle facilitated by a mentor teacher (MT).
- TCs in their 3<sup>rd</sup> year of a 4-year teacher education program at a public institution were taking a methods course about integrating technology and manipulatives in secondary math instruction.
- We ask: ***What learning opportunities leverage teacher candidates' knowledge and professional community experiences during lesson study?***
- We analyzed video-recordings of meetings by two lesson study teams, A and B.
- Our goal is to examine possibilities and challenges of our lesson study adaptation.

# Lesson Study Poll

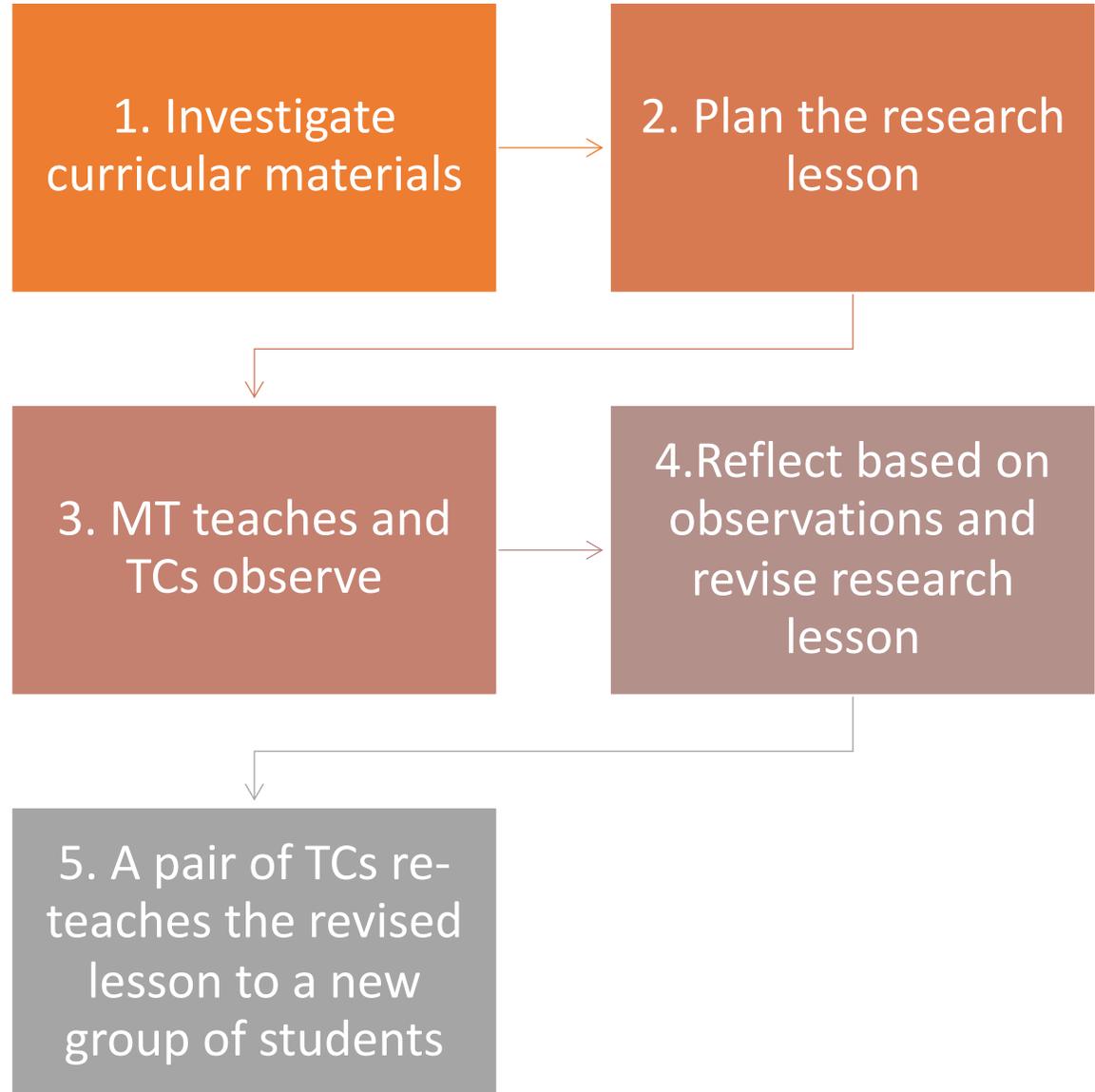
A. Lesson Study is new to me.

B. I have participated in Lesson Study as a teacher.

C. I have organized/facilitated Lesson Study.

D. I'm curious about how to engage teacher candidates in Lesson Study.

# Our Lesson Study Adaptation



# Research Questions

1. What evidence of teacher learning opportunities is related to each lesson study step?
2. How is that evidence supporting the creation of a hybrid space connecting the methods course and the field experience?

# Theoretical Framework for Lesson Study (Lewis, Perry, & Hurd, 2009)



## Teachers' knowledge and beliefs

Subject matter knowledge

Pedagogy

Student thinking

Long-term goals



## Teachers' professional community

Motivation

Mutual accountability

Shared goals for students

Shared language and frameworks



## Teaching-learning resources

Tasks that reveal student thinking

Data collection protocols

Tools for exchanging ideas

Lesson plans

# Method

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Produced a timeline to segment each meeting in relation to changes in the activity structure (Herbst, Nachlieli, & Chazan, 2011).

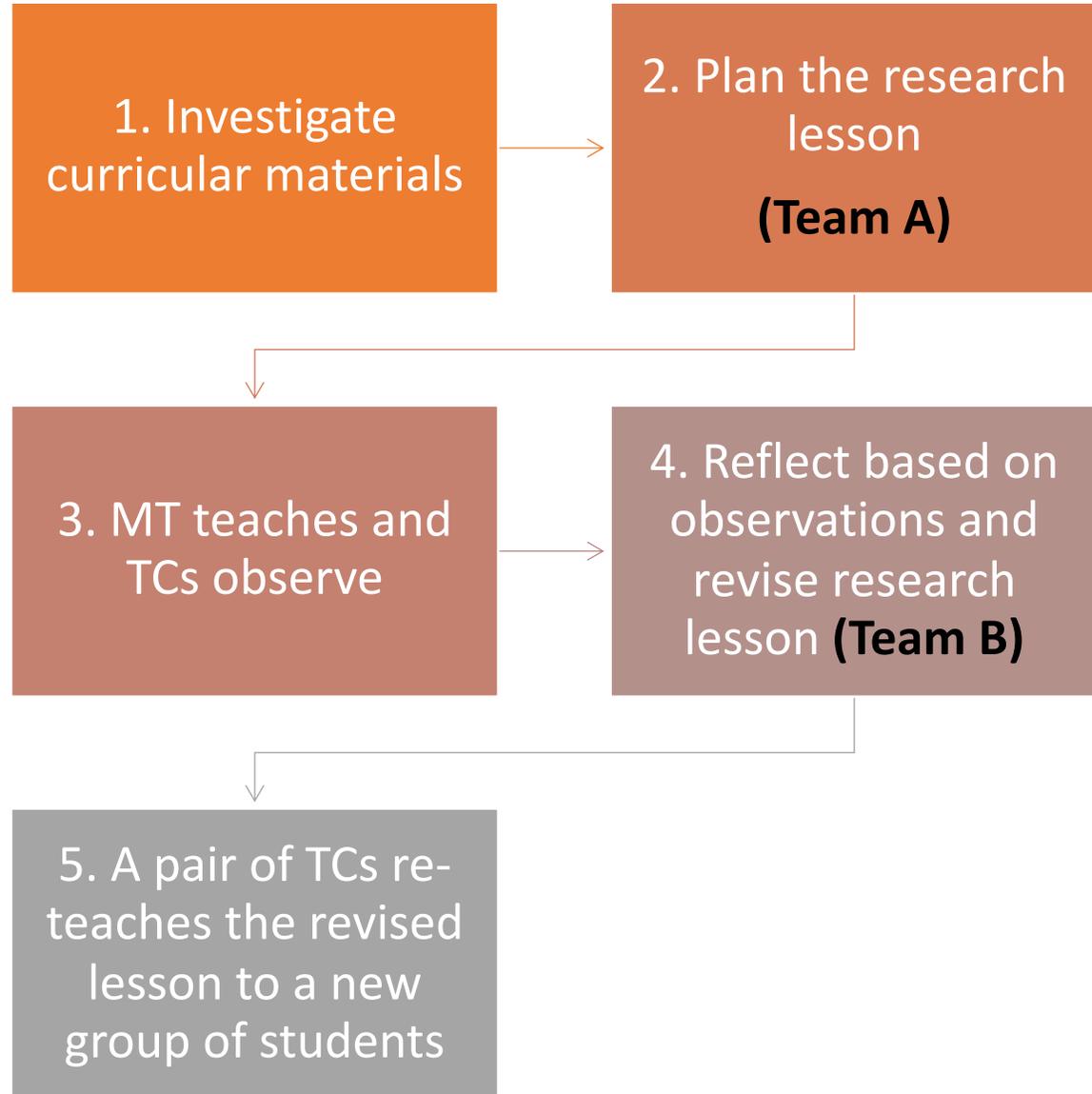
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Coded each interval in relation to whether there was evidence of learning opportunities along the three dimensions in the discussions using a binary coding (i.e., 1 for evidence and 0 for no evidence).

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Checked our coding and consistently achieved reliability of more than 78% when coding independently.

# COVID-19 interruptions



# Breakout groups

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- In what ways moving to an online environment affects Lesson Study implementation?
- How did you cope with setting up clinical experiences online in your own institution?
- What sources do you think that mentor teachers need for supporting Lesson Study online?



# Results

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We found evidence of learning opportunities along the three dimensions in all the meetings.

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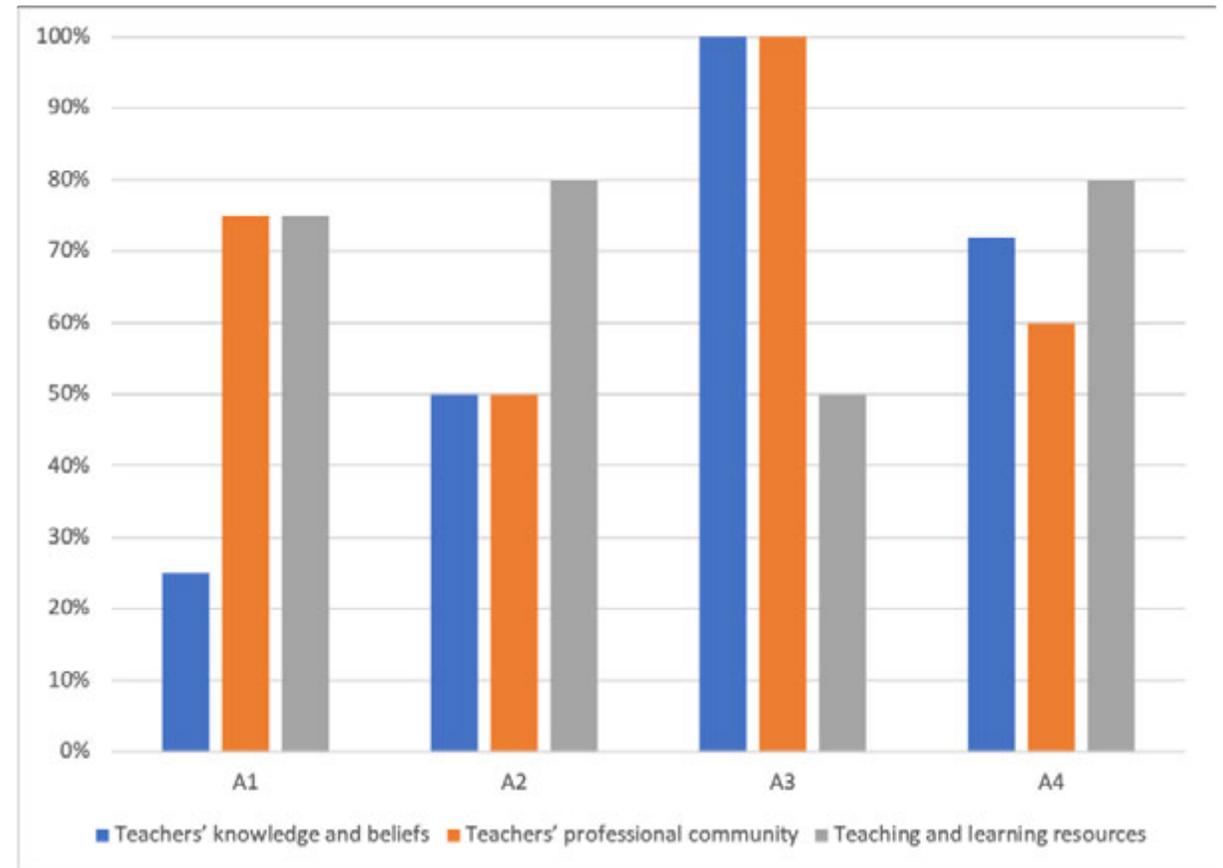
Team A had more intervals with evidence of discussions about teaching and learning resources (78%), followed by teachers' professional community (63%), and teachers' knowledge and beliefs (57%).

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Team B had more discussions about teachers' knowledge and beliefs (67%), followed by teachers' professional community (53%), and teaching and learning resources (47%).

# Intervals with Evidence of Learning Opportunities in Team A

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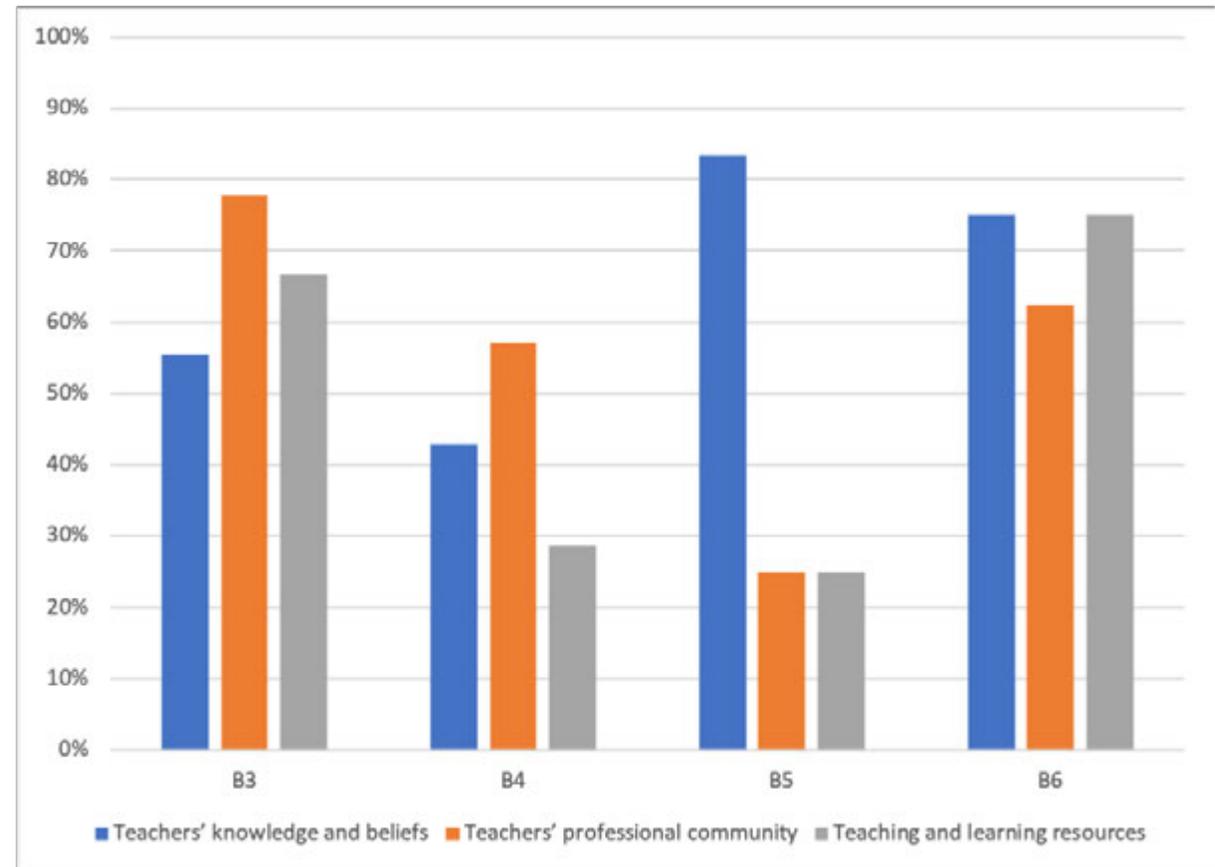


# Mentor Teacher A's Learning Supports

- Showed how to read curricular materials.
- Mapped Common Core State Math Standards to Puerto Rico Math Standards.
- Asked to differentiate instruction.
- Discussed math concepts in the research lesson (e.g., the solution of a system of linear equations).
- Illustrated possible student errors.
- Asked to focus on two strands of math proficiency for the research lesson.
- Reviewed a presentation about the strands of mathematical proficiency from the methods course.
- Facilitated TCs' active participation in discussions.
- Fostered responsibility for revising the research lesson.
- Made suggestions to improve the research lesson.

# Intervals with Evidence of Learning Opportunities in Team B

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# Mentor Teacher B's Learning Supports

- Discussed the math content of the research lesson.
- Identified pedagogical decisions when teaching with a problem (e.g., the choice of numerical values and scaffolding math procedures).
- Introduced a proof of the Pythagorean theorem.
- Explained connections with prior lessons.
- Anticipated possible student errors.
- Showed appreciation for the proof.
- Held TCs accountable for incorporating lesson revisions discussed in the debriefing.
- Facilitated the process of instructional materials through online platforms.
- Referred to instances in the lesson during the debriefing to show evidence of student thinking.

# Breakout groups

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- Discuss the mentor teachers' actions that promoted learning in Lesson Study.
- In what ways do you think that Lesson Study can help to develop **teachers' knowledge and beliefs**, **build a professional community**, and create teacher-learning resources?



# Resources for creating a hybrid space connecting the methods class & the clinical experiences

- References to teaching moves using Desmos which had been introduced in class with a “rubric.”
- Shared language about mathematical proficiency in relation to the strands: *conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition.*
- Lesson plan template provided in the methods course which required references to Desmos and math proficiency (adapted from Bieda, Cavanna, & Ji, 2015).

# Example: Desmos rubric

Nivel interacción	Movimientos	Descripción	Aspectos Técnicos (How to?)	Propósito Pedagógico	Ejemplo
Bajo	Selección múltiple	Crear una pregunta y los estudiantes seleccionan una o varias alternativas.	<a href="https://www.youtube.com/watch?time_continue=10&amp;v=oS0Oc0i1Dnk&amp;feature=emb_logo">https://www.youtube.com/watch?time_continue=10&amp;v=oS0Oc0i1Dnk&amp;feature=emb_logo</a>	Evaluar respuestas que los estudiantes proveen y determinar respuestas más frecuentes; promover discusión entre éstos.	En una lección sobre sistemas de ecuaciones lineales, los estudiantes predicen la solución.
Mediano	Pregunta abierta	Crear una pregunta y los estudiantes escriben sus respuestas.	<a href="https://www.youtube.com/watch?v=JQa8X0gu0OI&amp;feature=emb_reel_pause">https://www.youtube.com/watch?v=JQa8X0gu0OI&amp;feature=emb_reel_pause</a>	Cotejar las respuestas ofrecidas por los estudiantes, verificar si se repiten éstas. Verificar si las respuestas indican errores conceptuales.	En una lección sobre la definición de la pendiente de una recta, los estudiantes ven una colección de rectas con varias pendientes y con el mismo intercepto en $y$ . Los alumnos deben escribir características de las rectas.
Mediano	“Freeze”/ “Teacher pacing”	Seleccionar las pantallas que desea que vean los estudiantes.	<a href="https://learn.desmos.com/classroomconversation">https://learn.desmos.com/classroomconversation</a>	Discutir diferencias y similitudes en varias gráficas o aspectos a considerar al tomar decisiones sobre las funciones.	En una lección sobre regresión lineal, los estudiantes estiman la línea de mejor ajuste usando “draw” con el mismo conjunto de datos. Usas “freeze” para discutir características de las rectas trazadas como la pendiente y el intercepto, seleccionas las respuestas de 3 estudiantes.

# Breakout groups

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- In what ways do you think that Lesson Study can help to develop **teachers' knowledge and beliefs**, **build a professional community**, and create teacher-learning resources?



# Implications for Mathematics Teacher Education

- Lesson Study allowed for connections between the methods course and the clinical experiences.
- Resources such as shared frameworks (the strands of math proficiency) and tools (the rubric and the lesson plan template) supports the creation of hybrid spaces.
- Future research focusing on the professional development of mentor teachers can help in disseminating our Lesson Study adaptation.

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# Thank you!

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