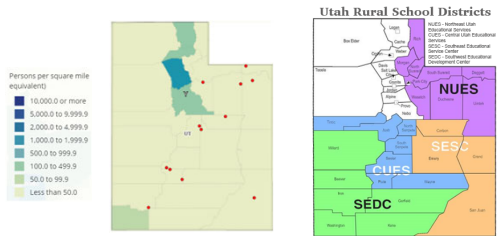


## RURAL EDUCATION IN UTAH



- Disciplinary Core Ideas (DCIs): Content
- Crosscutting Concepts (CCCs): Lenses
- Science and Engineering Practice (SEPs): Tools

### Rural Professional Development

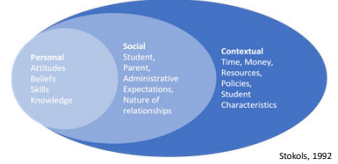
- Effective professional development should be ongoing, collaborative, and practice-based
- Rural teachers struggle with this
  - The only teacher in their field (e.g., physical science) or subject (e.g., biology) in their school/district
  - Geographical distance from other educators teaching the same subjects
  - Additional responsibilities (such as coaching, administrative work, etc.)
  - Reduced access to PD opportunities

## PRIMARY GOALS & CONCEPTUAL FRAMEWORK

**People.** Building capacity for culturally responsive 3D science teaching among rural Utah teachers. Creating community and collaboration within a broader network of rural teachers.

**Principles.** Designing, studying, and refining TMLS as a productive model for professional development.

**Products.** High-quality 3D science lesson plans that can be shared broadly with Utah teachers and teachers across the country.

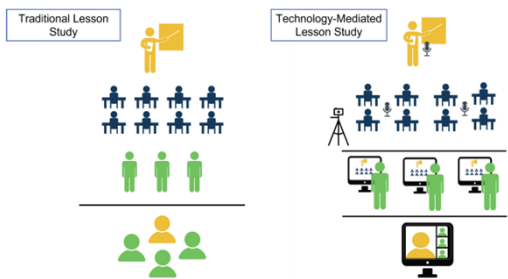


Stokols, 1992

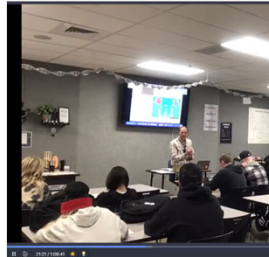
## RESEARCH QUESTIONS

1. Does TMLS help teachers develop the personal skills and dispositions they need to enact 3D science teaching?
2. Does TMLS help teachers build social networks and communities of practice that support enactment of 3D science teaching?
3. Does TMLS help teachers overcome contextual barriers or leverage contextual drivers to enact 3D science teaching?

## TECHNOLOGY-MEDIATED LESSON STUDY (TMLS)



## TEACHING, RECORDING, AND RESPONDING TO CREATED 3D SCIENCE LESSONS



**Ronan:** I think mentioning explaining the genes that are being changed is something that should be added into the lesson.

**EquiP:** Sense-making requires performance that integrates SEPs, CCCs, and DCIs

**Rich:** This activity really gives students a chance to start forming their evaluations and provides a formative look at where students are at.

**EquiP:** Embeds formative assessment processes throughout

**Wayne:** I think one of the best things we are doing with this lesson is giving plenty of time and information to help students form an opinion and evaluate what biotechnology is doing.

**EquiP:** Provides opportunities for students to express, clarify, justify, interpret, and represent their ideas and to respond to peer and teacher feedback orally and/or in written form as appropriate

## MEETING VIRTUALLY TO TALK ABOUT THE LESSON

**Ellen:** I think adding a slide that says this is what it is, and this is what it isn't. What do you guys think?

**Charles:** I think more clarity is always better.

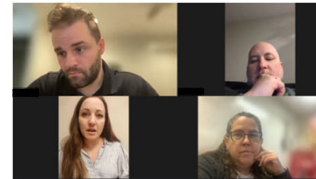
**Brock:** That's the teaching battle we have, right? Our desire to make sure that students understand versus trying to help them learn to figure out some of the things as they go.

**Ellen:** In my experience, when I spell it out for them, they forget, and they are more likely to remember if they have to figure it out.

**Meganne:** The slide show, as we have it, doesn't have a list, but we can have the students generate a list, maybe as a check for understanding.

**Brock:** Right. Because their ideas are creating the definitions. I think this slide is a good idea because it...

**Ellen:** ...forces them to be part of the lesson.



## REVISING THE LESSON BEFORE IT IS RETAUGHT

## CHANGES IN TEACHER'S 3D SCIENCE KNOWLEDGE

**Before TMLS**

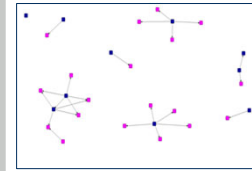
- Rich: "Traditionally, [science] primarily only been 1D, highly focused on one of those dimensions."
- Sophia: "I've been hearing about this 3D in NGSS and science standards since I started about three years ago, and I really didn't get, what it means."

**After TMLS**

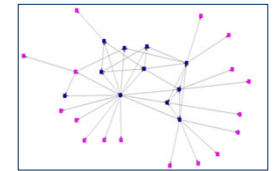
- Rich: "I think I've had a paradigm shift in how I look at things. Before, I looked at the three dimensions as three columns not as three things to be integrated. I would teach one column and then I would teach another column. [This project] has helped me see the value in integrating them, not just that it's possible to integrate them—that you can make it work, but also that it makes all of them work better when they are together."
- Sophia: "This project pretty much changed the way I taught and my lessons, how I've organized my lessons and organized my classroom. It makes me more of a conscientious teacher. And it seems from experience from my classroom, the students were way more focused and way more involved in this lesson and they got something out of it when I have the assessment at the end; they actually did much better."

## SOCIAL NETWORK OF TMLS TEACHERS

PRE-TMLS COLLABORATION

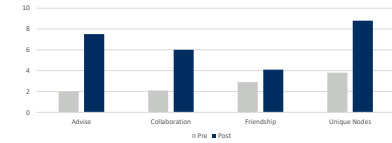


1 YEAR OF TMLS COLLABORATION



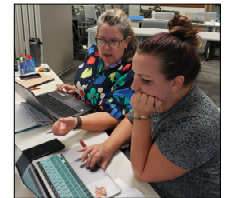
■ Non-participant  
■ Participant

Pre- & Peri-TMLS Outdegree



## TMLS PROCESS REFLECTIONS

It's so nice having other people...who have different strengths but then also different perspectives. They're going to notice things that I don't notice. And it's so nice having a group that is very focused on creating content and not dealing with school drama. There's no external education problems. We're just creating content.



It may take a long time, but then by being able to be a part of a research group like this, you are now afforded some time to really deep-dive into some of those teaching components that are going to really help your lessons.

## CONCLUSIONS

- TMLS assists rural science teachers in developing new connections, which strengthen over time.
- The professional development process of TMLS allows teachers the time to practice and develop knowledge and skills that extend beyond the lessons created in this project
- Teachers improve their 3D science teaching skills by writing lesson plans, teaching the lesson one at a time, watching each other teach it, and revising the lesson as a group.

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