

Coaching for Sustainability: Distance-Based Peer Coaching Science Inquiry in Rural Schools

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Research Questions

1. What are the **key aspects of follow-up PD** that improve teacher competency in developing and implementing guided inquiry lessons?
2. What are the **key aspects of a peer-coaching practice** that support teachers' implementation of the guided inquiry lessons?
3. What is the **value added effects of follow-up PD and peer-coaching practice** over a previous PD on student inquiry knowledge and skills?

Scientific Inquiry in NGSS

“...learning about science and engineering involves integration of the knowledge of scientific explanations (i.e., content knowledge) and the practices needed to engage in **scientific inquiry** and engineering design.” (A Framework for K-12 Science Education: Practices, crosscutting concepts, and core ideas, 2011, p. 11).

“In the future, science assessments will not assess students’ understanding of core ideas separately from their abilities to use the **practices of science** and engineering. They will be assessed together, showing students not only “know” science concepts; but also, students can use their understanding to investigate the natural world **through the practices of science inquiry**, or solve meaningful problems through the practices of engineering design. The Framework uses the term “practices,” rather than “science processes” or “inquiry” skills for a specific reason: We use the term “practices” instead of a term such as “skills” to emphasize that **engaging in scientific investigation requires** not only skill but also knowledge that is specific to each practice.” (NRC Framework, 2012, p. 30)

Inquiry Continuum (Teacher Inquiry Rubric, Nugent, 2011)

<p>1. Pre Inquiry [Non-guided inquiry]</p> <p>No evidence of teacher instruction regarding:</p>	<p>2. Developing Inquiry [Direct and Didactic]</p> <p>Instruction addresses inquiry topic/construct through lecture or demonstration to help students know/recall/recognize the skills.</p>	<p>3. Proficient Inquiry [Guided Inquiry with Explicit/Didactic Teacher Guidance; low quality guided inquiry]</p> <p>Teacher uses guiding questions, scaffolds, experiences, and/or feedback to help students comprehend the skills.</p>	<p>4. Exemplary Inquiry [Guided Inquiry with Scaffolded Teacher Guidance; high quality guided inquiry]</p> <p>Teacher uses guiding questions, scaffolds, experiences, and/or feedback to help students perform the skills:</p>
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Instructional Coaching Provide:

- Effective self-reflective practices
- Follow-up assistance with feedback, support, and advice
- Incorporated changes into the context of the classrooms
- Increased implementing new teaching strategies (15%, without coaching -> 85%, with Coaching; 25%, without peer-coaching -> 95% with peer-coaching)

(Asay & Orgill, 2010; Tobin & Espinet, 1989; Cantrell & Hughes, 2008; Murray et al., 2009; Showers & Joyce, 1996; Cornett & Knight, 2009)

Distance-Based Peer-Coaching

- Can peer-coaches replace hired instructional coaches?
- Reported some issues of peer-coaching on the same site (Joyce & Showers, 2002)
- Coaching by a peer-teacher from a remote place may remove the issues
- Easy access to PD opportunities and on-going support
- Maintain active relationship and reflective practice for teaching

Study Context

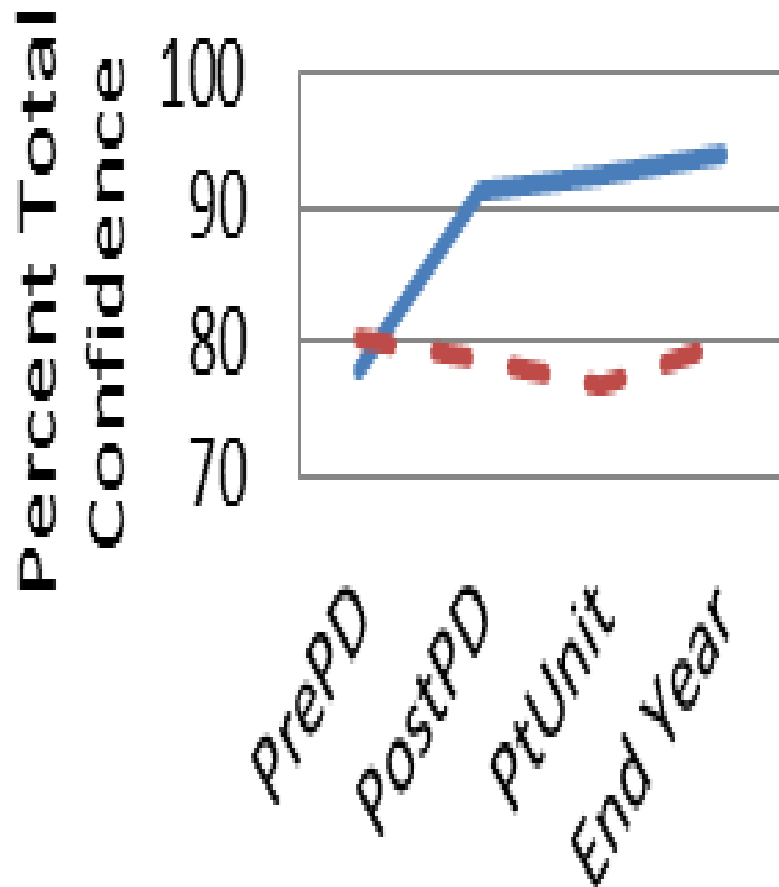
PD Program	Funder	Time	PD Continuum
1. Coaching Science Inquiry for Middle and High School Science Teachers	CCPE	2011-2012	Pilot
2. CSI: Coaching Science Inquiry in Rural Schools	IES	2012-2014	Implementation
3. Coaching for Sustainability: Peer Coaching Science Inquiry in Rural Schools (Presented Study)	CCPE	2013-2014	Sustainment part I
4. Professional Development for Reflective Practice of Guided Science Inquiry Instruction (Proposal Submitted)	CCPE	2014-2015	Sustainment part II

CSI: Coaching Science Inquiry in Rural Schools

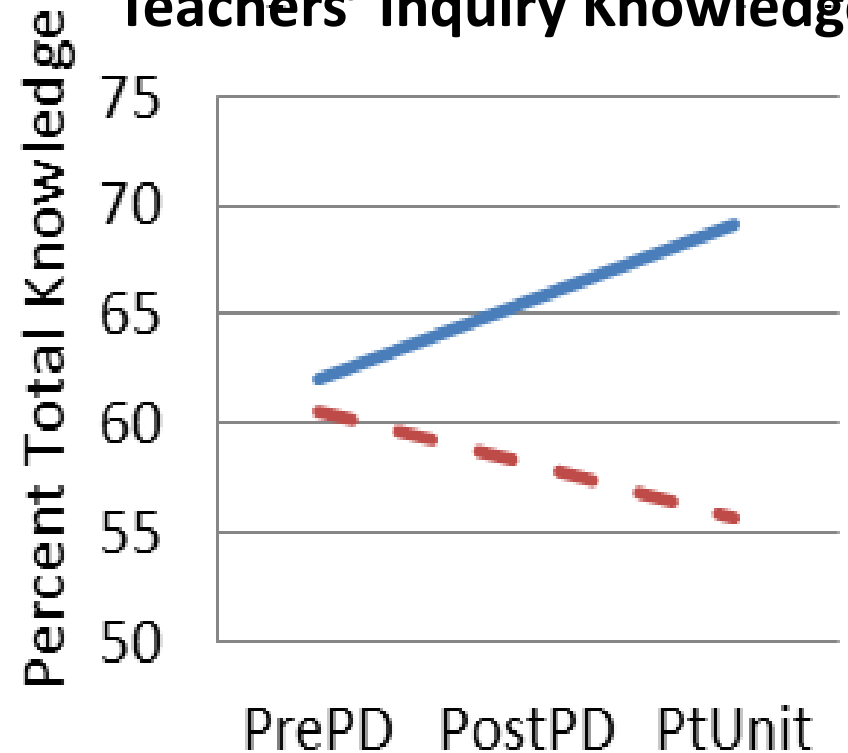
- Randomized controlled trial conducted by the National Center for Research on Rural Education (R²Ed) at the University of Nebraska-Lincoln funded by the U.S. Department of Education, Institute of Education Sciences
- Involves 119 teachers over two years (2012-2014)
- 2-Week Summer Workshop for Implementing Guided Inquiry Instruction
- 32 Guided Inquiry Lesson Lesson Plans Provided
- 4 Science Instructional Coaches – Former Science Teachers
- 8 – 16 Distance-Based Instructional Coaching Sessions
- Showed increased teachers' self-efficacy and inquiry knowledge after summer institute and maintained throughout the school year

Results from the first year of CSI Study

Teachers' Self-Efficacy



Teachers' Inquiry Knowledge



Coaching for Sustainability: Distance-Based Peer Coaching Science Inquiry in Rural Schools (Presented Study)

- Follow-up PD to sustain/improve CSI teachers' implementation of inquiry instruction
- 16 teachers from the treatment group in the first year of CSI study
- Experienced implementing inquiry-based teaching and technologies for distance-based coaching
- Three-Day Summer Workshop for transforming a traditional science lesson plan into a guided inquiry lesson plan
- Example lesson plan template, worksheet, guideline provided
- Distance-based peer coaching practice during the workshop
- Inquiry lesson implementation developed during the workshop
- At least three distance-based peer-coaching sessions during the following the following school year (10 teachers out of 16 have completed lesson implementation and peer-coaching by Jan 10, 2014)
- Follow and complete coach's protocol during the coaching session

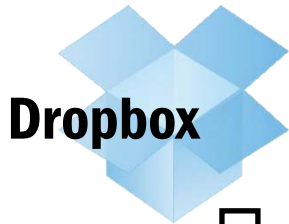
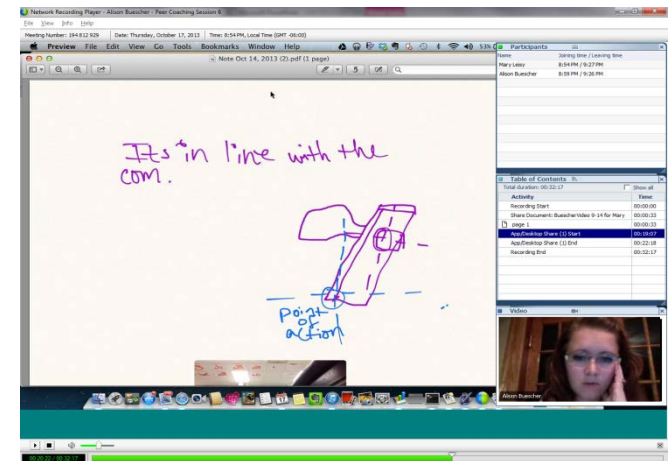
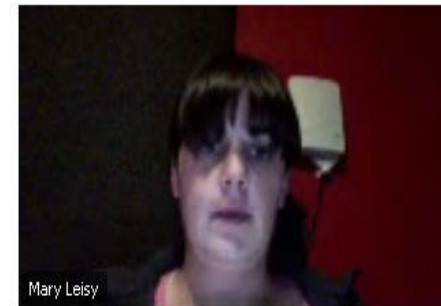
Participants

- 16 Science Teachers from Middle and High Schools in Nebraska and Iowa (6th to 12th)
- Paired for peer-coaching according to grade level and content area
- Content areas:
 - Physics – Wave, EM wave, Unbalanced Force, Physics, Center of Mass
 - Chemistry - Unknown Substance, Solubility Lab, Matter, Periodic Table, Periodic Table, Colorful Reaction
 - Biology – Carbohydrates, Bacteria
- 243 Students (109 Middle and 134 High School Students)

Video and Distance Technology



Peer Teacher



Dropbox



UNL Server

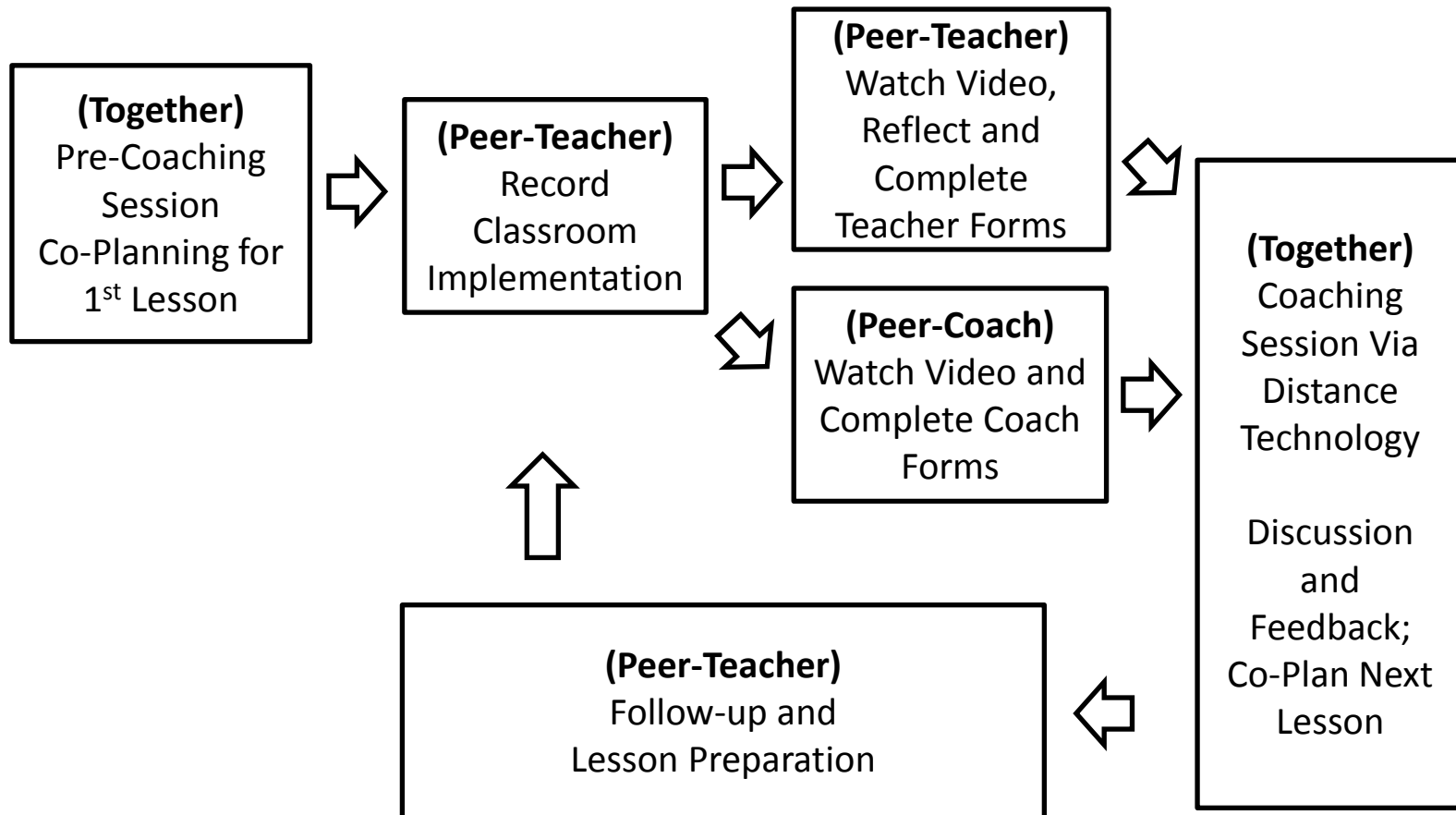


Peer Coach



WebEx Video Conference

Distance-Based Peer Coaching Process



Recorded Video Conference

26m 20s – 26m 40s

Overview of Coaching Protocol

- Positive Feedback
- Snapshot of Student Skill Level
- Review of Student Outcomes
- Review of Teacher Strategies
- Detailed Discussion of Lesson
- Sharing Video Clips
- What Were the Strengths?
- What Can Be Improved?
- Plan Next Lesson

Data Collection

Teacher Instruments

- Inquiry Knowledge, Self-efficacy, Inquiry Beliefs
- Assessment of student inquiry skills
- Interview

Student Instruments

- Inquiry knowledge test, NeSA practice, Attitude Questionnaire

Researcher-Completed Instruments

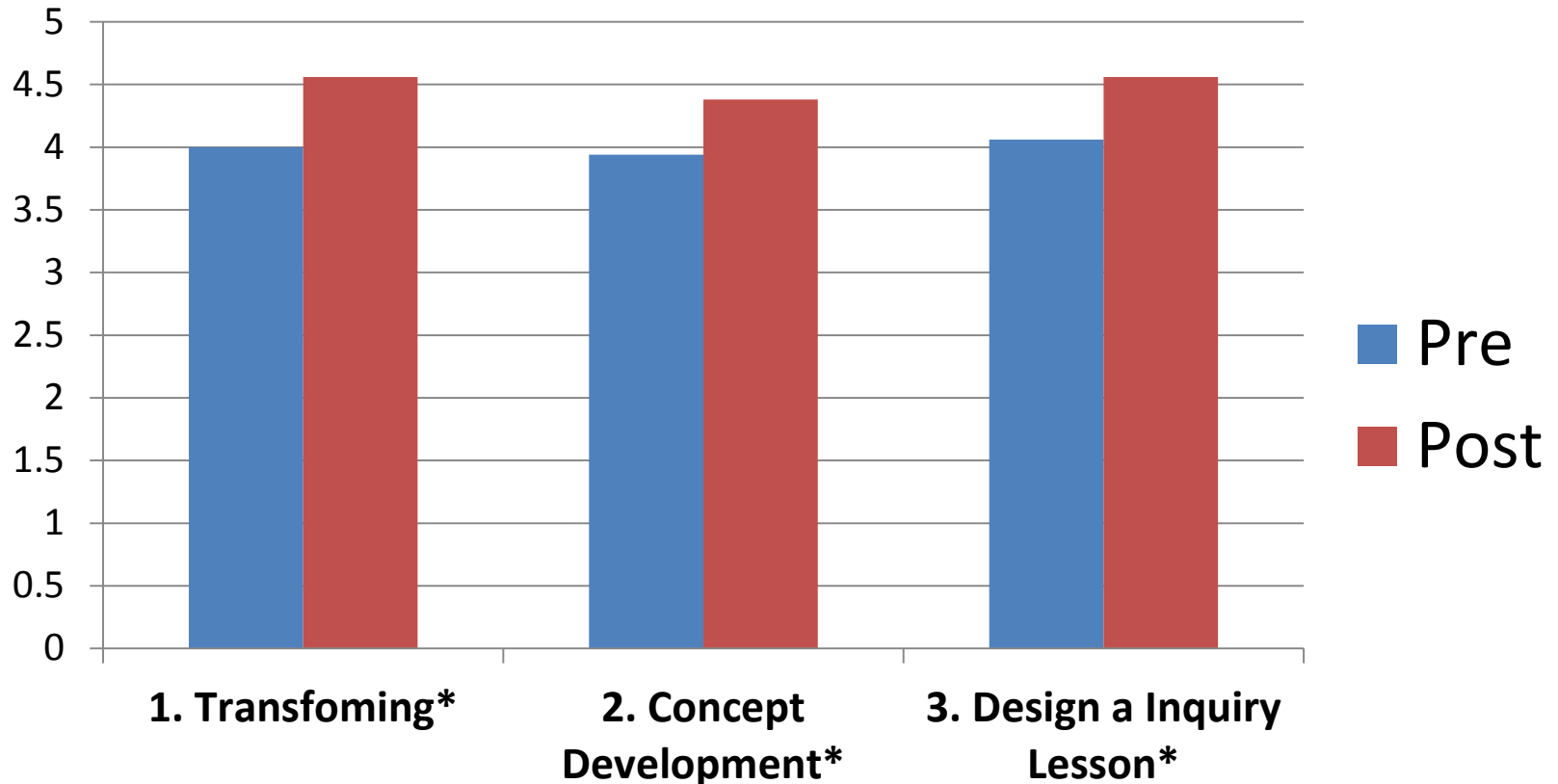
- Partial Interval Classroom Inquiry, Teacher Inquiry Observation Rubric, Electronic Quality of Inquiry Protocol (EQUIP), Fidelity Checklist for Coaching Sessions

Qualtrics Software

Project Website for Data Management

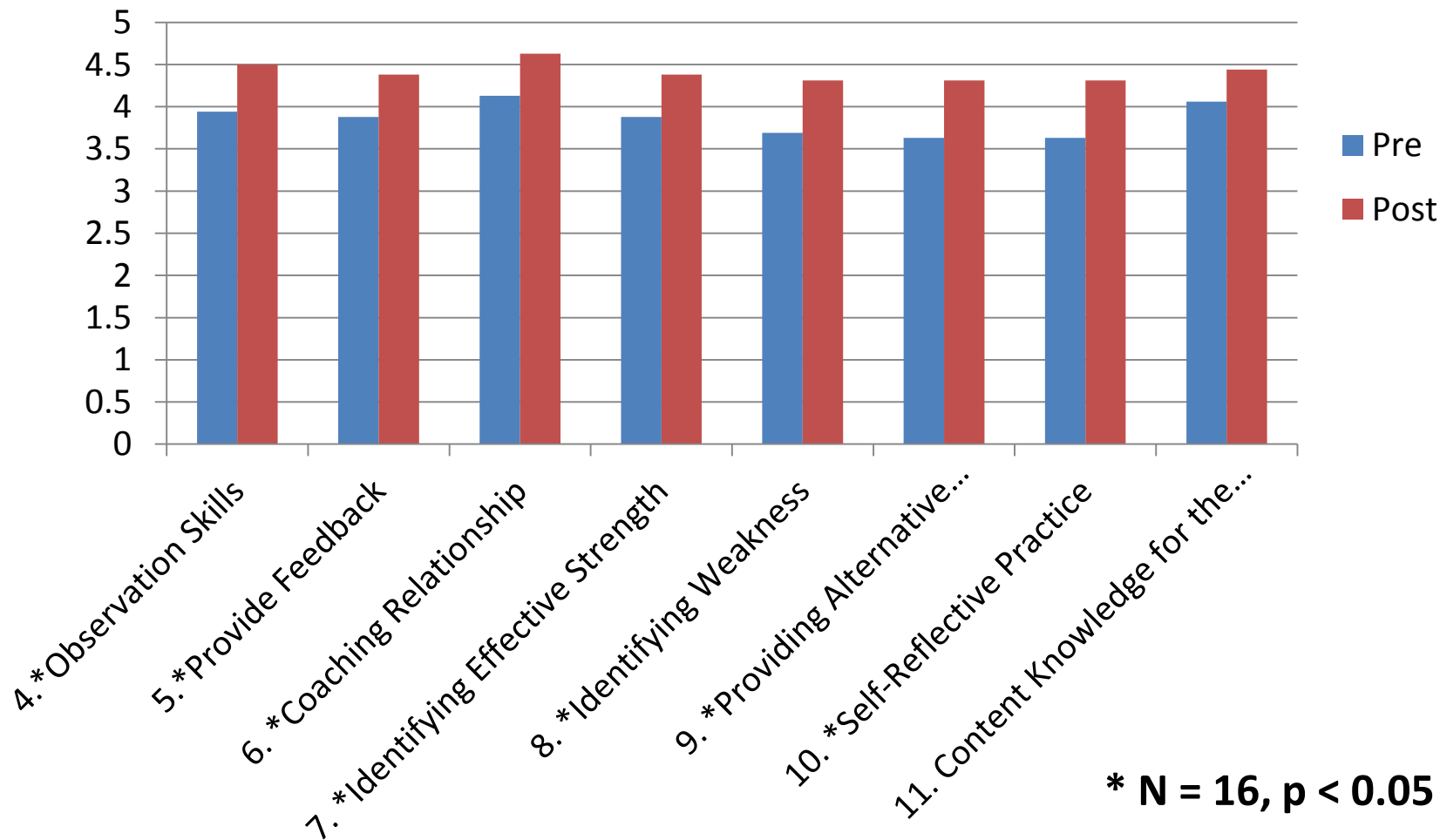
Preliminary Results

Science Teachers' Self-Efficacy after Summer Institute PD



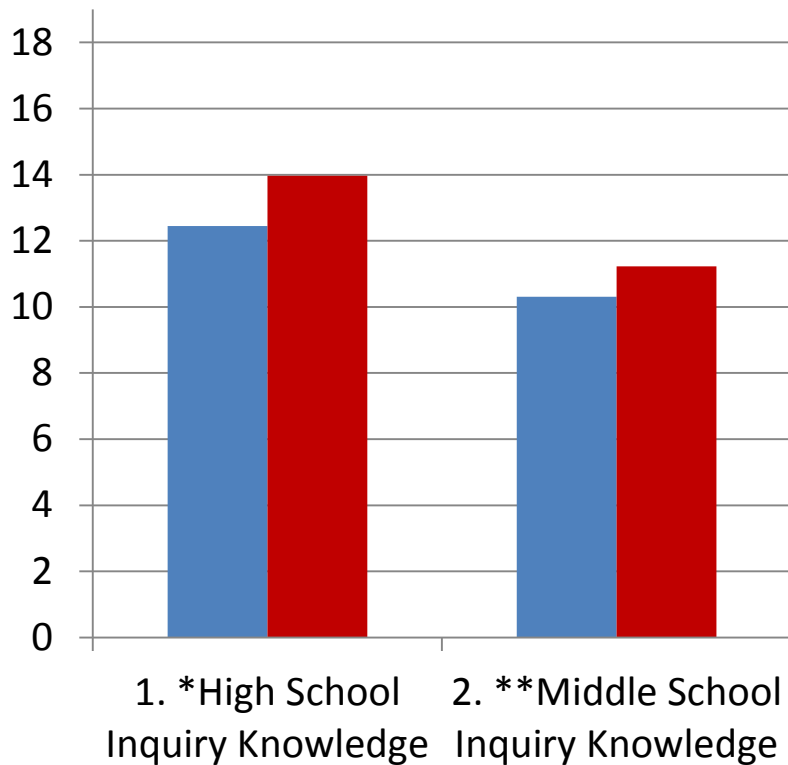
* N = 16, p < 0.05

Science Teachers' Self-Efficacy after Summer Institute PD



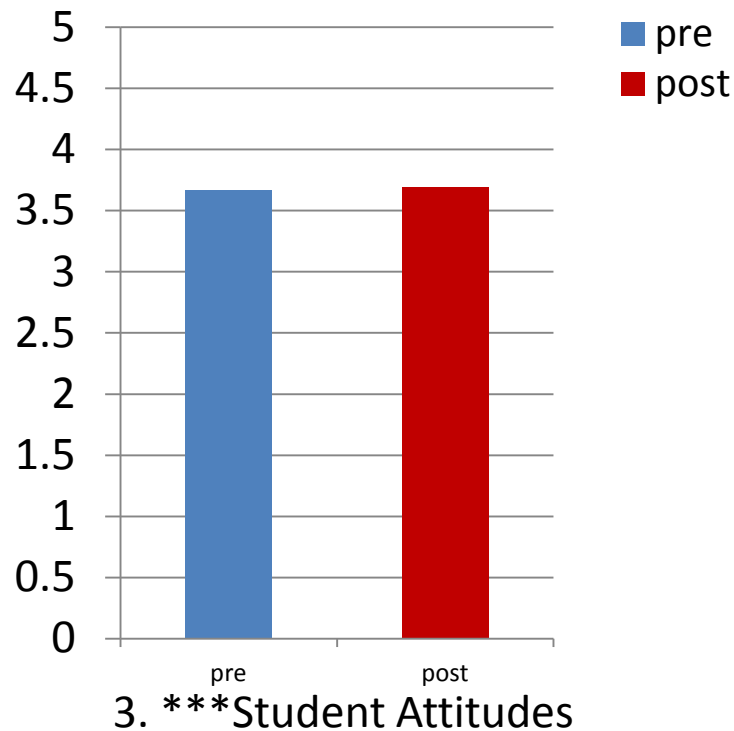
* N = 16, p < 0.05

Student Tests Results (Pre vs. Post Lesson Implementation)



* N = 58, $p < 0.05$

** N = 39, $p > 0.05$



*** N = 95, $p > 0.05$

Teachers' Comments after the Peer-Coaching

“As a coach I enjoyed looking critically at another person’s teaching because it made me think about my own as well as the whole process of inquiry. **As a teacher** I appreciated reflecting on my own teaching as I watched my own videos and hearing another’s perspective about things happening in my classroom.”

“As a teacher it helped me to see what I was missing in the inquiry process and helped me to realize that I need to work on more in depth questions. **As a coach** it helped me to see what I could do better myself and it was just nice to see someone else model the process.”

“The greatest benefit that I received from **the coaching role** was the ability to observe a teacher implementing an inquiry lesson and having the opportunity to objectively analyze the lesson. This objective analysis helped me reflect on my own teaching and identify areas of improvement. **In the teacher role** I benefited from having another science professional to brainstorm ways to improve or modify parts of the lesson.”

Questions & Suggestions

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Nebraska's Coordinating Commission
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CCPE

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