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The Effectiveness of E-Coaching in Rural Science Classrooms

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Abstract for DBER Group Discussion on 2015-03-19

Presenter(s), Department(s):

Gwen Nugent

Research Professor

Nebraska Center for Research on Children, Youth, Families and Schools

University of Nebraska-Lincoln

Title:

The Effectiveness of E-Coaching in Rural Science Classrooms

Abstract:

This presentation will present final results of a research project funded by the U.S. Department of Education and conducted by the National Center for Research on Rural Education at UNL. The study is a randomized control trial with 119 rural middle and high school science teachers in Nebraska and Iowa. It examines the impact of professional development on guided scientific inquiry with technology-delivered follow-up coaching (treatment) versus no professional development (control) on teacher and student inquiry knowledge, skills, self-efficacy and attitudes. This presentation will provide an overview of the project, focusing on the coaching processes and procedures, and present final results.



National Center for **Research** on
Rural Education (R²Ed)

The Effectiveness of E-Coaching in Rural Science Classrooms

Gwen Nugent, James Houston, Gina Kunz, Irina
Kalutskaya, Greg Welch, ChaoRong Wu

K-12 Teacher Professional Development

- Research has shown that teacher PD should include *follow-up* support that is directly tied to what is happening in a teacher's classroom
- Technology can connect teachers in rural areas with instructional coaches

CSI: Coaching Science Inquiry in Rural Schools

- CSI is a **research** study 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
 - Key PD element is technology-delivered coaching
 - Randomized controlled trial
 - Involves 124 middle/high school rural teachers

CSI Research Study Research Question

*What is the impact of professional development on guided scientific inquiry with follow-up coaching (treatment) versus no professional development (control) on (a) **teacher** inquiry knowledge, skills, self-efficacy, and beliefs and (b) **student** inquiry knowledge, skills, engagement and science attitudes?*

CSI Inquiry Approach

- Guided inquiry instruction with scaffolding

NOT

Verification of teacher-presented content through demonstration

Summer Institute

- 8-day workshop in Lincoln using evidence-based strategies
 - Modeling by faculty, expert teachers, and coaches with commentary
 - Teacher practice of new skills
 - Feedback from coaches, peers, and faculty
- Use of video examples of pedagogical strategies (concept identification, questioning, scaffolding)
- Teachers provided with 6 – 8 week inquiry units
- Provided a foundation for a common language and shared understanding of what inquiry is and how to implement it

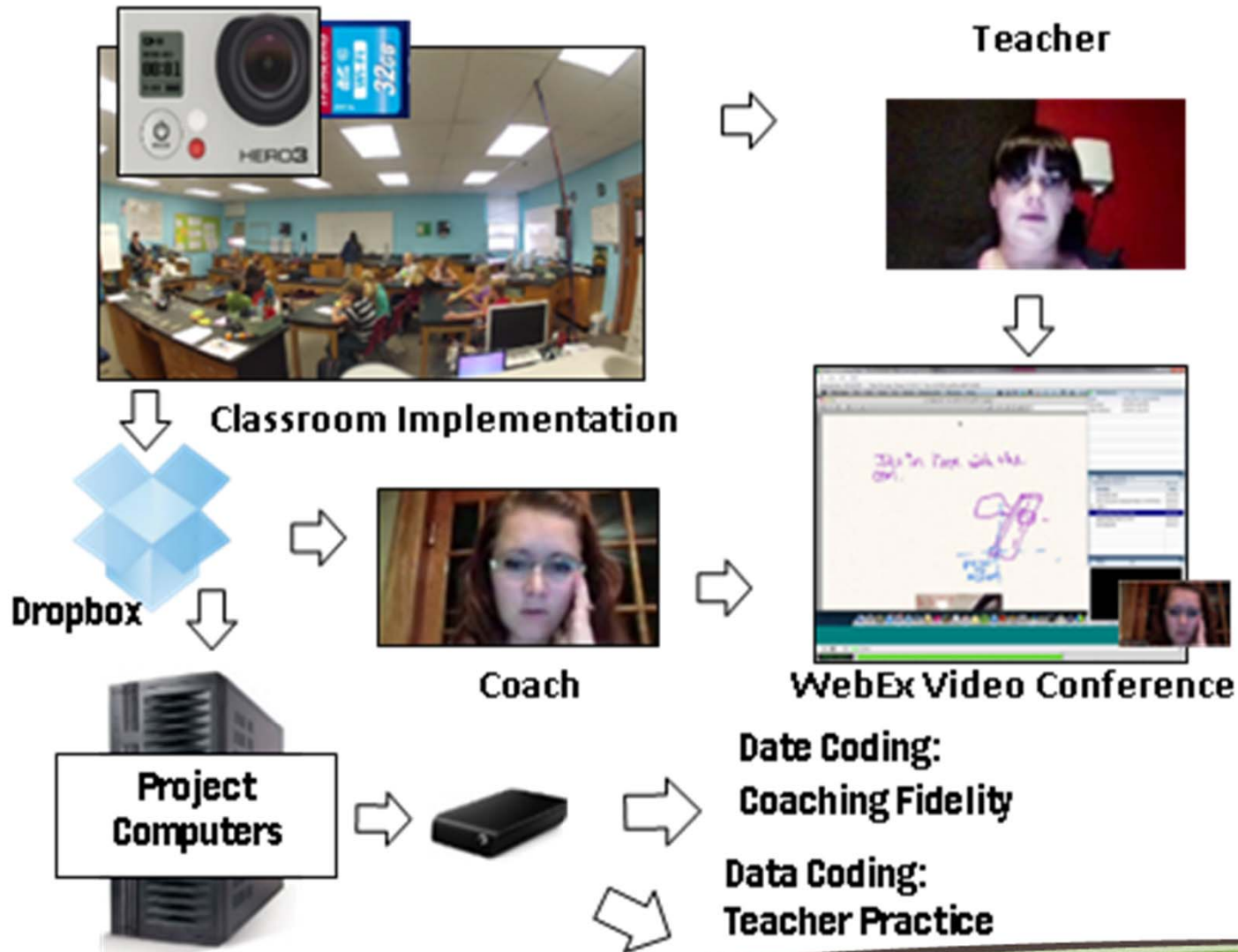
Over 60,000 miles traveled by teachers for
Summer Institute



Coaching

- Coaches were experienced science teachers
 - Nearly 100 years of classroom experience at both middle and high school level
- Coach training was one week with video examples and modeling
 - Establishing effective teacher-coach relationships
 - Co-creating behavioral targets for teacher instruction
 - Skills for teacher observation
 - Providing feedback
 - Technology training

E-Coaching Process



Use of Technology for Multiple Purposes

- Teacher recording classroom lessons for review by themselves, coaches, and data coders
- Delivery of video files from teachers to coaches and data coders
- Connecting teachers and coaches for the synchronous coaching sessions
- Data collection and coding

Teacher Recording of Classroom Instruction

- Teachers video recorded lessons using GoPro cameras and mics
- Teachers offloaded videos by either removing the storage card or connecting GoPro to computer

Transfer of Video Files to Coaches

- Files were uploaded to DropBox
- Project-developed software automatically uploaded new files to the main project computer

E-Coaching

- Usually twice a week for about 45 min. each over a 6 – 8 week period
- Bi-directional feedback based on video-recorded classroom lesson
- Used WebEx
 - Two-way video/audio
 - Playback of video examples of classroom instruction
 - Sharing of documents and desktop
 - Recording capability

Technology Use in Data Collection and Coding

- 6,000 – 8,000 hours (7 TB) of classroom video to code using three observational instruments
- Also recorded coaching sessions to assess coach adherence to established coaching protocols

Research Study Results

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Teacher Demographics

- 124 Teachers from 109 schools
 - 70% Female / 30% Male
- Average of 14 years of teaching experience
- 50% have master's degree

CSI Students

- Approximately **1800** Students from Nebraska and Iowa schools
- ~900 High School Students (9-12)
- ~900 Middle School Students (6-8)

Study Outcomes

- Based on student scientific inquiry abilities/practices specified in standards
 - Questioning
 - Designing and conducting a scientific investigation
 - Data collection, analysis and interpretation
 - Developing explanations
 - Communicating results
- Focus on teacher behaviors needed to elicit student skills

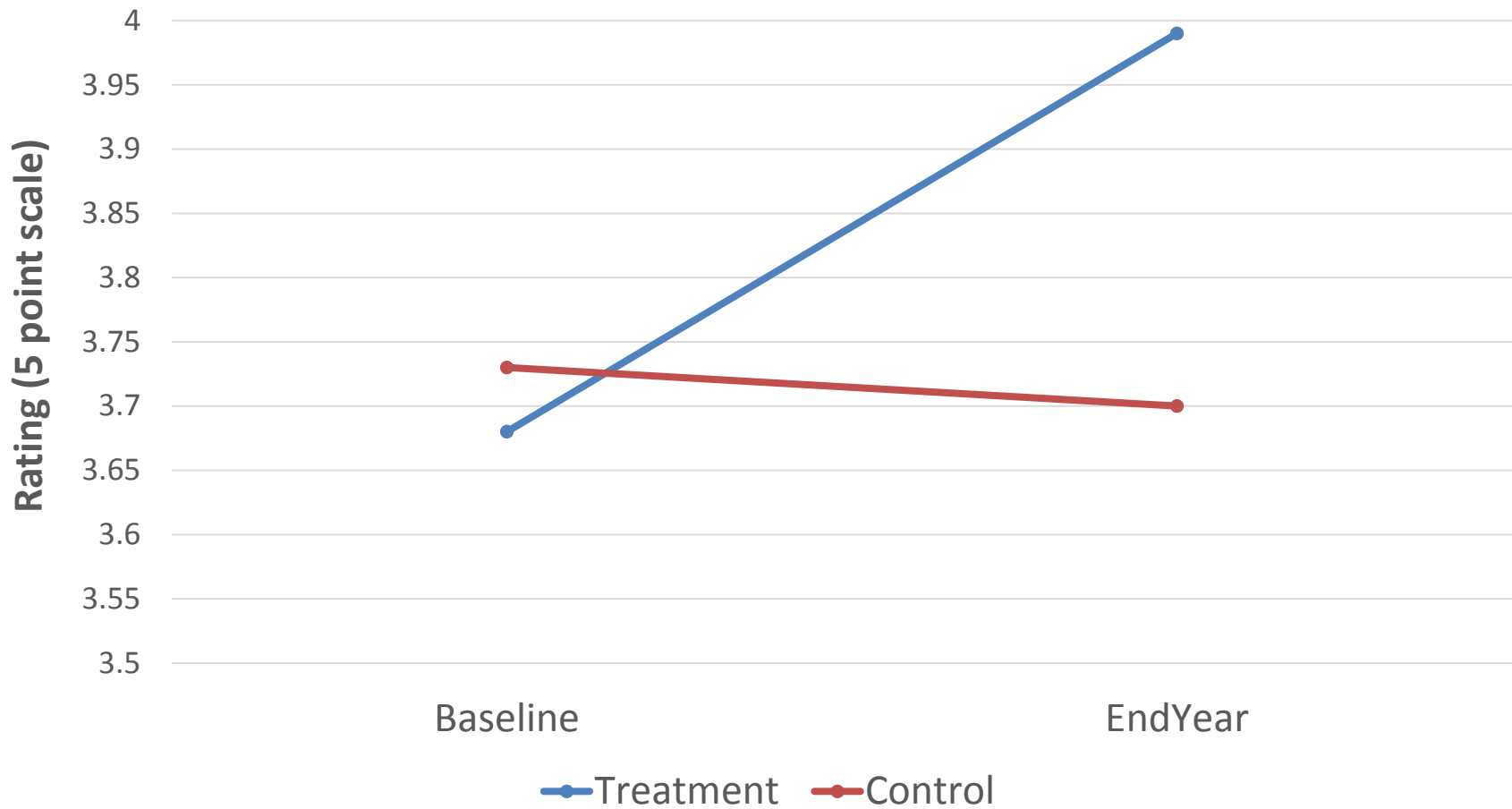
Teacher Results

63 treatment teachers

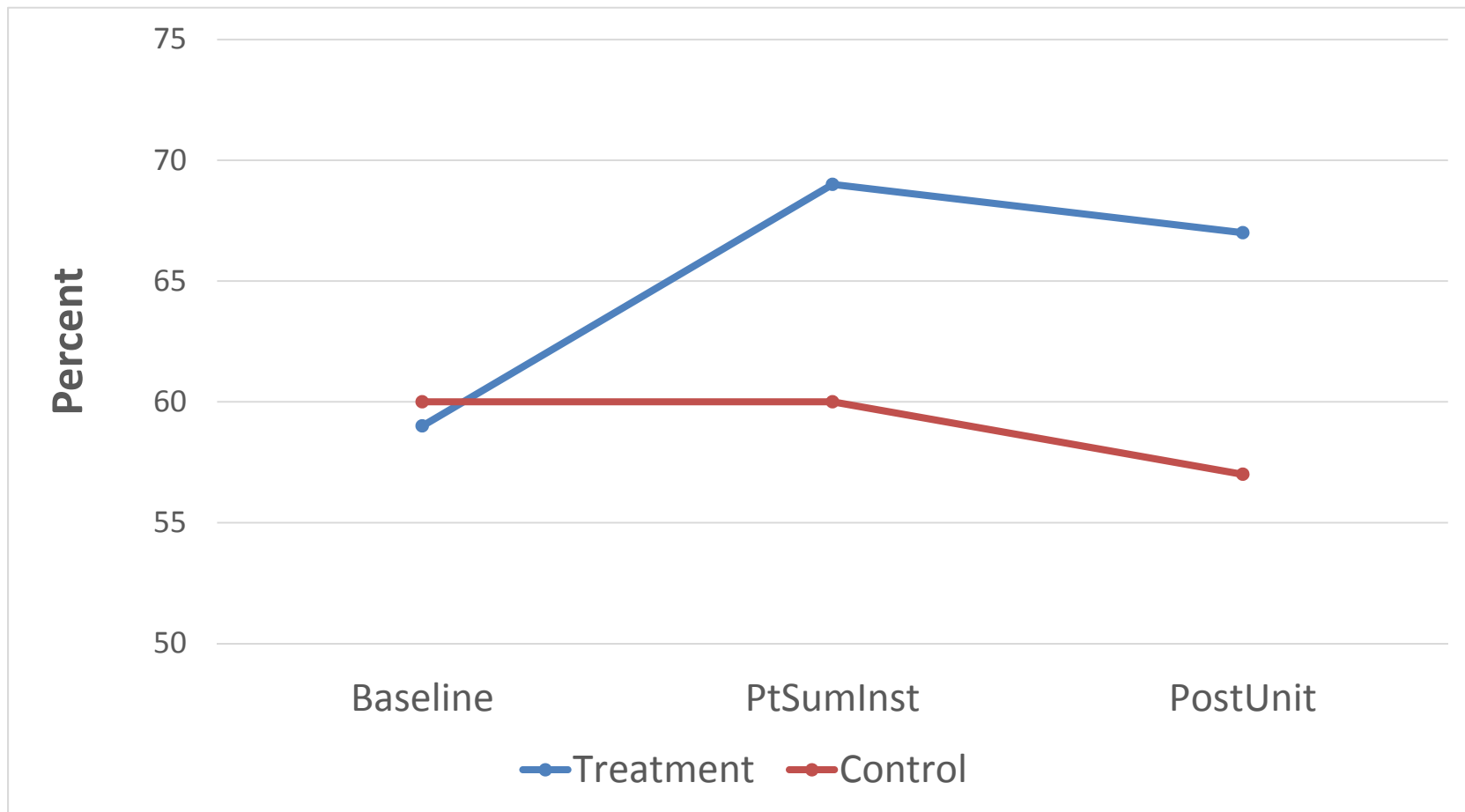
61 control teachers



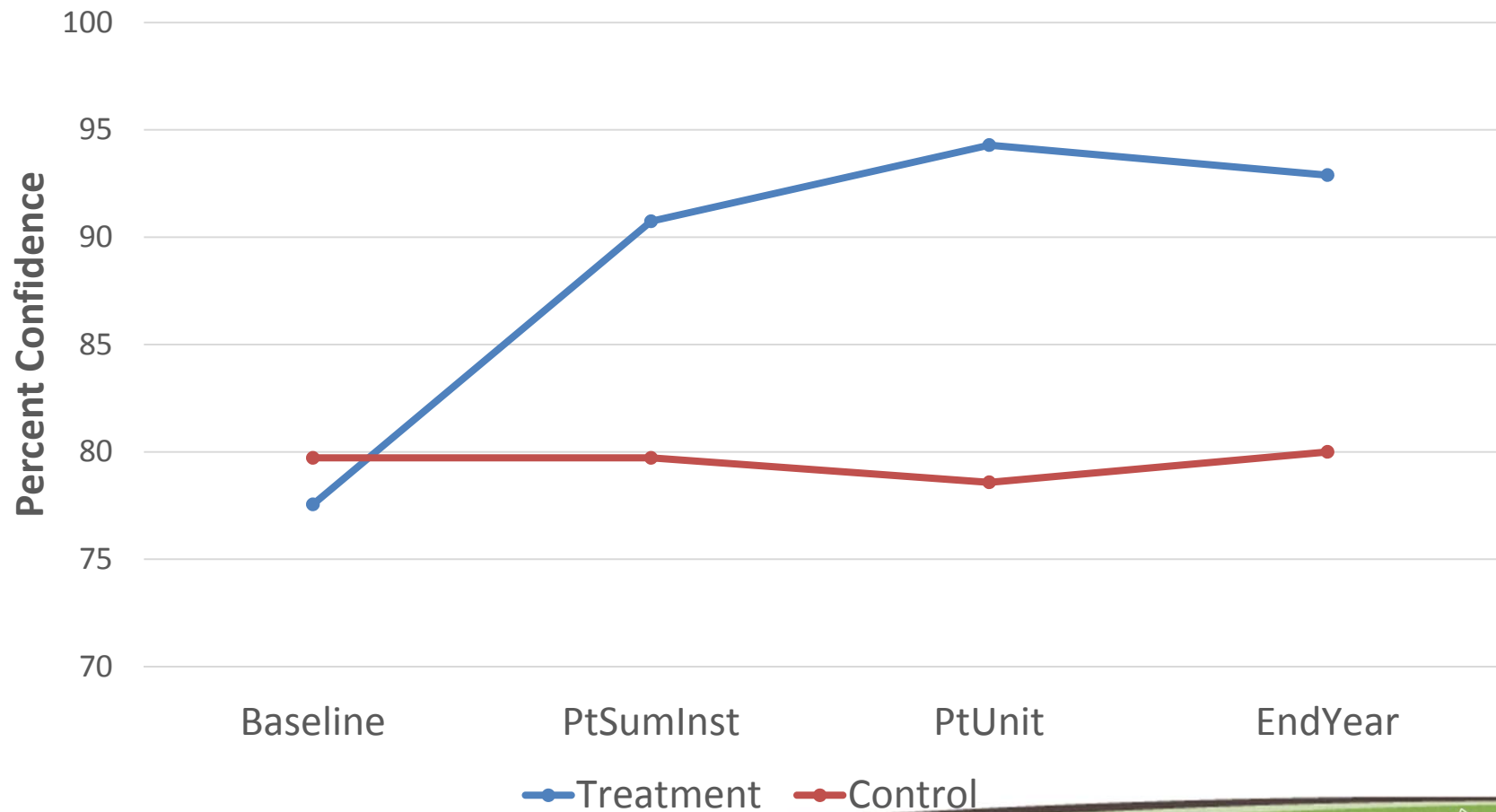
Teacher Inquiry Beliefs



Teacher Inquiry Knowledge



Teacher Self-Efficacy



Teacher Instructional Practice

- Three observational instruments
 - Teacher Inquiry Rubric (project-developed)
 - EQUIP (Electronic Quality of Inquiry Protocol, Marshall, 2009)
 - Partial Interval Classroom Inquiry Observation System (PICI; project-developed)

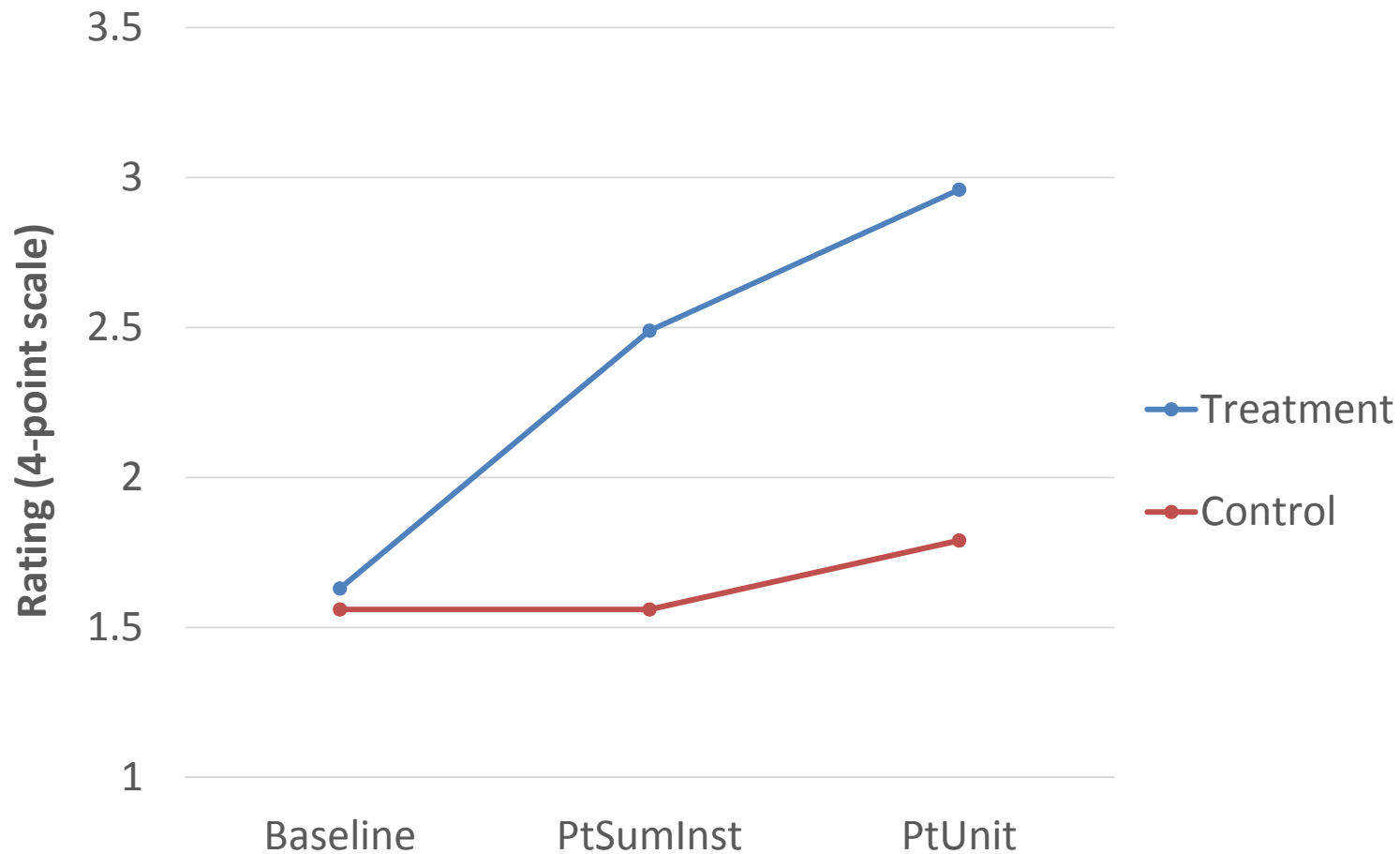
Teacher Inquiry Rubric

- Six constructs based on student scientific inquiry abilities specified in standards (questioning, investigation, collect data, explanation, communication & application)
- Focuses on teacher behaviors needed to elicit student skills

TIR Proficiency Levels

1. Pre – No evidence of instruction for particular skill
2. Developing – Direct presentation by teacher using lecture or demonstration
3. Proficient – Teacher use of guiding questions, experiences, scaffolding and/or feedback
This is guided inquiry!
4. Exemplary - Use of guiding questions, scaffolds, and/or feedback to guide students to *perform* the skill

Teacher Inquiry Rubric Results



EQUIP

Electronic Quality of Inquiry Protocol

- 19 indicators with overall construct scores targeting areas of reform or inquiry-based instruction that are linked to student achievement.

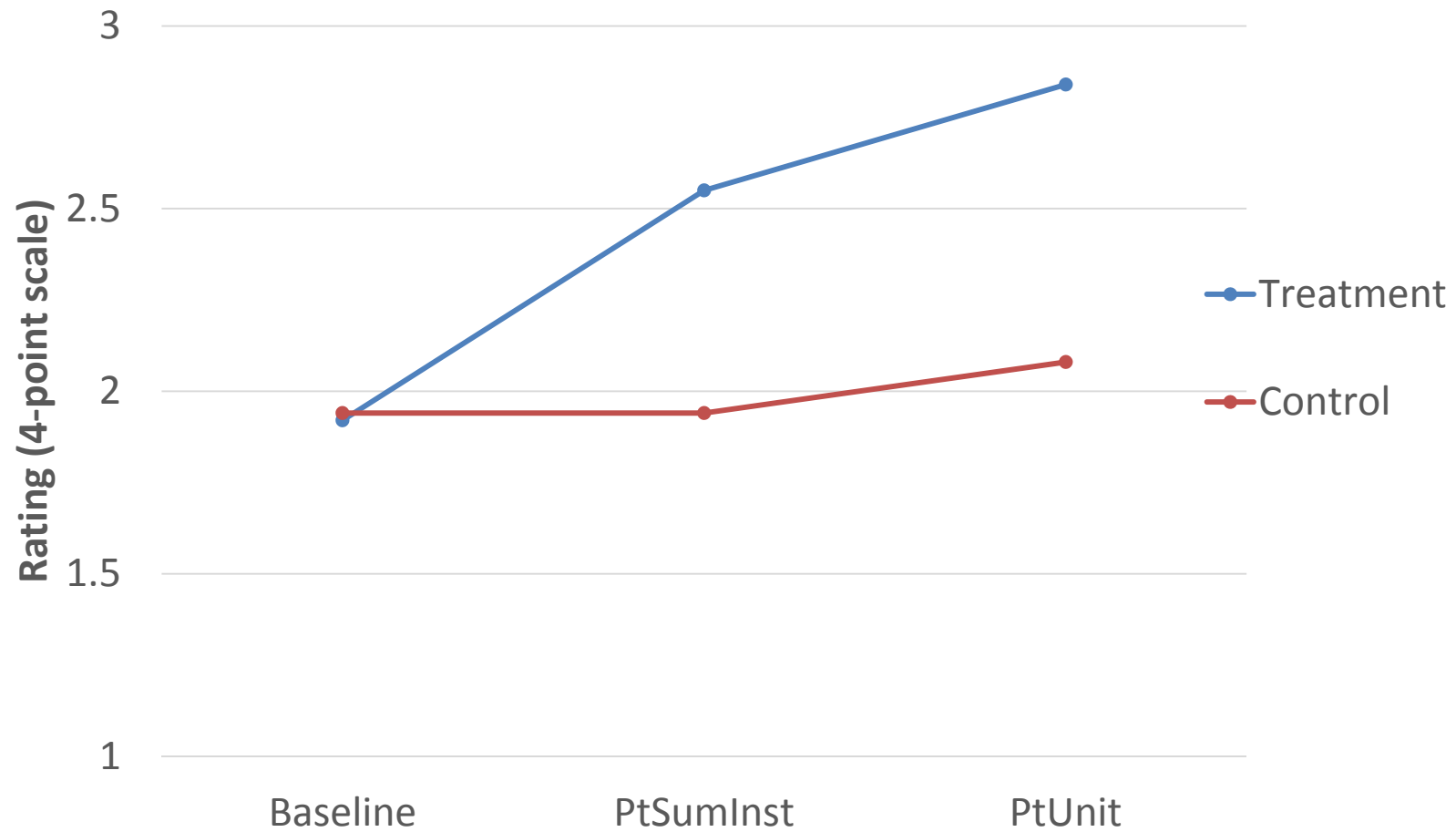
Instruction (How do I lead?)

Discourse (How do we interact?)

Assessment (How does instruction influence achievement?)

Curriculum (What guides teaching and learning?)

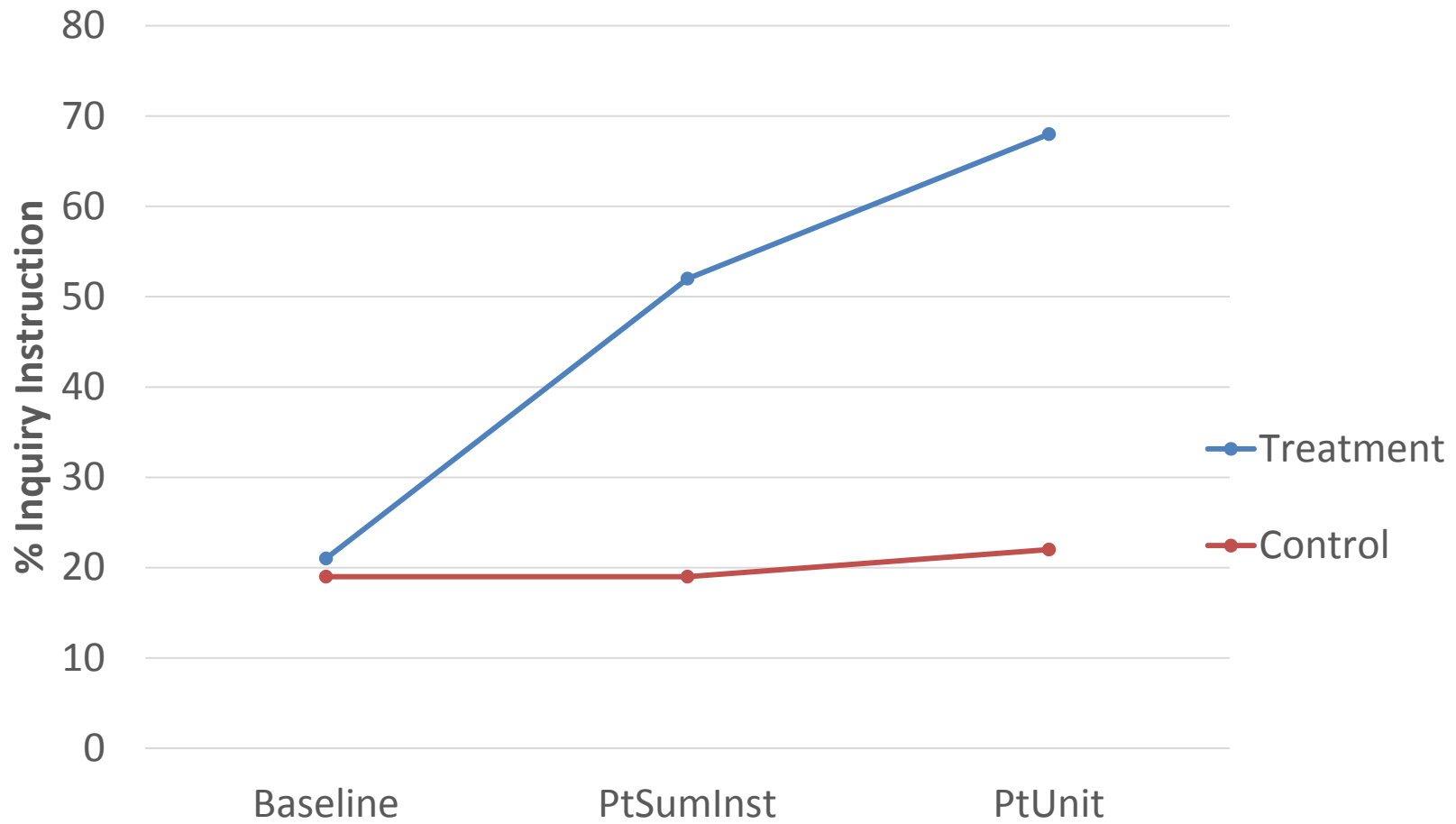
EQUIP Results



Partial Interval Classroom Inquiry (PICI) Observation System for Teachers (PICI-T)

- Interval recording procedure: 15 sec intervals
- Records whether teacher is presenting or not presenting inquiry instruction during each interval

PICI-T Results



Student Results

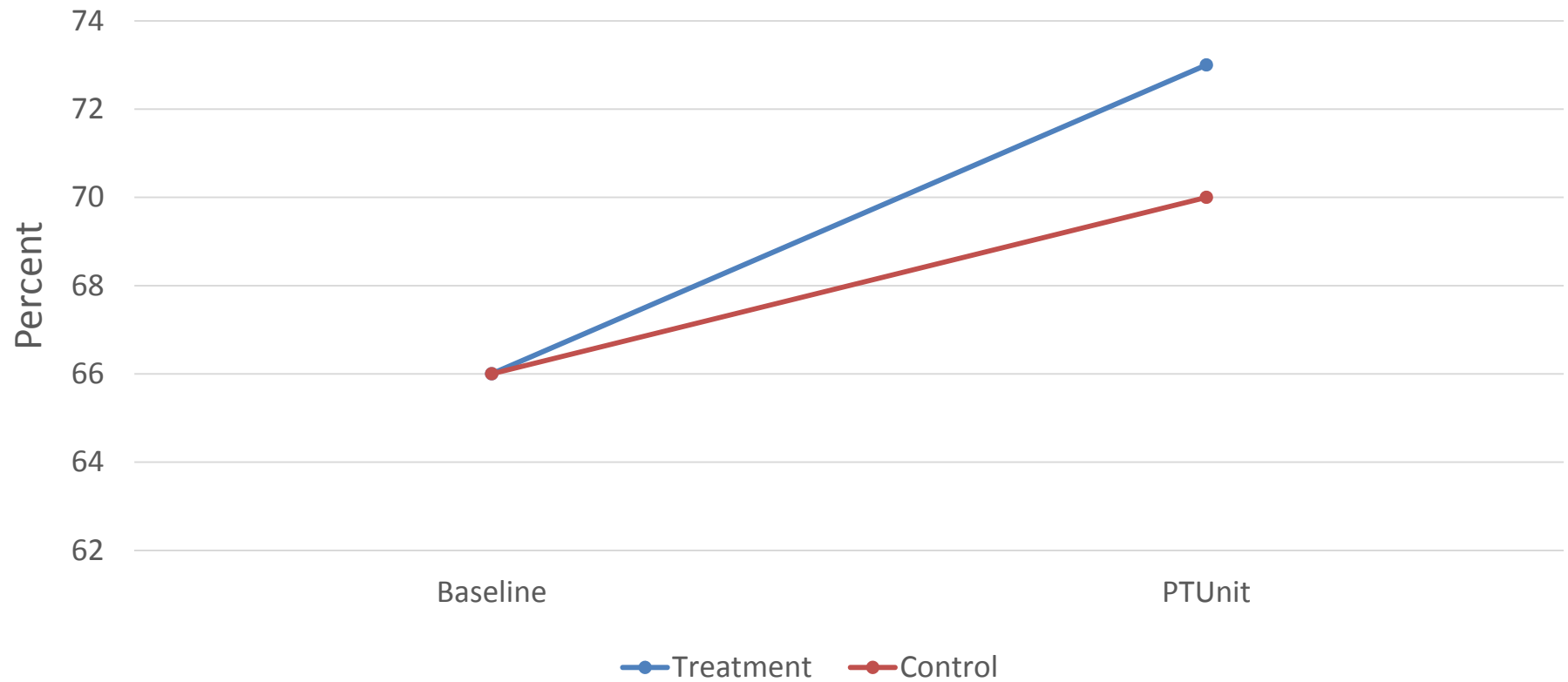
~900 Treatment

~900 Control

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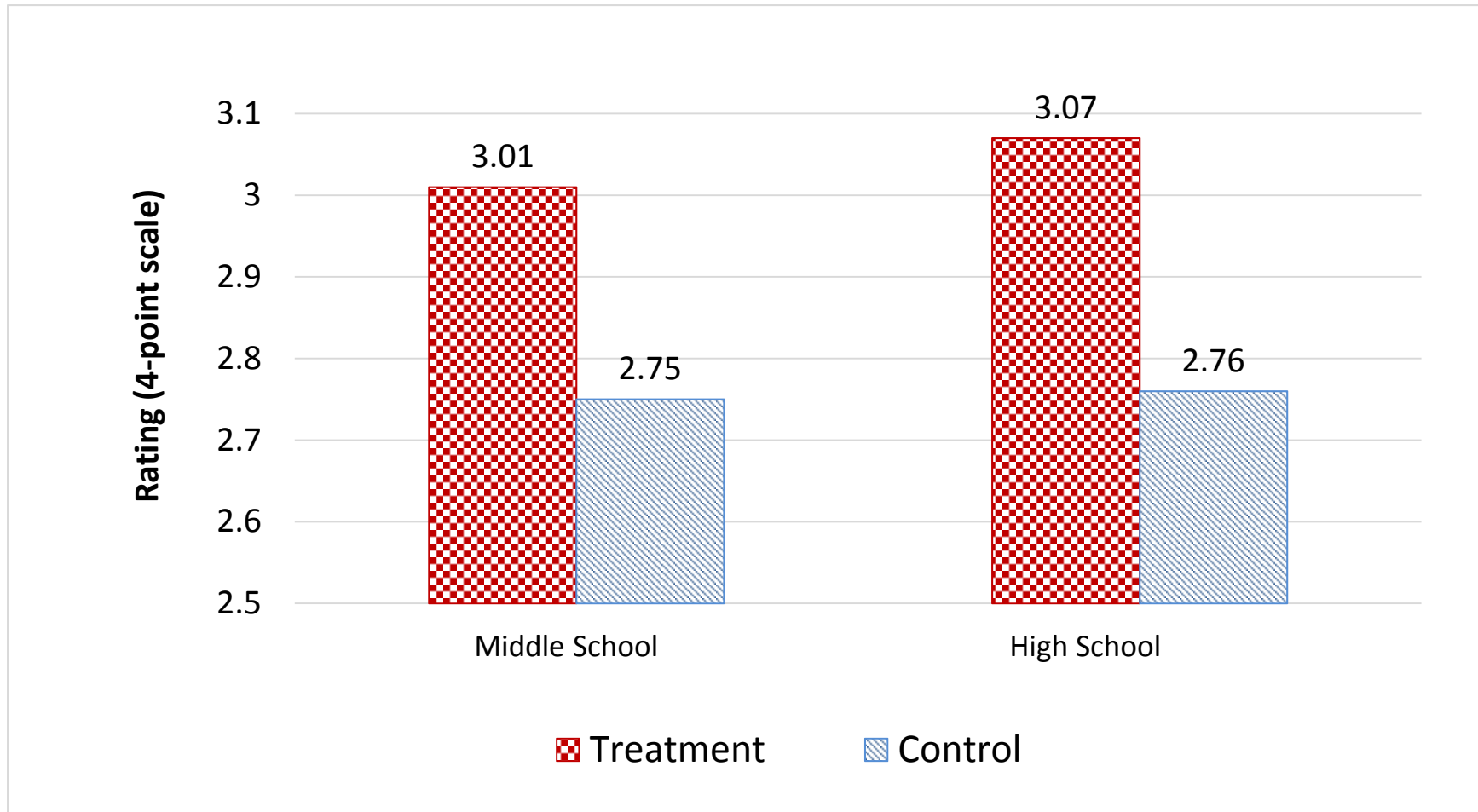
Student Findings: MS Inquiry Knowledge



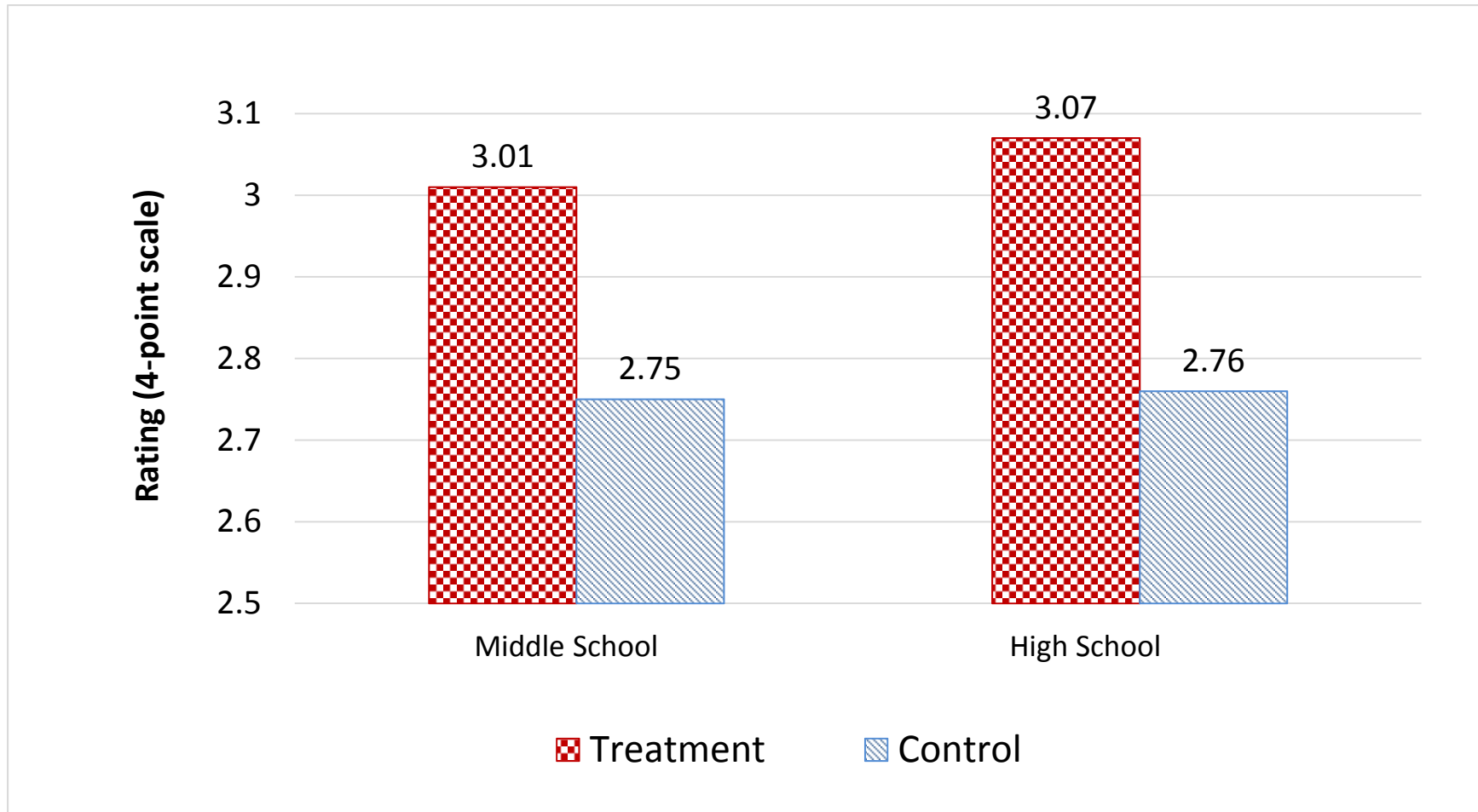
Student Inquiry Skills

- Instrument: Student Inquiry Rubric (SIR)
 - Four-level rubric investigating student's inquiry practices (questioning, collecting data, investigating, developing explanation from evidence, communicating results)
 - Adapted from instrument developed by NE ESU 3
 - Completed by teacher for each student in the study

Student Inquiry Rubric Results



Student Inquiry Rubric Results





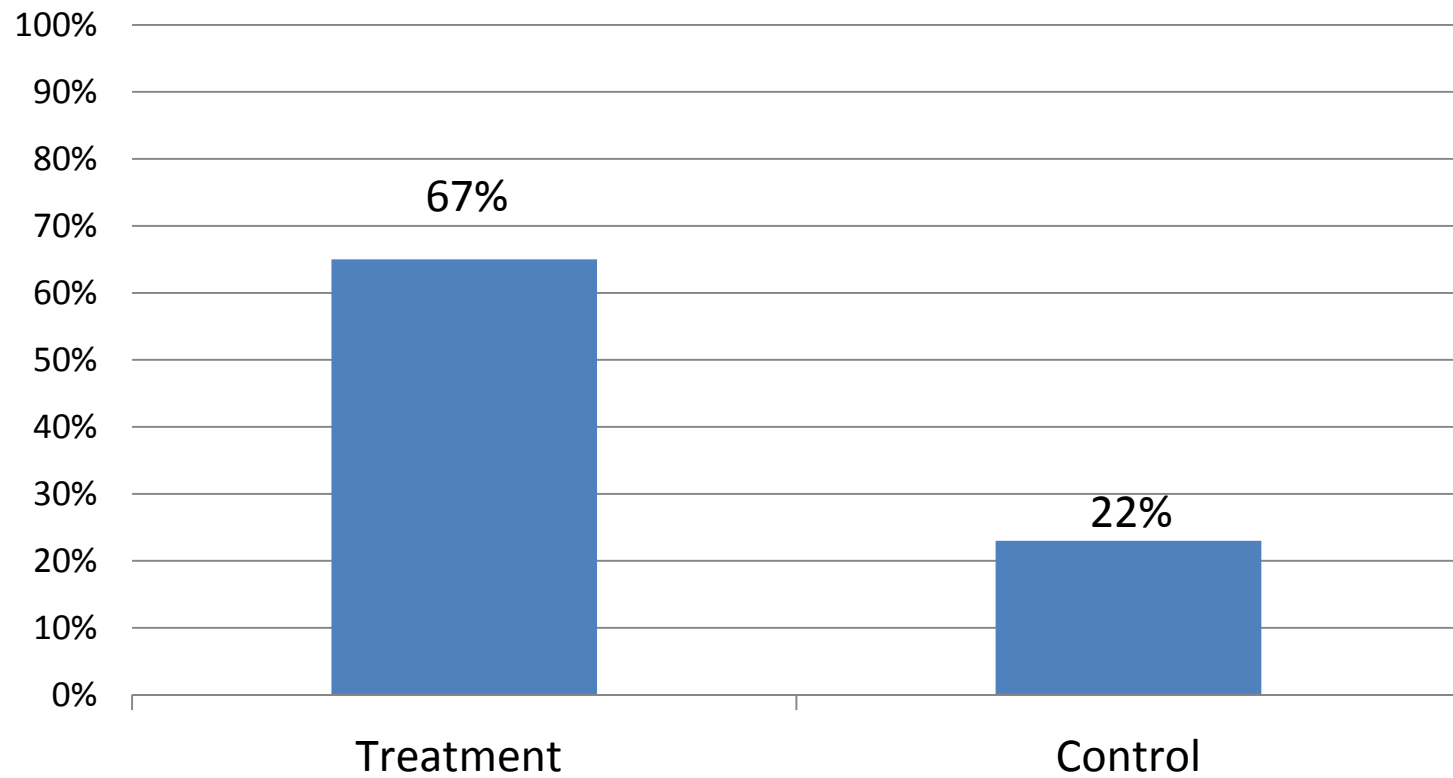
- No significant differences in treatment and control for either middle or high school, although middle school results are in the hypothesized direction.

PICI-Student

- Used 15 second interval recording procedure
- Student Response type: On-Task, Off-Task, Inquiry Engaged
- Observe one student for 1 minute, then switch to another student until all students included and then start over
- Class measure based on individual student responses

PICI-S

Student Inquiry Engagement



Coaching Evaluation



Technology Advantages: Coaching

- Eliminated need for coaches to travel to school site

Huge \$ savings

- Anywhere, anytime advantages for both coaches and teachers
 - Coaching sessions were scheduled weekends, early mornings, and late evenings
- Physical separation of coaches meant they were viewed as separate from the school administration
- Allowed teachers to review their lessons
- Allowed sharing of video clips during coaching
- Videos provided a teaching portfolio

Technology Advantages: Data Collection and Coding

- Coders could stop and review recording
- Eliminated need for coders to travel to school site
- Coders could work anywhere with computer access
- Permitted flexibility in reliability coding
- Allowed for coding of fidelity in coaching sessions

Technology Challenges: Coaching

- Teachers were unfamiliar with web-based videoconferencing
- Teachers needed hands-on practice with technology
- Large video files required long transfer times and large storage capability
- Project required ongoing troubleshooting at regional and local levels

Technology Challenges: Data Collection and Coding

- Audio/Video recording quality varied greatly
- Coding video was a difficult, time consuming process
- Coders typically watched video 2 – 3 times to code three instruments
- Getting coders trained to established criteria was challenging
- IRB issues with video recording

Lessons Learned

- Value of technology and video-based data collection
- Coding videos of classroom instruction and student behaviors is challenging and time consuming
- Power of watching videos for teacher self-reflection and to lead to change in instructional practice
- Power of the repeated practice for teachers to effect change
- Quality of science teachers in rural context – high performing teachers in low resource areas
- Coaching relationship established and maintained across distance and with a non-evaluative role
- Coaching has a powerful impact on teacher classroom instruction

View from the CSI Teachers

CSI Website

<http://r2ed.unl.edu/CSI/>

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Theory of Change

