



# Which Technical Writing Strategy Improves Student Writing and Scientific Comprehension?



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## Background

This project focuses on what strategy or strategies will improve student technical writing and science comprehension. In my experience, I have found that many students struggle with technical writing. It is a 21<sup>st</sup> century skill that is required for most jobs, even if the writing is not directly related to science.

Through initial student surveys and focus groups, it was determined that students most struggled with scientific comprehension, writing conventions, pre-planning the writing process, and revision of content and ideas.

## Student Population

Science students at Blue Valley High School were part of this study (n=49). Blue Valley High School is located in Randolph KS and services the communities of Olsburg, Fostoria, University Park, and Randolph, as well as northeast rural Riley County and northwest rural Pottawatomie County. This sample group consisted of 47% male and 53% female, 32% free-and-reduced lunches, and 12% on an IEP. Seven seniors, fourteen juniors, thirteen sophomores, and fifteen freshmen are included in the study.

## Focus and Sub-Questions

My research questions were:

- What strategies can best help struggling writers improve their technical writing over a nine-week time span?
  - How can scaffolding prompts help all writers improve their technical writing?
  - What are the effects of improved technical writing on students' scientific comprehension?
- What are the effects of improved technical writing on the classroom teacher?
  - In what ways do I play a role in my students' ability to organize their thoughts and share them through the written word?
  - How can I improve my practice to aid students in becoming better writers?

## Methodology

Two writing strategies were tested: Self-directed Inquiry (SDI) and Calibrated Peer Review (CPR). Multiple methods were used to determine which strategy led to the most improvement in student writing and the largest gain in student comprehension. The data collection techniques included individual interviews, student surveys, CAT assessments, a teacher reflection journal, student writing samples assessed with a Content and Ideas Rubric and Curriculum Based Measurement (CBM), and comparison of pre-test and post-test scores.

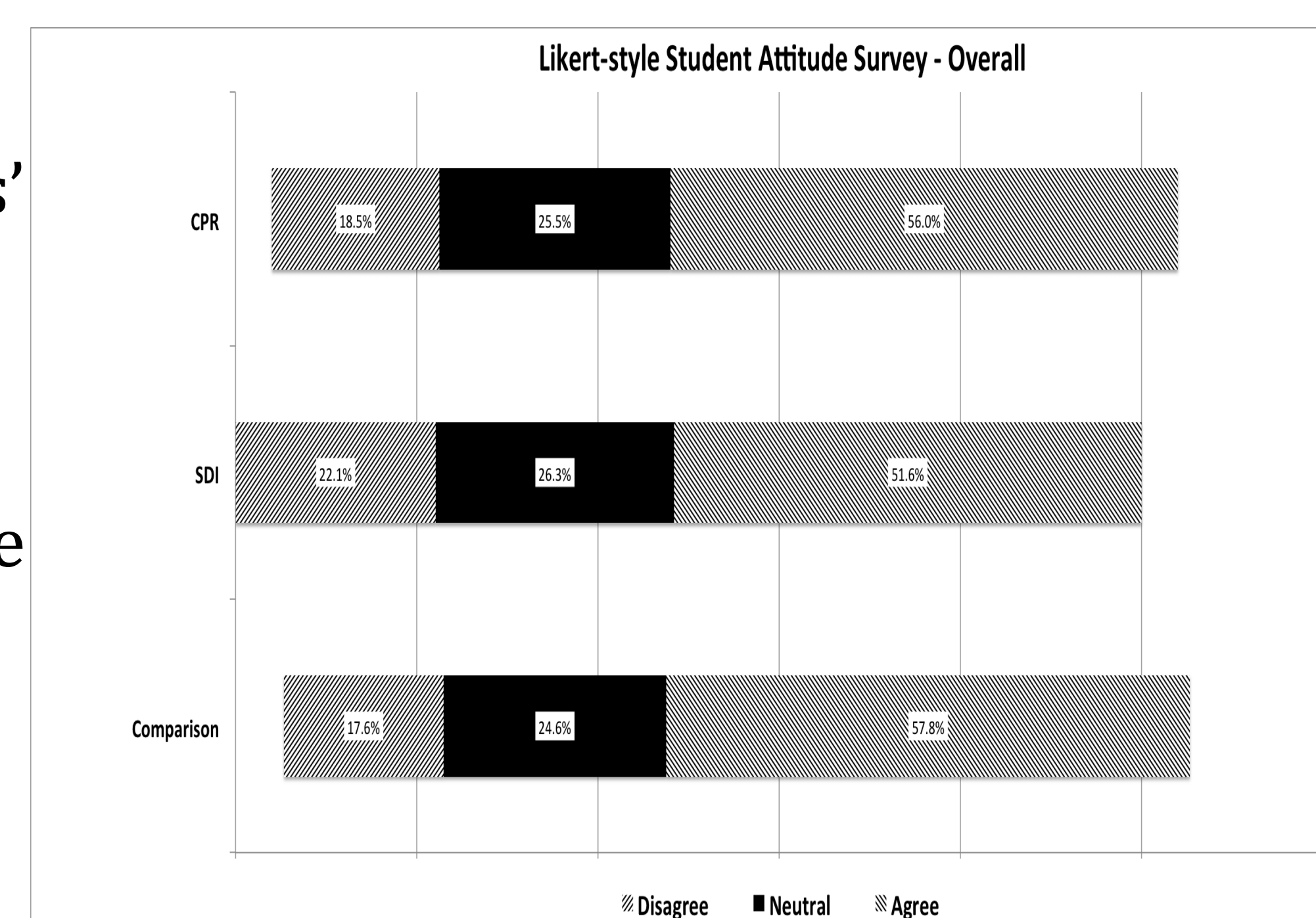
## Treatment

| Research Questions  | 1             | 2                           | 3          | 4                     | 5                     | 6     | 7     | 8                 | 9           |
|---|---------------|-----------------------------|------------|-----------------------|-----------------------|-------|-------|-------------------|-------------|
|   | Pre/Post Test | Student Writing Assignments | Daily CATs | Likert Student Survey | Idea & Content Rubric | CBM   | CPR   | Student Interview | Teacher Log |
| What strategies best help struggling writers improve their technical writing over a nine-week time span?                  |               | A, B, & E                   | A & B      | C                     | A & B                 | A & B | A & B | C & D             | D           |
| How can scaffolding prompts help all writers improve their technical writing?   |               |                             | A & B      |                       | D                     | D     | D     |                   | A & B       |
| Will improved technical writing increase students' scientific reasoning?  | D             |                             |            | C                     | C & D                 | C & D | D     |                   |             |
| What are the effects of improved technical writing on the classroom teacher?  |               |                             |            |                       |                       |       |       |                   | D           |
| In what ways do I play a role in my students' ability to organize their thoughts and share them through the written word? |               |                             |            |                       |                       |       |       |                   | D           |
| How can I improve my practice to aid students in becoming better writers?   |               |                             |            |                       |                       |       |       |                   | D           |

Key to identify reasons why the data method selected is suited to gather data for the question it is matched to.

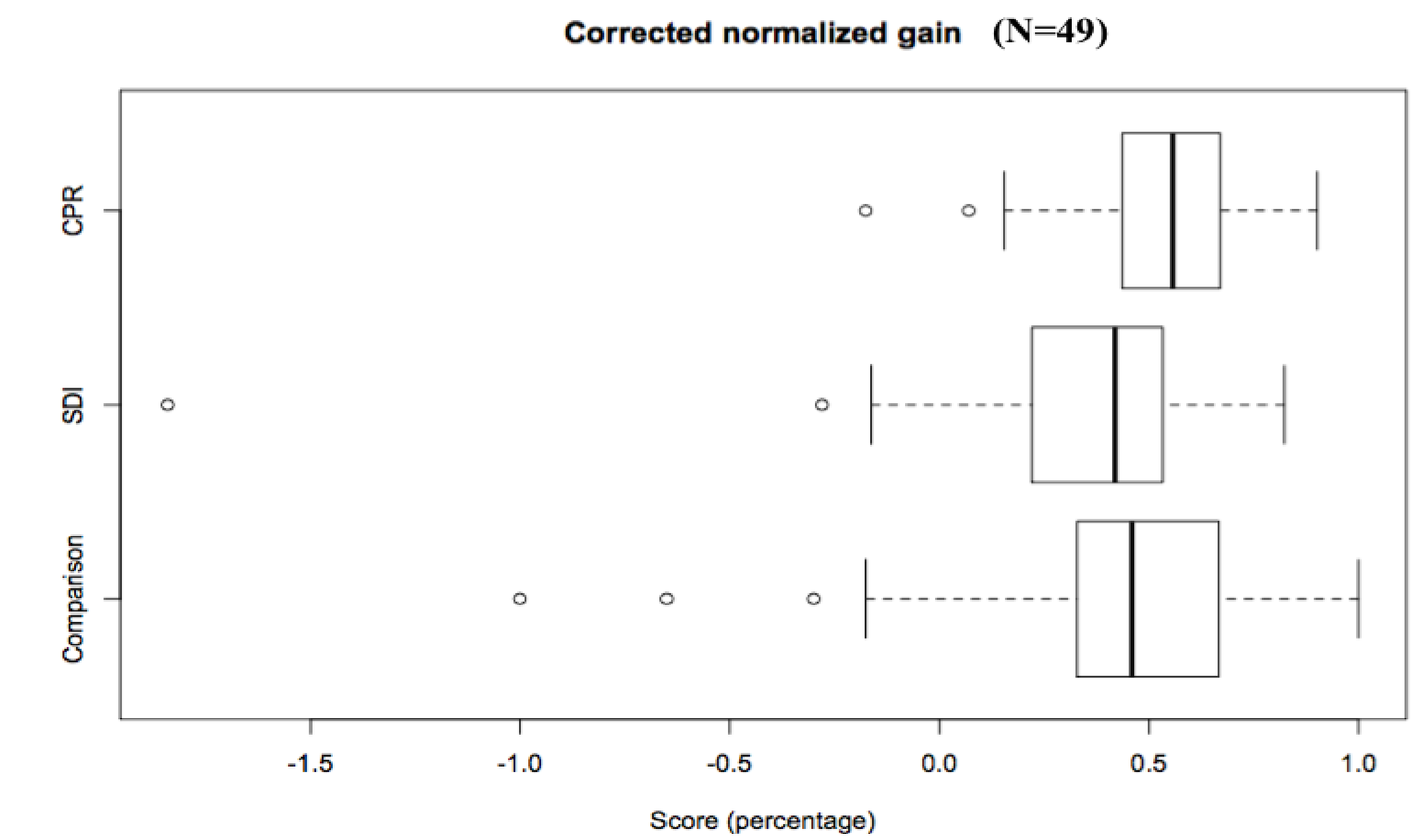
- A) Data will show change in student's written work
- B) Data will show samples of student's work over time.
- C) Will give qualitative data of student opinions and self-evaluations.
- D) Data reflects the value of the treatments
- E) Data will provide an example of students writing ability prior to the treatment

## Student Attitude Results



- Student preferred the comparison unit and the unit taught using Calibrated Peer Review equally well.
- Students preferred the more traditional approach to writing than Self-Directed Inquiry.

## Normalized Gain in Scientific Comprehension



- When posttest scores were adjusted for guessing
  - Calibrated Peer Review had the most improvement in scores (mean=0.55, median=0.56, std dev=0.21).
  - 91.3% of students showed a middle to high level of improvement.
  - Self-Directed Inquiry had the least improvement in scores (mean=0.33, median=0.42, std dev=0.42)
  - 67.3% of students showed a middle to high level of improvement

## Interpretation of Results

The strategy that best helped struggling writers improve their technical writing and scientific comprehension was Calibrated Peer Review. Calibrated Peer Review was a more effective method by which students can learn and apply content than a more traditional teaching. Based on the way it was presented, Self-Directed Inquiry was not shown to be more effective than traditional teaching methods for the entire student population. Although student scores did show improvement at the end of the Self-Directed Inquiry Unit, one cannot be certain that it was due to the application of the treatment.

## Implications to My Teaching

CPR proved to be a very versatile method that could be used as a stand-alone strategy that one could use with students to teach an entire unit or a writing strategy incorporated into a daily lesson in which students read about a study related to a topic they are learning in class. Most of my frustration during this study came from the SDI unit. A valid question to consider is what is the best time frame in which to incorporate the use of SDI.