

# Addressing Misconceptions Through Inquiry

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## in First Grade Science



### Focus Questions

How do students perceive their learning as they participate in inquiry?

How effectively can inquiry-based-instruction repair student misconceptions in science?

#### Background

I teach a first grade class of 22 students at Birch Lane Elementary school in Davis, California. Davis is a university town, and the highest educated city in California, so the students in my class have a wide range of backgrounds, abilities, and experiences in science.

The National Research Council and other experts have recommended that science instruction be taught through inquiry-based-instruction for decades. Students come into school carry misconceptions, which can interfere with learning. These misconceptions can be repaired through a process called conceptual change.

#### Methodology

The treatment consisted of four inquiry-based units focusing on repairing specific science misconceptions. Each of the units was taught in increasingly student-centered forms of inquiry, integrated with the conceptual change process. The first unit, Movement in the Sky was taught through demonstrated inquiry. Seasons was taught through structured inquiry. Light was taught through 5e guided inquiry. Sound was taught through open inquiry.

Misconception probes were administered as a pretest, a posttest, and a one month followup. Each question contained a Likert question on confidence. Field notes taken during class discussions and Misconception interviews were conducted at the end of each unit.

Students' perception of learning through inquiry was assessed at the end of each lesson with a Likert item survey on how "fun" the lessons were and who controlled the learning.

Style of Inquiry	Topic	Misconception Probes *Self-Created
Demonstrated Inquiry	Path of Moon, Sun, and Stars	Objects in the Sky; Darkness at Night; Where Do Stars Go; Me and my Shadow; Gazing at the Moon; Going Through A Phase
Structured Inquiry	Seasons	*Sunrise Direction; *Earth's Tilt; *Length of Day; *Temperature in Day; *The Sun's Angle; *Different Seasons; *Timing of the Seasons; *Temperature in Seasons
5e Guided Inquiry	Light	Birthday Candles; *Shadows; Apple in the Dark; *Light's Color; *Paper Window; *Magnifying Glass; Moonlight; Can it Reflect?
Open Inquiry	Sound	*How Sound is Made; *Hitting Bell; *Vocal Cords; *Firetruck *Tuning Fork; *Sound Waves; *Speed of Sound; Making Sound

#### Data and Analysis

All forms of inquiry were rated as fun.

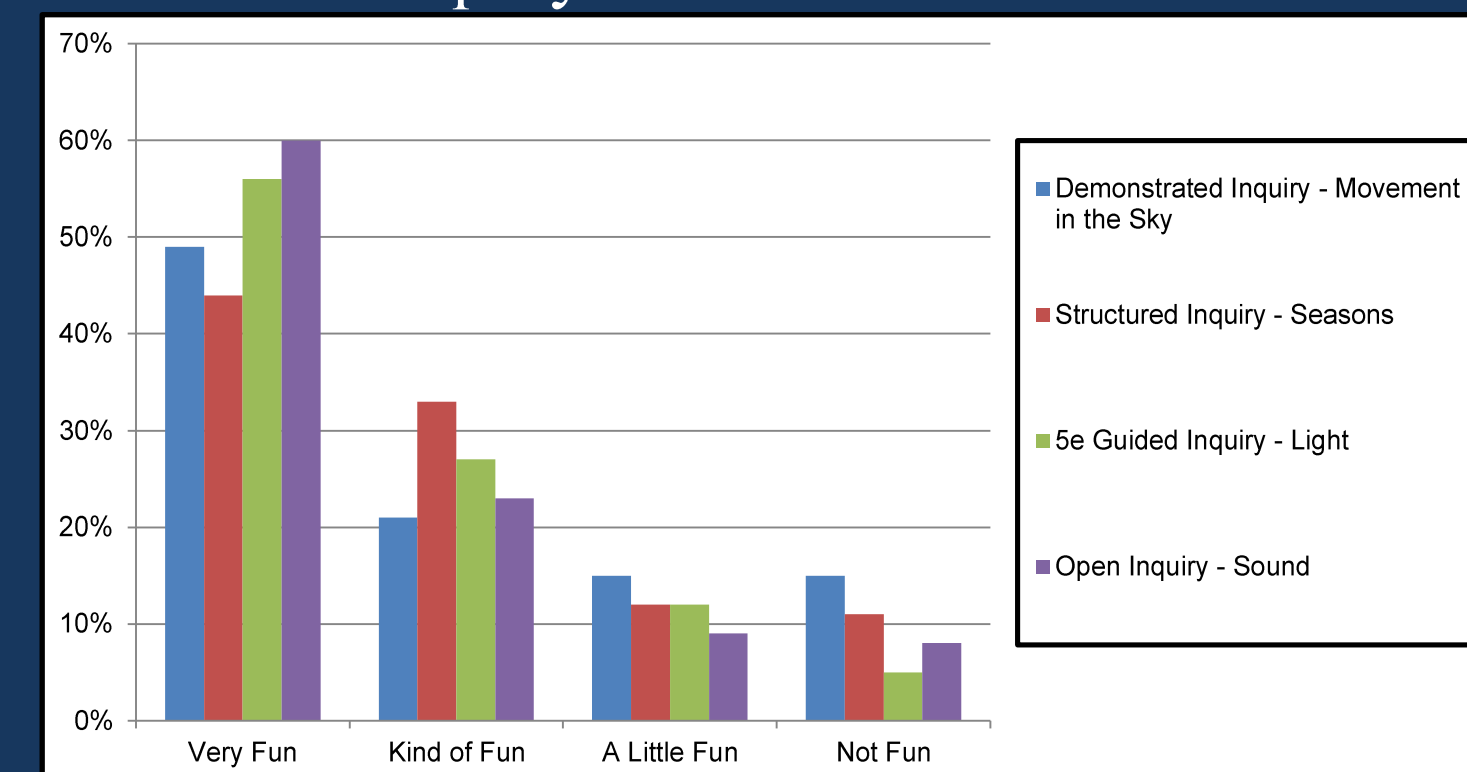


Figure 1. Comparison of answers indicating student perception of fun, (N=416) The students felt that the teacher controlled the learning in each form of inquiry.

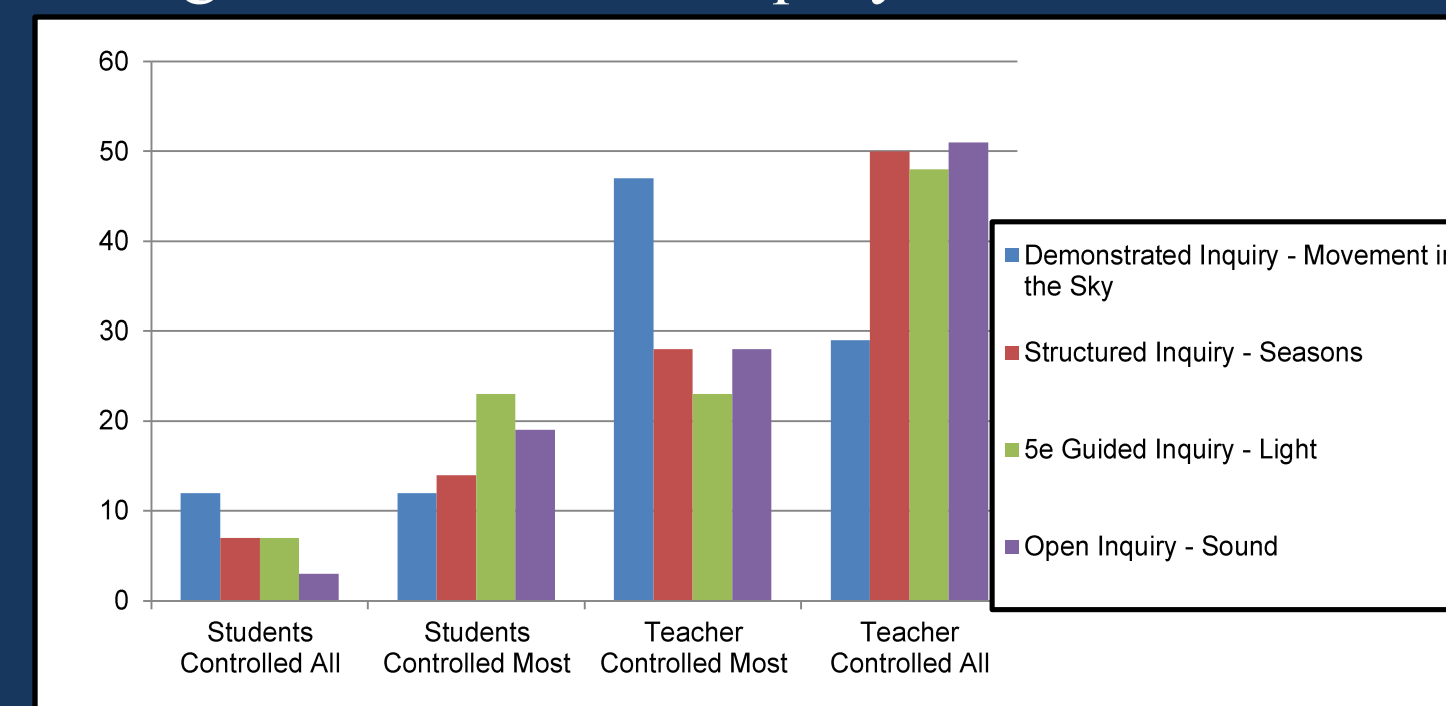


Figure 2. Comparison of answers indicating student perception of control of learning, (N=416)

#### Data and Analysis

Different units were more effective for certain students and less effective for others. Many students showed gains between the Posttest and Followup Test that were almost, if not as large as their gains between the Pretest and Posttest during the treatment.

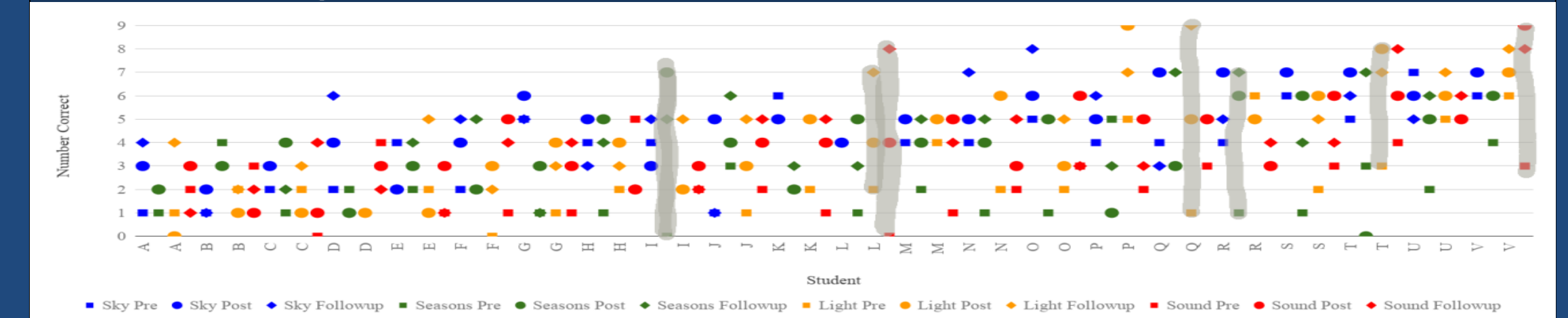


Figure 3. Comparison of student scores throughout units, (N=22)

#### Data and Analysis

Some of the units were effective at repairing misconceptions, such as the idea that light is white or that it has no color (figure 4). Other units created misconceptions, such as the idea that a shadow will get longer then shorter throughout a day. Correct answers are blue.

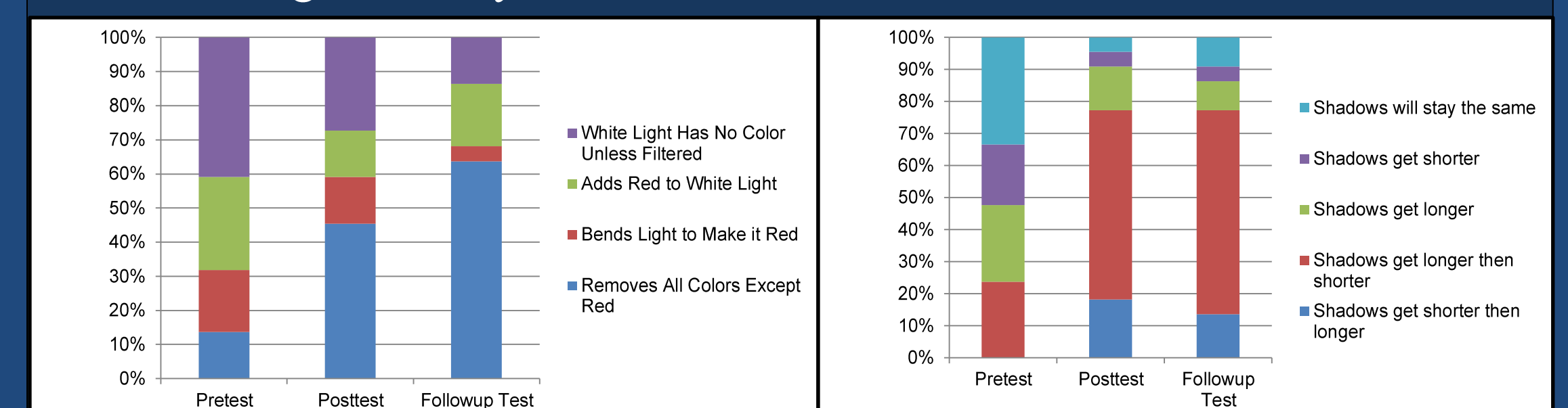


Figure 4. Comparison of answers on Light's Color, (N=22) Figure 5. Comparison of answers on Me and My Shadow (N=22).

#### Conclusions and Value

- Each form of inquiry was effective at repairing some, but not all, of the targeted misconceptions in my first grade students.
- Identifying misconceptions is important but the probes can show that a student understands a concept when they retain serious misconceptions.
- The students were able to learn some abstract ideas and many retained this knowledge, although some reverted back to misconceptions on the Followup Test.
- Many students scored better on the Followup Test than the Posttest, indicating it would benefit teachers to review previous topics.
- The students indicated that they enjoyed participating in each form of inquiry almost equally.
- The students felt like the teacher had more control over learning than the students in each form of inquiry.