

Lesson Study: Temperature Readings For Three Colorado Locations

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INTRODUCTION

NAME OF UNIT/GRADE LEVEL: SCIENTIFIC PROCESS--6TH GRADE

GOAL OF THE LESSON STUDY:

Our goal is for students to actively problem solve as opposed to look for teacher directed learning.

We would like to see a group of active, engaged learners developing at our school. Our hope is that this lesson incorporates tools that enable students to directly relate to the information presented, and problem solve on their own. At our schools, students expect teacher guidance and direction, rather than problem solving on their own. In the classroom, students often put in one attempt and then expect the teacher to help figure out where to go next. We see that time constraints as educators and the need to cover a vast amount of curriculum in a short amount of time often inhibits our ability to allow students to struggle. In this lesson, students create their own question. Our expectations are focused on the process, not the product.

NARRATIVE OVERVIEW OF BACKGROUND INFORMATION:

Observers in our classrooms need to know that our students middle to upper socio-economic class, predominantly Caucasian, mostly proficient or above on CSAP, and motivated learners. We have a small special needs population at our schools (less than 2%), less than 1% ELL, and a slightly higher number of boys than girls.

Students in our classrooms have a basic understanding of graphs. All learning strategies are evident and in use in our classroom. They are motivated by rewards and positive behavior support (PBS).

The concept of data analysis and interpretation is extremely important in both Jefferson County curriculum standards and CSAP requirements. The real world application of these concepts is vital as they continue their education.

Common misconceptions for students include the difference between line and bar graphs, scale, and dependent and independent variables.

At the end of the lesson, students will have a better understanding of the interpretation of data and the application of a line graph.

Central to the design of this lesson is inquiry-based instruction. Students look at a given set of data and create their own scientific question, pick a dependent and independent variable, and design a line graph to interpret the data.

HOW THE UNIT IS RELATED TO SCIENCE CURRICULUM STANDARDS:

1.1 Students will learn science by actively taking part in the process: asking questions, manipulating materials, working as a member of a team, making observations, analyzing data, drawing conclusions, and occasionally designing and conducting experiments.

- A. ask questions and state hypotheses that lead to scientific investigations;
- B. create a written plan or follow written procedures for an investigation;
- C. make predictions based on prior experiences and understandings;

- D. use different kinds of investigations to explore different types of scientific questions (*for example, experimenting, collecting specimens, using a model, researching the literature*);
- E. work as a group to solve a problem;
- F. use appropriate tools, technologies, and metric measurement units to gather and organize data;
- G. organize data in tables, charts, or graphs and use appropriate labels;
- H. identify things in an experiment that can change and understand why, if possible, only one thing should vary at a time
- L. realize there may be more than one reasonable way to interpret the results of an experiment and that without further evidence, it is not always possible to tell which one is correct;

1.2 Students will communicate observations, experimental methods, understandings, and results in a variety of ways, including mathematically.

- A. understand written material that incorporates bar and line graphs, charts, data tables, diagrams, and symbols;
- B. summarize data and communicate results of investigations in a variety of ways, including written reports, graphs, charts, data tables, and oral presentations;

QUALITY LESSON AND DESCRIPTION OF NEED

SCIENCE CONCEPT BEING TAUGHT:

Students summarize collected weather data and communicate results of investigations in a line graph

5E'S DESCRIPTION:

ENGAGE-- We pique student curiosity and determine prior knowledge of graphs

EXPLORE-- We provide the students with the opportunity to evaluate data and design their own graph. **-- our lesson occurs during this stage

EXPLAIN-- We provide time for students to compare their ideas with those of others and develop an analysis of the relationship between temperature and altitude, time of day, or sun/shade. **-- our lesson also occurs during this stage

ELABORATE-- The students are encouraged to use what they have learned to explain physical events they observe in nature.

EVALUATE-- An assessment of the graph evaluates the students understanding of relationships related to temperature measurements.

ALIGNMENT OF UNIT/LESSON TO SCIENCE STANDARDS:

Students need to have some prior exposure to graphing. They need to understand what a graph looks like and the parts that are necessary. They are exposed to graphing at a young age. As they continue on, any science/math course in middle school builds on concepts practiced in this unit.

Please see the Jefferson County Science Standards above for alignment at our grade level.

DESCRIPTION OF NEED:

In the 6th grade Space Science unit, students are required to design and conduct a "fair" test, and interpret the results. We have found that students have a difficult time with this task.

METHODOLOGY AND PROCEDURES-- LESSON INFORMATION

NAME OF THE STUDY LESSON

Temperature Readings for Three Colorado Locations

GOALS OF THE STUDY LESSON

Our goal is for students to actively problem solve as opposed to look for teacher directed learning. The science concept being developed is the understanding of the scientific process. Students should pick data to understand relationships related to temperature measurements. They will use this create a line graph as a visual representation of the relationship.

RELATIONSHIP OF STUDY LESSON TO GROUP LESSON STUDY GOAL

In this lesson, students create a scientific question that they explore and answer, using a tool provided by us. By letting the students control the content of their inquiry, we allow for more student directed problem solving.

PROCESS OF THE STUDY LESSON

Misconceptions-- the difference between line and bar graphs, scale, and dependent and independent variables.

Student Materials-- pencil, sticky notes, graph paper, Scientific Method guide (see attachment),

ruler, colored pencils

Teacher Materials-- projector, transparency of guide

Group Size-- whole group introduction; partner application

Specific Instructions-- knowledge of specific vocabulary

Record of information-- in guide packet

Safety precautions-- none

Introduction-- We will review variables and graphing through a discussion of previous paper airplane/crater lessons.

Progression-- We will spend a day prior to this lesson discussing the data table and the information it contains. The next day, students will partner together to complete the Scientific Method guide.

Divergent questions--

- 1) Do you need to use all the information?
- 2) Using the data table, what things could you explore?
- 3) What things could you measure or observe?
- 4) What things could you keep the same?
- 5) What happened to ___ (what was measured) when you changed ___ (what was changed)?

Student responses-- We expect students to answer these questions correctly. If students do not answer correctly, further review of concepts would be necessary.

Student understanding-- We learned that students needed a more structured approach to the lesson. In the initial lesson, students were not able to respond accurately to our questions about the data table. They were unable to correctly identify the variables, and were confused about what data to use in their graph construction. We revised the lesson because we felt that there was too much information on the data table. After streamlining the data table and

question packet, the students correctly identified the variable and were able to create a data table and graph.

Focus on main idea-- Yes, the lesson focused students on the main idea of interpreting data and creating a line graph.

Closure-- students share graphs with another pair.

Formative assessment-- pairs will assess each other using a checklist.

Achievement of goal-- We will look for correct interpretation of the students' chosen information

EVALUATION

We are looking for students that are actively involved in the asking of questions to further their understanding. We expect students to work collaboratively in groups to correctly interpret the set of data and create an accurate data table and line graph. The students need to turn in a completed packet. In the packet, students first identify variables that changed or stayed the same. They must formulate a testable question and use the data provided to answer their question. Students create a data table and line graph to visually represent their findings. They need to use their graph to answer to their testable question, and also form a conclusion based on their findings. Finally, students think of a question that they would like to answer next.

APPENDIX

See attached handouts

TEMPERATURE READINGS FOR 3 COLORADO LOCATIONS
 OCTOBER 2-6, 2006
 TEMPERATURES GIVEN IN DEGREES FAHRENHEIT

Temp. Time/Location	Denver	Evergreen	Bailey
Mon. 8:45 Sun	59	66	63
Mon. 8:45 Shade	54	66	63
Mon. 2:10 Sun	81	77	75
Mon. 2:10 Shade	79	77	75
Mon. Night	64	59	59
Tues. 8:45 Sun	65	59	55
Tues. 8:45 Shade	60	59	55
Tues. 2:10 Sun	73	72	70
Tues. 2:10 Shade	71	72	70
Tues. Night	54	45	45
Wed. 8:45 Sun	47	50	45
Wed. 8:45 Shade	41	50	41
Wed. 2:10 Sun	63	61	61
Wed. 2:10 Shade	59	61	61
Wed. Night	55	52	52
Thurs. 8:45 Sun	54	54	63
Thurs. 8:45 Shade	50	54	63
Thurs. 2:10 Sun	79	75	72
Thurs. 2:10 Shade	77	73	72
Thurs. Night	66	54	54
Fri. 8:45 Sun	64	55	61
Fri. 8:45 Shade	58	55	61
Fri. 2:10 Sun	77	70	70
Fri. 2:10 Shade	75	70	70
Fri. Night	65	61	61

Names _____

Exploring Temperature

What is the question that you are trying to answer?

What do you already know about temperature?

(Use sticky notes for the following investigation)

Brainstorm

What are the variables, or things you could change:

(Place sticky notes of variables below)

What information do you have available on the data table?
(Place sticky notes of the information here)

Now choose the variables you will use:
(place the sticky notes you choose here)

I will change:

I will use this information:

I will keep these the same (so that the test is fair):

Table of Results

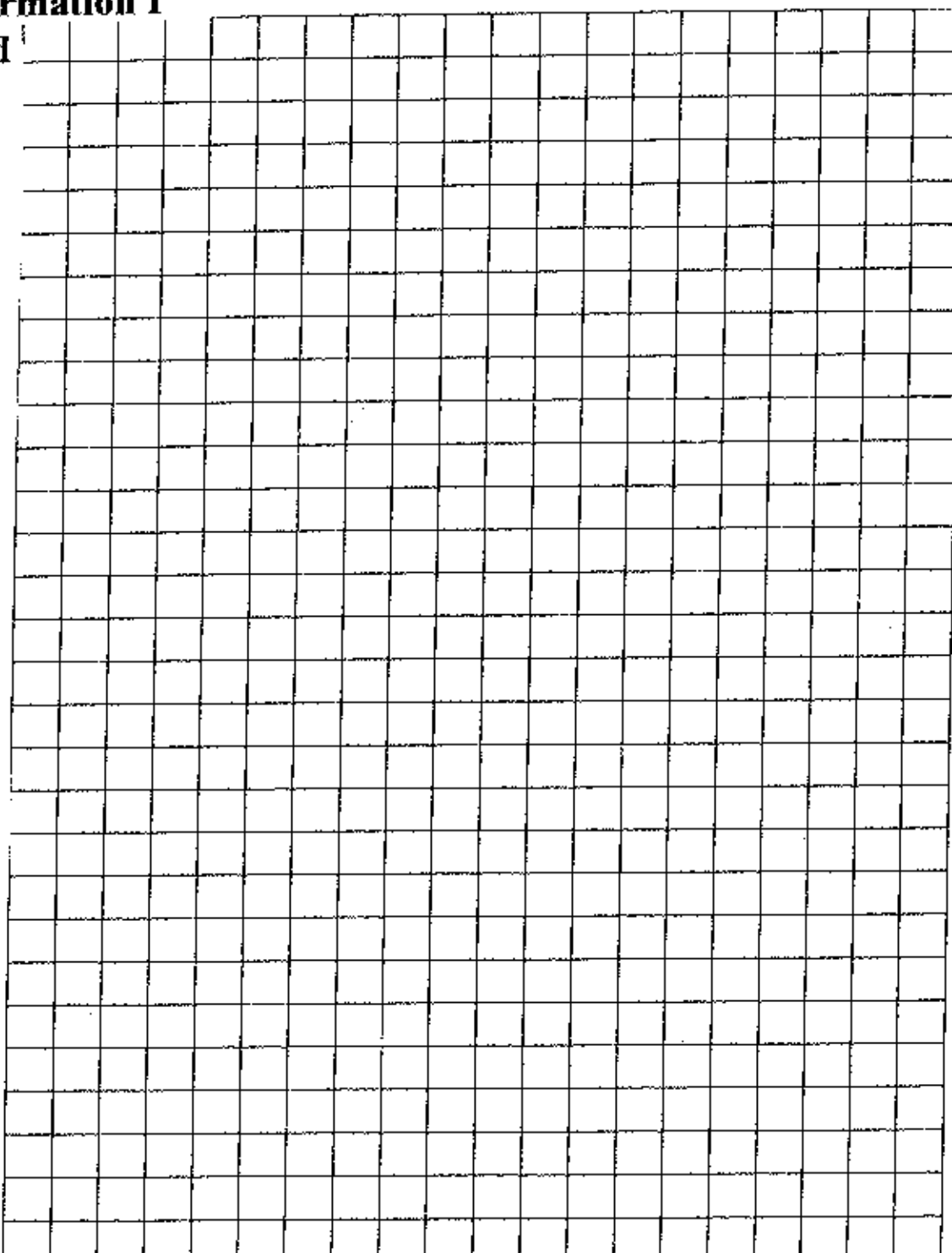
What I changed

Information I used

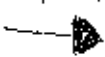
Graph your Results

Information I

Used



What I changed



Finding Patterns in Results

What happened to (what I measured)
(sticky note)

When I changed (what I changed)?
(sticky note)

Conclusion:

The next thing that I want know _____

TEMPERATURE READINGS FOR 3 COLORADO LOCATIONS
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Day	Denver	Evergreen	Bailey
Mon. Day	81	77	75
Mon. Night	64	59	59
Tues. Day	73	72	70
Tues. Night	54	45	45
Wed. Day	63	61	61
Wed. Night	55	52	52
Thurs. Day	79	75	72
Thurs. Night	66	54	54
Fri. Day	77	70	70
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Thurs. Night	66	54	54
Fri. Day	77	70	70
Fri. Night	65	61	61

Names _____

Exploring Temperature

(Use sticky notes for the following investigation)

Brainstorm

What are the variables, or things you could change:
(Place sticky notes of variables below)

Now choose a variable from above and move the sticky notes to the appropriate spot below:

I will change:

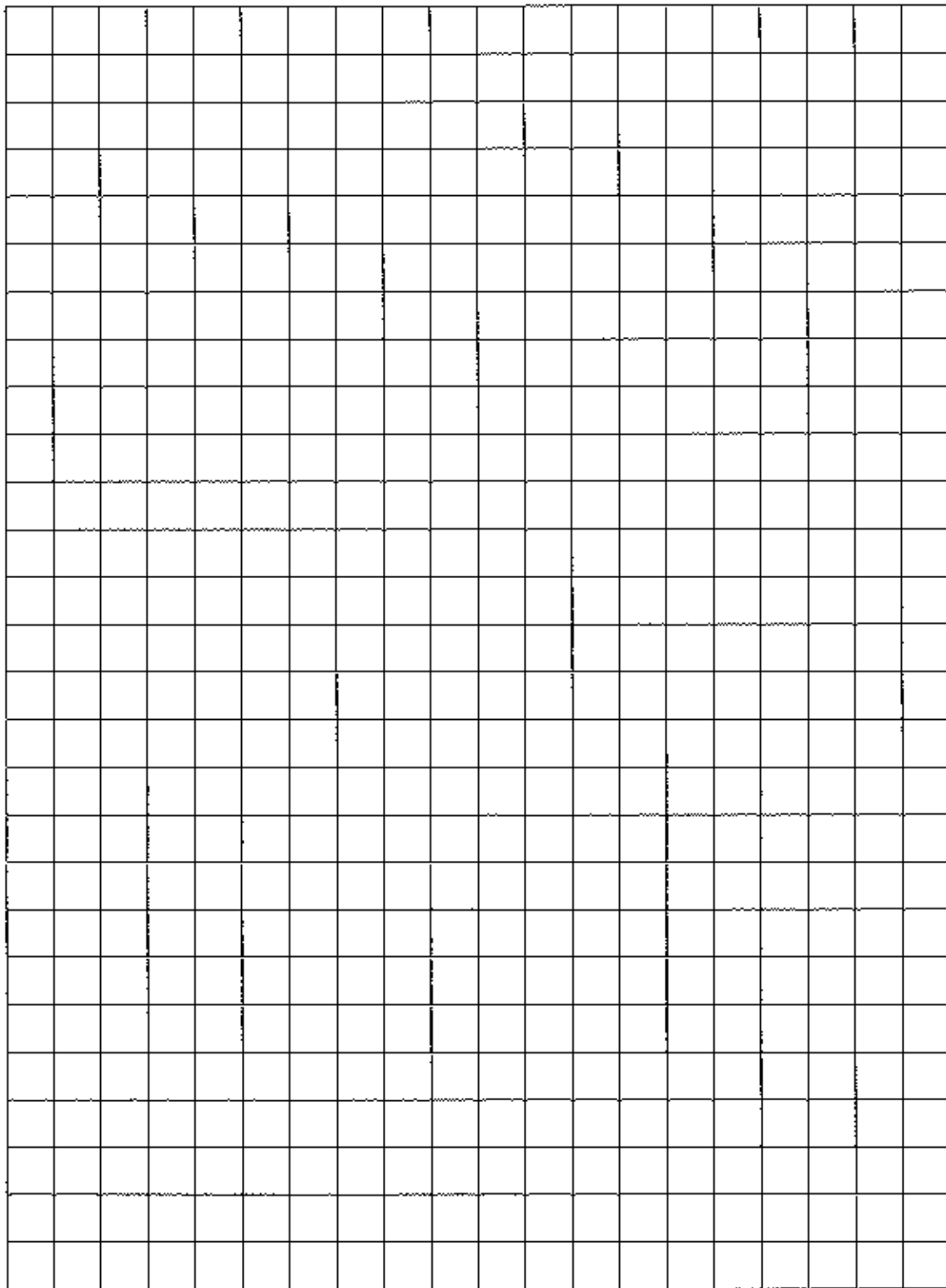
I will keep this the same (so that the test is fair):

What temperature readings do you need to look for on the data table?

What is the question that you are trying to answer?

Design a table for your data. Use the entire week of temperature readings, and don't forget to keep the other variable the same.

Title of Graph _____



10/2	10/3	10/4	10/5	10/6
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Days of the Week

Finding Patterns in Results

What happened to what I measured?

Answer the conclusion that applies:

What was the relationship between the 3 Colorado locations and their temperature readings at a set time during the week?

What was the relationship between day and night temperatures at a specific Colorado location during the week?

After answering your conclusion, please finish the following statement:

The next thing that I want know is...

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INTRODUCTION

- Our goal is for students to actively problem solve as opposed to look for teacher directed learning.
- Background overview
- Scientific Process-- 6th grade
- Relationship to curriculum
- Student profile

QUALITY LESSON AND DESCRIPTION OF NEED

- Students summarize collected weather data and communicate results of investigations in a line graph
- Five E's
- Science standards addressed
- Why improve??

In the 8th grade Space Science unit, students are required to design and conduct a "fair" test, and interpret the results. We have found that students have a difficult time with this task.

METHODOLOGY AND PROCEDURES

- Original Lesson Plan
- Changes made
 - Variables
 - Buy In
 - Teacher directed vs. Student directed
- Observations

MEASUREMENT OF EFFECT

- Student work
- Effect of revisions
- Conclusion/Summary
- Student work resulting from revised lesson
- Analysis of success
 - Sweet!

REFLECTIONS

- What did we learn?
- In the future...