Work Sample & Commentary: *Weather Watch*
Elementary School Science

The task

Students studied weather and learned to use instruments such as the thermometer, barometer, hygrometer, wind meter, and compass. They learned how to record temperature, barometric pressure, humidity, wind speed, and wind direction and to observe cloud cover. They also learned to interpret weather data in a local newspaper. They were then given the opportunity to use these skills in a field study wherein they collected and recorded weather data outdoors for five consecutive school days. Each student team was then asked to choose weather factors and represent each factor visually using appropriate charts or graphs of their choice. The students reflected on their experience through narrative writing. While the narratives are not intended to be conclusive, they do reflect understanding of key concepts.

Circumstances of performance

This sample of student work was produced under the following conditions:

√ alone	√ in a group
√ in class	as homework
with teacher feedback	√ with peer feedback
timed	√ opportunity for revision

This work sample illustrates a standard-setting performance for the following parts of the standards: [65]

S3c Earth Sciences Concepts: Changes in Earth and sky.

S6a Scientific Tools and Technologies: Use technology and tools.

S6b Scientific Tools and Technologies: Collect and analyze data.

S7a Scientific Communication: Represent data and results in multiple ways.

What the work shows

S3c Earth Sciences Concepts: The student produces evidence that demonstrates understanding of changes in Earth and sky, such as changes caused by weather….

(A) (B) (C) (D) The chart, bar graphs, and narratives provide evidence that the children have used weather instruments to collect quantifiable data outdoors.

[65] The quotations from the Science performance descriptions in this commentary are excerpted. The complete performance descriptions are shown on pages 22-53.

S6a Scientific Tools and Technologies: The student uses technology and tools…to gather data and extend the senses.

(A) (E) (F) (G) The students used instruments (thermometer, barometer, hygrometer, wind meter, compass) to collect data. They described their work with these instruments in their narratives.

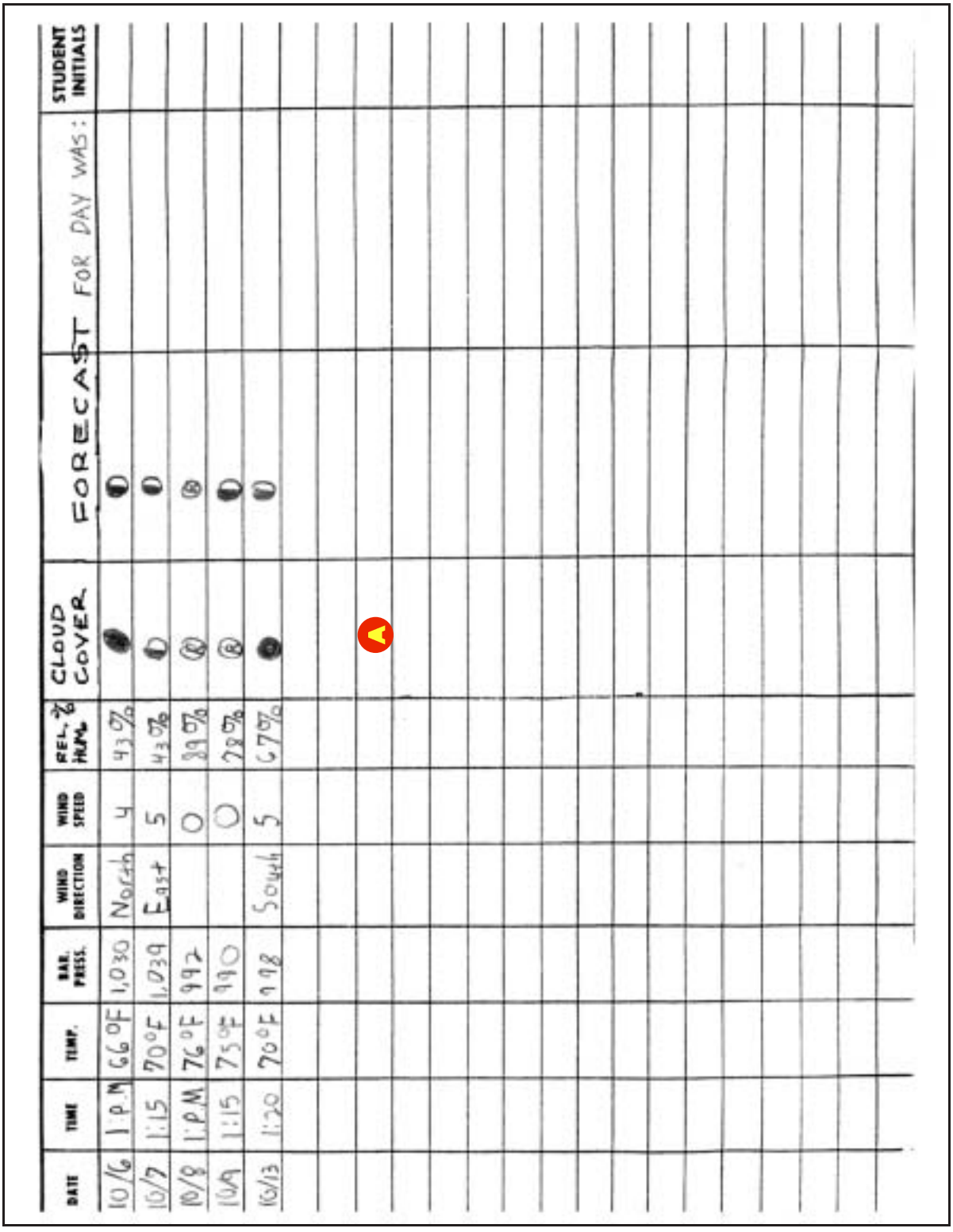
S6b Scientific Tools and Technologies: The student collects and analyzes data using concepts and techniques in Mathematics Standard 4, such as…data displays…[and] graphing.

(B) (C) (D) The students collected and analyzed data and used the information to construct graphs.

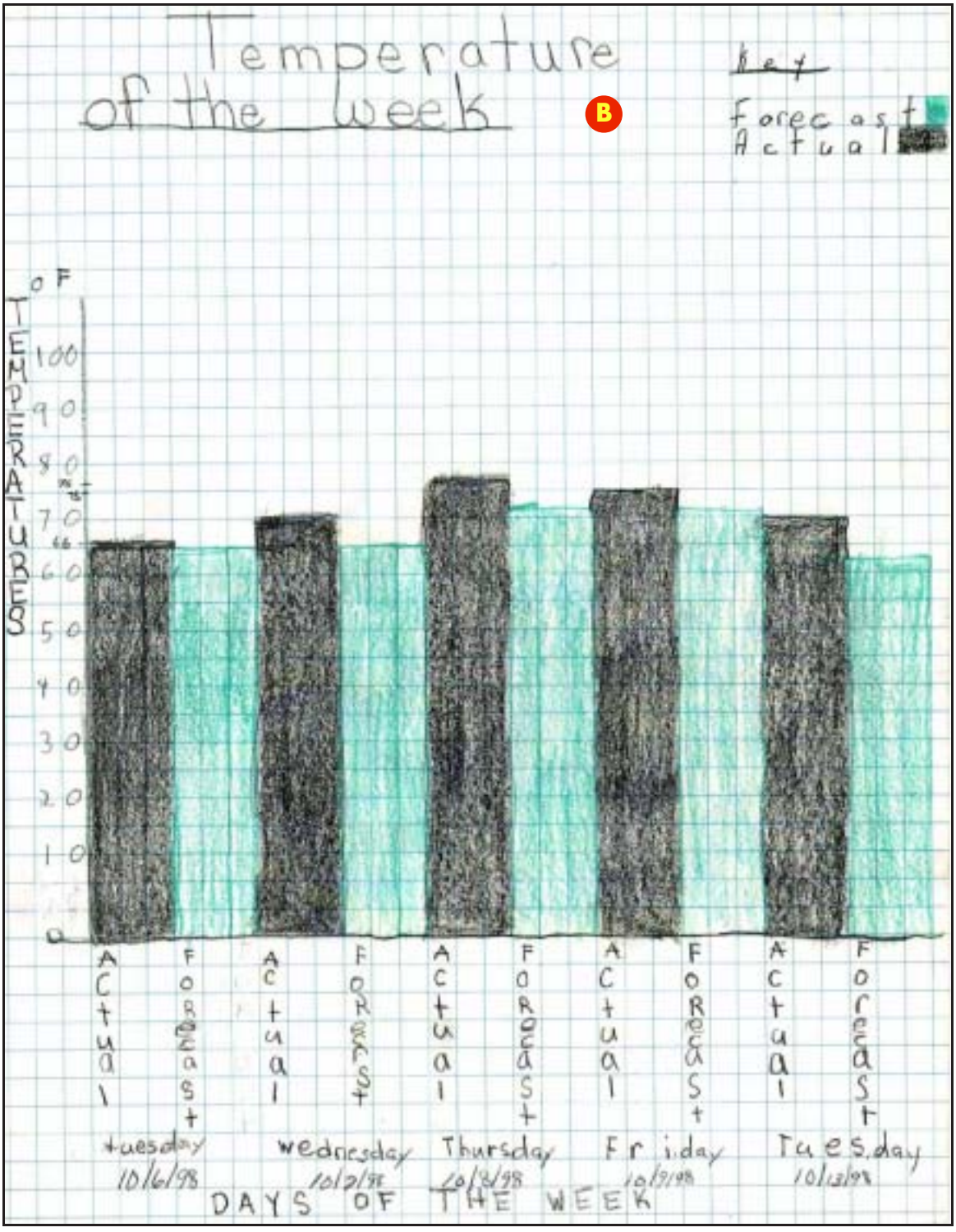
S7a Scientific Communication: The student represents data and results in multiple ways, such as numbers, tables, and graphs…and technical and creative writing.

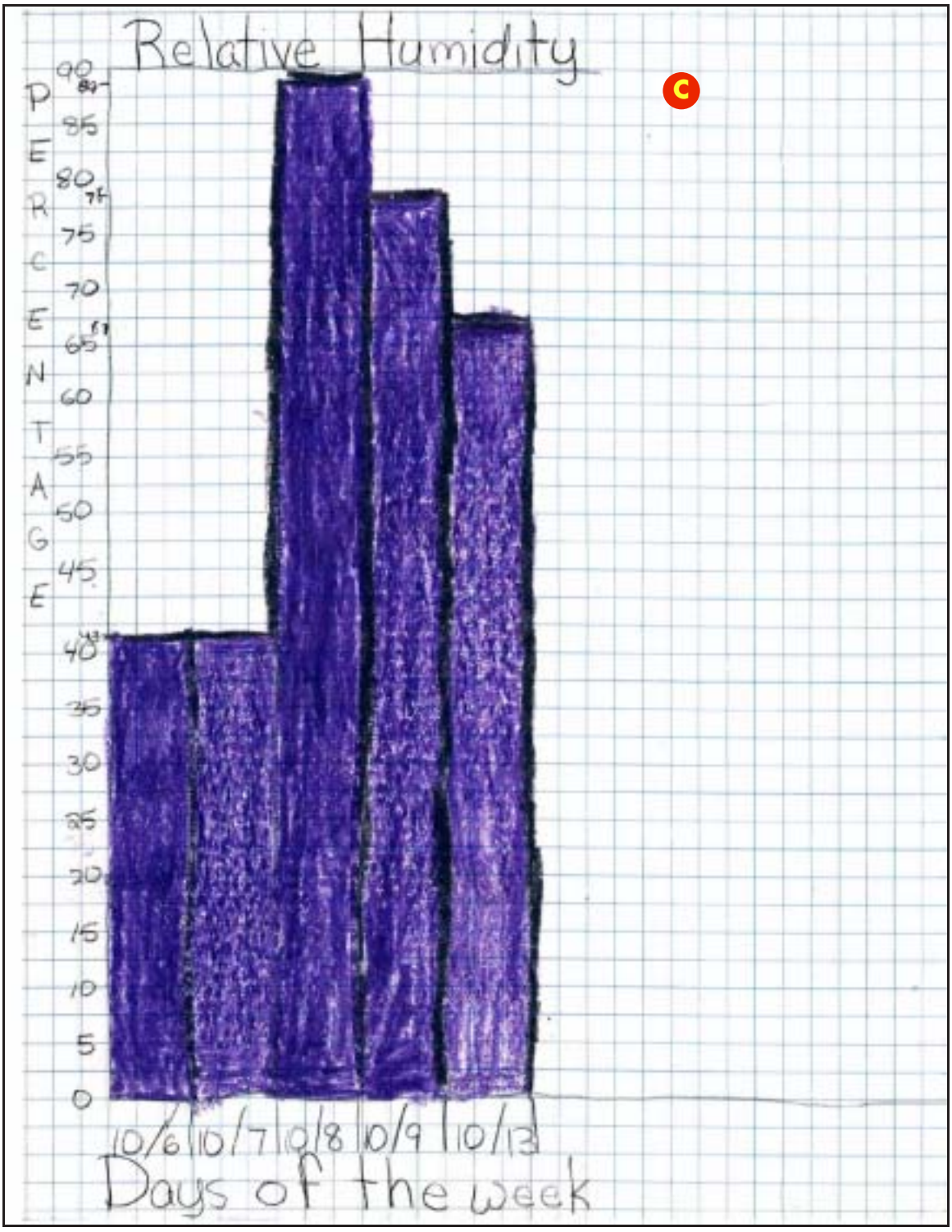
(A) (B) (C) (D) The students completed charts and generated graphs based on the collected data. On two of the graphs (Temperature of the Week and Relative Humidity) students added extra numbers to the y axis so that they could accurately interpret and display the data they collected, indicating a clear understanding of the incremental organization of the graph formats. Note that the Wind Speed graph has a minor flaw in that the bars are not all an equal width, and on the Temperature of the Week graph the increment between 0 and 10 is different, however this does not detract from the students' accurate representation of the data collected.

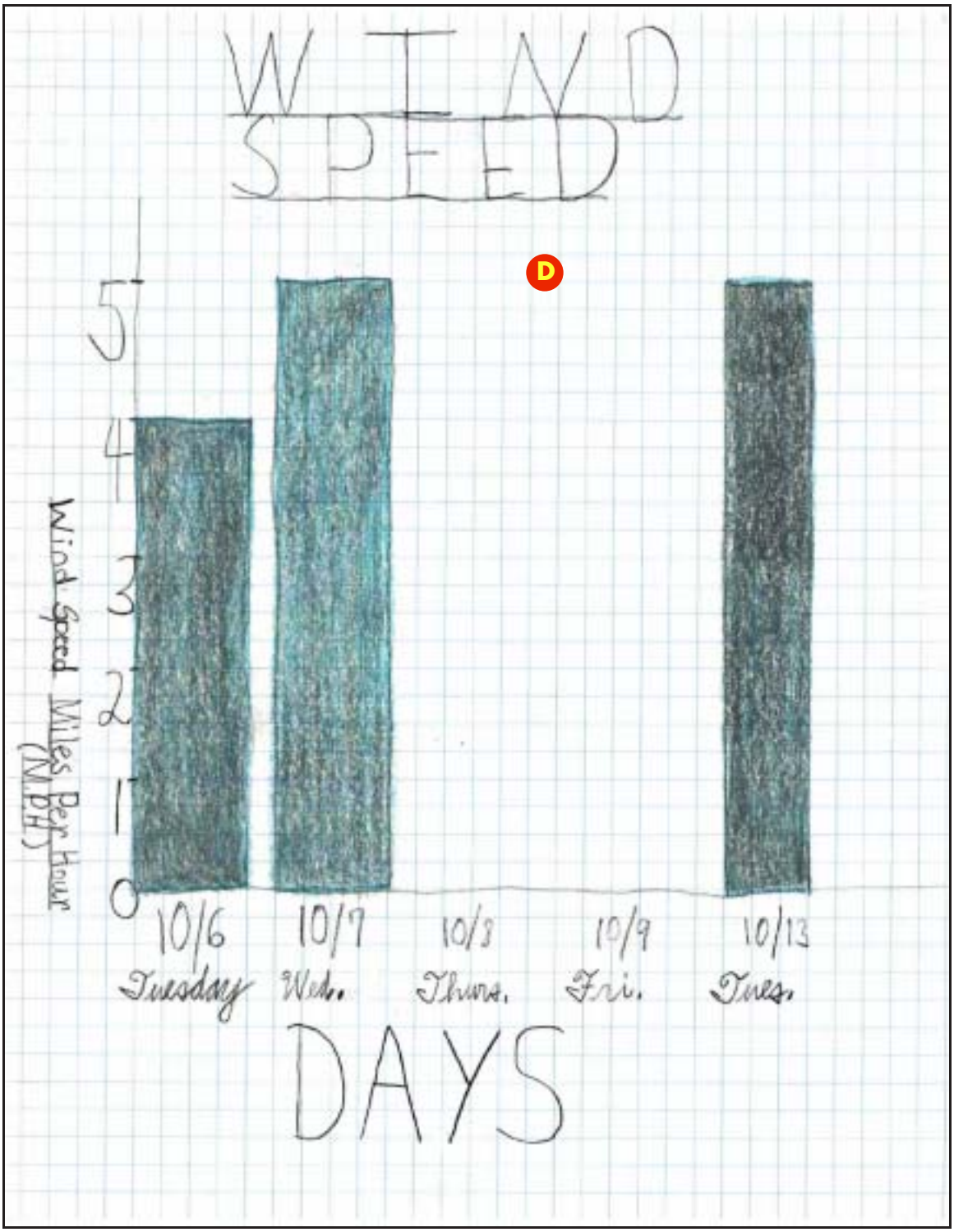
In the narratives, the students describe their work with various instruments and their surprise at some of their results. In (H), for example, the student explains how a hygrometer works. The writing contains some spelling and grammatical errors, but these do not detract from the quality of the students' narratives.

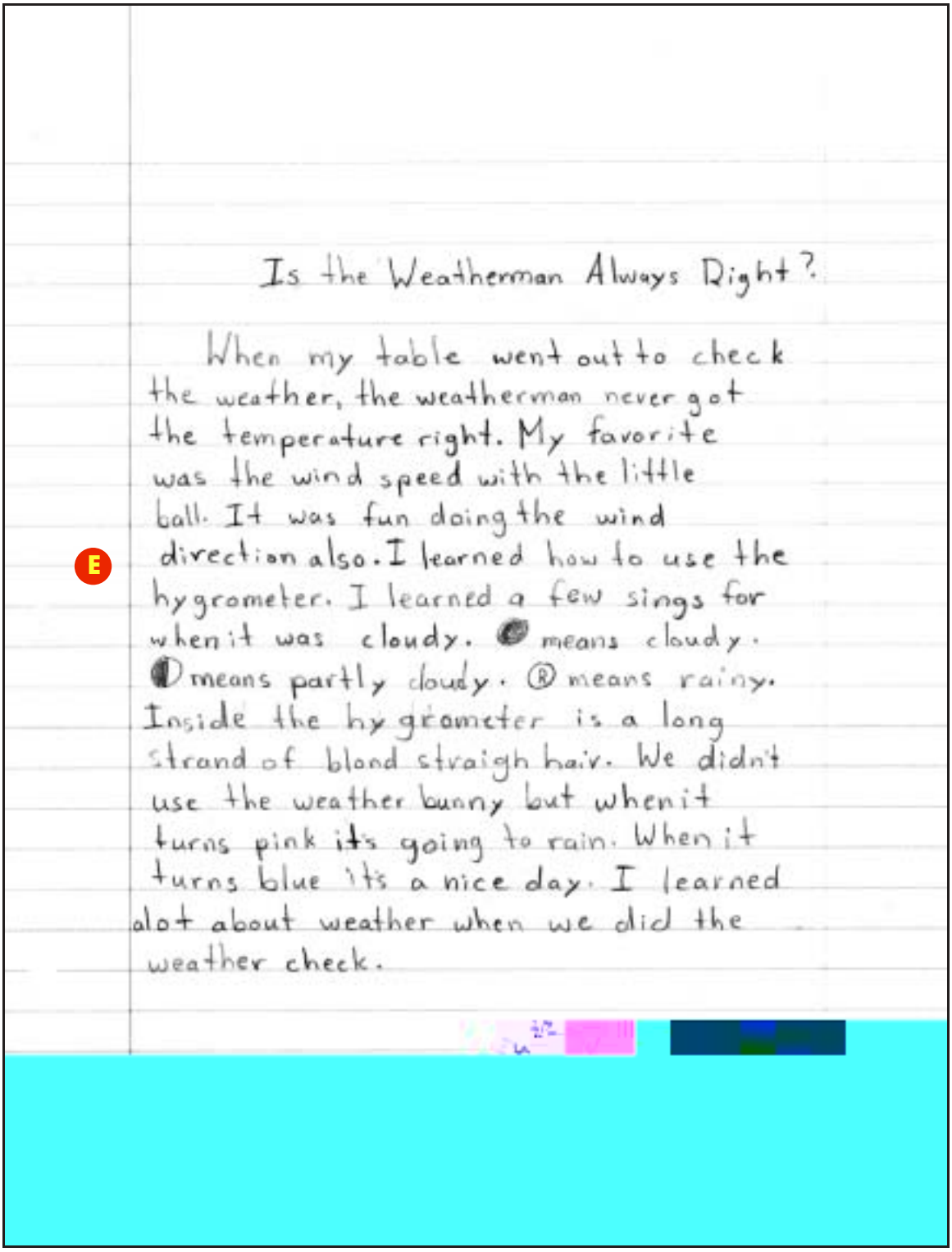


DATE	TIME	TEMP.	BAR. PRESS.	WIND DIRECTION	WIND SPEED	REL. % HUM.	CLOUD COVER	FORECAST FOR DAY WAS:	STUDENT INITIALS
10/6	1 P.M	66°F	1,030	North	4	43%	◐	◐	
10/7	1:15	70°F	1,039	East	5	43%	◐	◐	
10/8	1 P.M	76°F	992		0	89%	⊗	⊗	
10/9	1:15	75°F	990		0	28%	⊗	◐	
10/13	1:20	70°F	998	South	5	67%	●	◐	


Temperature of the week
B
Key
Forecast
Actual
TEMPERATURES
°F
100
90
80
70
66
60
50
40
30
20
10
0
Actual
Forecast
Actual
Forecast
Actual
Forecast
Actual
Forecast
Actual
Forecast
tuesday 10/6/98
wednesday 10/7/98
Thursday 10/8/98
Friday 10/9/98
Tuesday 10/13/98
DAYS OF THE WEEK


Relative Humidity
C
PERCENTAGE
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
10/6
10/7
10/8
10/9
10/13
Days of the week


WIND SPEED
D
5
4
3
2
1
0
Wind Speed Miles Per Hour (M.P.H.)
10/6
Tuesday
10/7
Wed.
10/8
Thurs.
10/9
Fri.
10/13
Tues.
DAYS



Is the Weatherman Always Right?

When my table went out to check the weather, the weatherman never got the temperature right. My favorite was the wind speed with the little ball. It was fun doing the wind direction also. I learned how to use the hygrometer. I learned a few sings for when it was cloudy. ● means cloudy. ◐ means partly cloudy. Ⓡ means rainy. Inside the hygrometer is a long strand of blond straigh hair. We didn't use the weather bunny but when it turns pink it's going to rain. When it turns blue it's a nice day. I learned alot about weather when we did the weather check.

E

weather watch

H

G

I had fun testing the weather. My favorite thing was using the Wind Speed Meter to test the wind speed. I also was interested in what was in the hygrometer. I learned that there was a long straight blond hair inside the hygrometer and when the air had a lot of moisture in the air the hair will get longer and the hygrometer would show a higher persentage of moisture in the air. At the end of testing the weather my group graphed the tempurature. It was fun.

The task

Students who had been studying weather were asked to write a story about a drop of water that goes through the water cycle.

Circumstances of performance

These samples of student work were produced under the following conditions:

√	alone		in a group
√	in class		as homework
√	with teacher feedback		with peer feedback
	timed	√	opportunity for revision

These work samples illustrates standard-setting performances for the following parts of the standards:[66]

S1a Physical Sciences Concepts: Properties of objects and materials.

S3a Earth and Space Sciences Concepts: Properties of Earth materials.

S3b Earth and Space Sciences Concepts: Objects in the sky.

S4a Scientific Connections and Applications: Big ideas and unifying concepts.

What the work shows

S3b Earth and Space Sciences Concepts: The student produces evidence that demonstrates understanding of objects in the sky, such as…the importance of the Sun to provide the light and heat necessary for survival.

(A) (B) The stories begin with the important role of the Sun in the water cycle.

S1a Physical Sciences Concepts: The student produces evidence that demonstrates understanding of properties of objects and materials, such as…different states of materials.

(C) Conceptual understanding of different states of matter is demonstrated in the consistent and accurate relationships among phase, temperature and volume, particularly the recognition that gases rise, and in the descriptions of how it "feels" to be a gas ("getting bigger"), to be a solid ("smaller"), and to condense from gas to liquid ("getting really crowded"). The student is correct that the drop of water is smaller as a solid than it is as a gas; it should be noted, however, that solid water (ice) takes up more space than liquid water.

(D) Conceptual understanding of different states of matter is demonstrated by the relationship between temperature and form.

(E) Strictly speaking, a single drop of water is not "converted into a white beautiful cloud," but one may grant the author poetic license.

[66] The quotations from the Science performance descriptions in this commentary are excerpted. The complete performance descriptions are shown on pages 22-53.

S3a Earth and Space Sciences Concepts: The student produces evidence that demonstrates understanding of properties of Earth materials, such as water and gases….

(F) Noting that water can condense dust particles is evidence of understanding the water cycle.

(G) An understanding of the role of gravity in precipitation is implicit in the statement that "someone is pulling me."

(H) The arrival in the Mississippi River, not in the original lake in Nebraska, shows further understanding of the water cycle in that water precipitates elsewhere from its evaporative source.

(I) The final sentence denotes the cyclical concept.

S4a Scientific Connections and Applications: The student produces evidence that demonstrates understanding of big ideas and unifying concepts, such as…change and constancy….

(J) The final sentences, especially the conclusion, "The End…not really," go beyond an understanding of the water cycle to suggest understanding of a unifying concept, change and constancy.

Sample 1

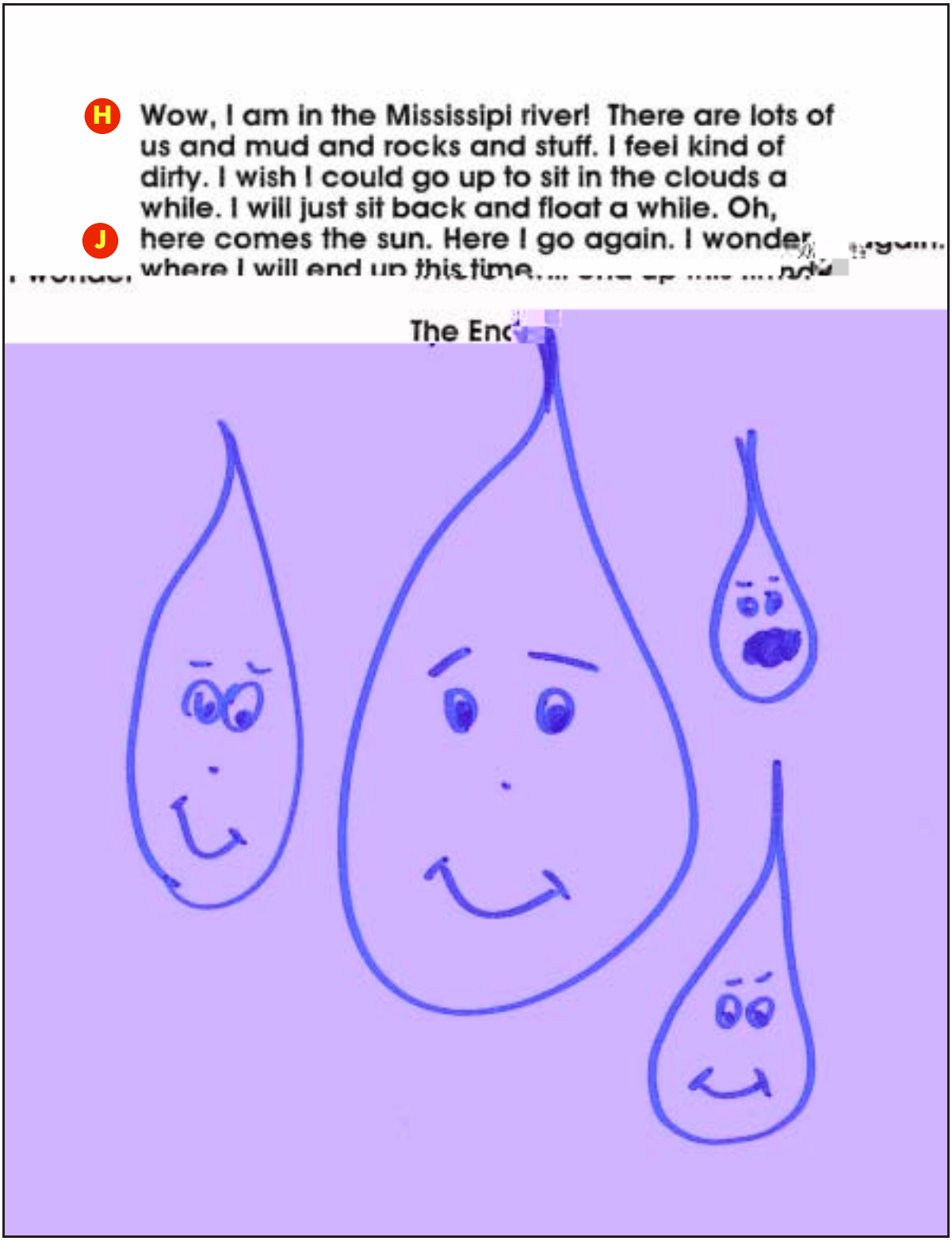
My Big Trip
by Jason

Good morning, I am Mr. H. Tuoh. I just woke up and the sun is coming up. I have been swimming with my friends in a nice lake in Nebraska. Since I am on top of this pile of sleeping friends the sun is going to take me for a ride today. A

Wow, that was fast. I am climbing really fast. I feel bigger. That's because I am a gas . It happens every time I get hot. When I get cold I get smaller. They call me a solid. Being solid gives me a headache. This is better than World's of fun! There is a big cloud ahead and we are slowing down. I am getting smaller now because my pants fit better. But, it's getting really crowded!!! I can hardly move. Who let in the ugly dust family? I think I will hang on to this dust guy so I can rest up. Hey, everybody is coppying my idea and we are getting heavy. Oh Noooooooooooooooo we are falling!!! But that's OK because I was getting really cold. C F

What a trip. I am almost back to the lake. Wait, where is the lake. This looks like a big river . I don't think I am going to hit the river. Oh nooooooooo .I better put on my crash helmet and prepare for a land landing. OUCH! That hurt. But, at least I am down. hey, we are moving again. These dirt and rock hurt. Do they have to come along on MY trip?

Sample 1 (cont.)



Sample 2

Las Aventuras de una gota de agua que cae

Yo Soy la gota que le cae a la grama, las flores y las personas que no tienen sombrillas. Ustedes se preguntar§n como yo puedo estar en tantas partes
B diferentes. El calor del sol me hace sentir como si fuera un avi·n que empieza a volar y a volar como una pluma cuando la soplan y me empiezo a elevar en la atm·sfera. Cuando voy volando me encuentro con mis amigas las aves. Me dicen que estoy muy caliente y
D que estoy cambiando y me evaporo como humo. Despu®s llego a un lugar muy frio en la atm·sfera siento como si estuviera dentro de un congelador. Cuando abro mis ojos me doy cuenta de que ya no
E soy una gota de agua. Me he convertido en una blanca y bella nube. Cuando estoy en el cielo me siento feliz pero a veces me siento muy sola porque quiero volver a la tierra. Ahora estoy pesada y creo que ya no puedo estar mas tiempo aqu² arriba. Creo que me voy a caer.
G A veces creo que alguien me esta jalando de los pies. Estoy tan pesada que ahora si creo que me precipitar® al suelo. Podr® ver a mis amigos: las flores, la grama, las aves, los campos y otros amigos. Mis hermanas las gotas est§n feliz porque al juntarme con ellas nos convertimos en lluvia. Ahora ya no somos gotas sino una hermosa lluvia que llena de agua los campos,
I mares, rios y lagos. Pronto regresar§ el sol y mi aventura epezar§ otra vez.

Sample 2 translation

The Adventures of a Drop of Water That Falls

I am a drop of water that falls on the grass, flowers, and people who don't have umbrellas. You might wonder how I could be at some many different places. Here
B is what happens, the heat of the sun makes me feel like an airplane that starts to fly and fly like a feather when it is blown. I start to elevate to the atmosphere. While I'm flying I encounter my friends the birds. They tell
D me that I am too hot and I am changing and I evaporate like smoke. I then arrive to a very cold place in the atmosphere it feels as if I were inside a freezer. When I open my eyes I realize that I am no longer a drop of
E water. I have been converted to a white beautiful cloud. When I'm in the sky I feel happy but sometimes I feel lonely because I want to return to the earth. Now I am heavy and I think that I can't be up here much longer. I think I am going to fall. Sometimes I think that some-
G one is pulling me by the legs. I'm so heavy that I really think that I am going to precipitate to the ground. So I can see my friends: the flowers, the grass, the birds, the countryside, and other friends. My drop sisters are happy because I can join them and become rain. We are no longer drops but a beautiful rain that fills the countryside, oceans, rivers, and lakes. Soon the sun will
I come back and my adventure will start again.

The task[67]

An elementary class was involved in a year-long, interdisciplinary study of their state. On a field trip to a conservation center, they learned about wind and water erosion. When they returned, they wanted to learn more about erosion and which combinations of soil and grass were most effective in preventing erosion.

Circumstances of performance

These samples of student work were produced under the following conditions:

	alone	√	in a group
√	in class		as homework
	with teacher feedback	√	with peer feedback
	timed		opportunity for revision

These work samples illustrates standard-setting performances for the following parts of the standards:[68]

S3a Earth and Space Sciences Concepts: Properties of Earth materials.

S4a Scientific Connections and Applications: Big ideas and unifying concepts.

S5a Scientific Thinking: Ask questions about natural phenomena; objects and organisms; and events and discoveries.

S5e Scientific Thinking: Identify problems; propose and implement solutions; and evaluate the accuracy, design, and outcomes of investigations.

S6a Scientific Tools and Technologies: Use technology and tools.

S7a Scientific Communication: Represent data and results in multiple ways.

S7b Scientific Communication: Use facts to support conclusions.

S7c Scientific Communication: Communicate in a form suitable to the purpose and audience.

What the work shows

The first page explains that this group of students examined Tall Fescue grass. Other groups in their class studied Perennial Rye, Crested Wheat, and Irrigated Pasture Mix (a mixture of these three and two other types). The second, third, and fourth pages explain the question, hypothesis, and procedures. The fifth page shows the plan for studying soils; the sixth, seventh, and eighth pages show the observations from the three soil types.

The results of the soils' analysis (without grass) are summarized on page 9. The next three pages (10-12) show the results of the same procedure for the same soils planted with Tall Fescue. The final page (13) summarizes the work.

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[67] For related work on Erosion, see "River Cutters", page 265.
[68] The quotations from the Science performance descriptions in this commentary are excerpted. The complete performance descriptions are shown on pages 22-53.

S3a Earth and Space Sciences Concepts: The student produces evidence that demonstrates understanding of properties of Earth materials, such as…the properties of rocks and soils such as texture, color, and ability to retain water.

(A) (B) (C) There is ample evidence that the students have an understanding of erosion.

S4a Scientific Connections and Applications: The student produces evidence that demonstrates understanding of big ideas and unifying concepts such as…cause and effect.

(A) (B) (C) (D) These pieces and the ending also show a good understanding of cause and effect.

S5a Scientific Thinking: The student asks questions about natural phenomena; objects and organisms; and events and discoveries.

(D) The entire investigation came from students' questions about natural phenomena. The question and hypothesis are clearly stated.

S5e Scientific Thinking: The student identifies problems; proposes and implements solutions; and evaluates the accuracy, design, and outcomes of investigations.

(E) The conclusion shows that students were focused on the best combination of grasses and soils to prevent erosion.

S6a Scientific Tools and Technologies: The student uses technology and tools….

(F) (G) (H) (I) (J) (K) (L) The stream table was used effectively to gather data.

(M) (N) Attention to accuracy is evident throughout; these are but two examples.

S7a Scientific Communication: The student represents data and results in multiple ways, such as… diagrams…and…writing.

(F) (G) (H) (I) (J) (K) (L) The diagrams and accompanying explanations clearly describe the results of the investigations.

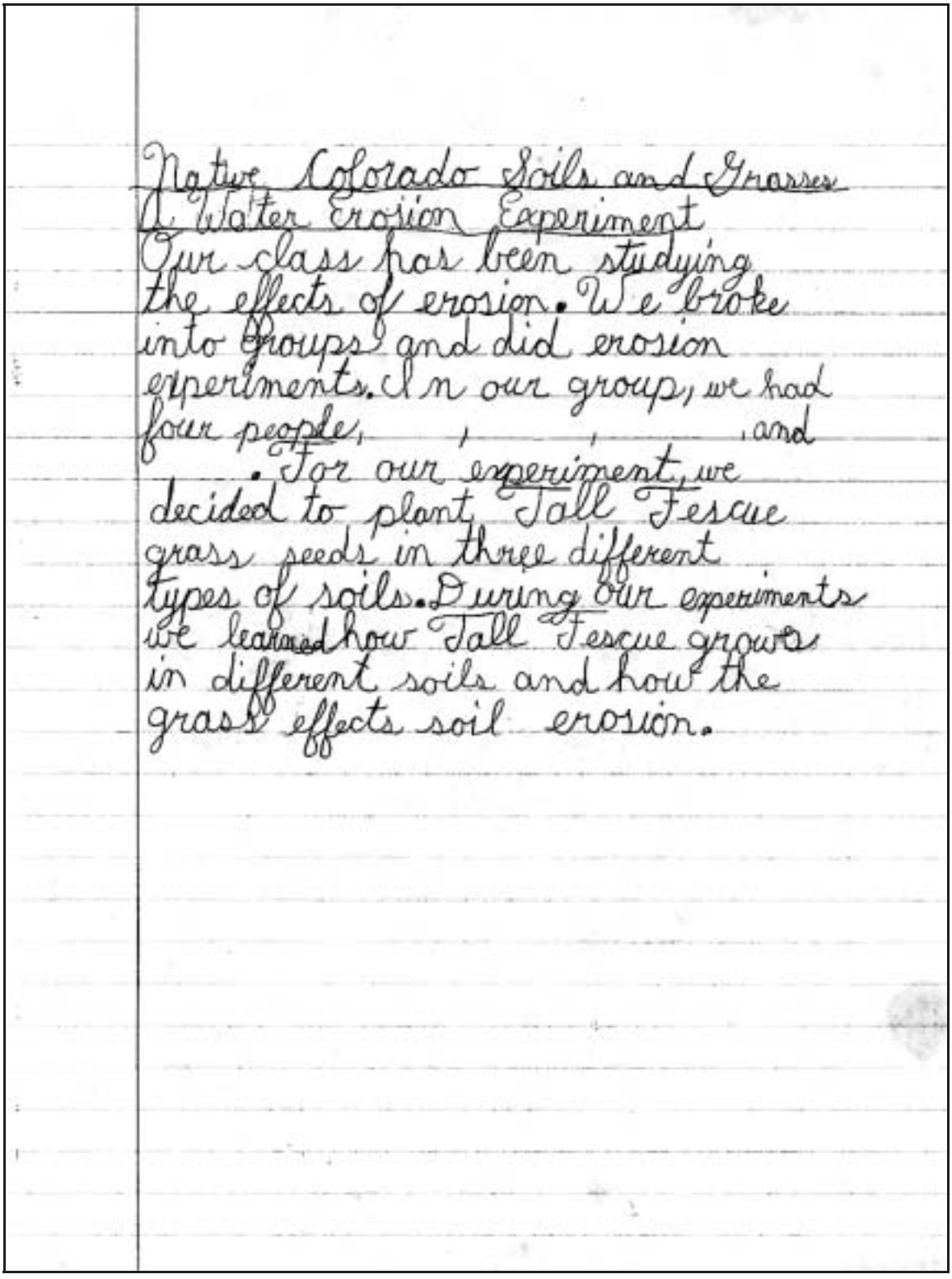
S7b Scientific Communication: The student uses facts to support conclusions.

(C) Throughout the work, but particularly in the conclusion, the generalizations follow directly from the data.

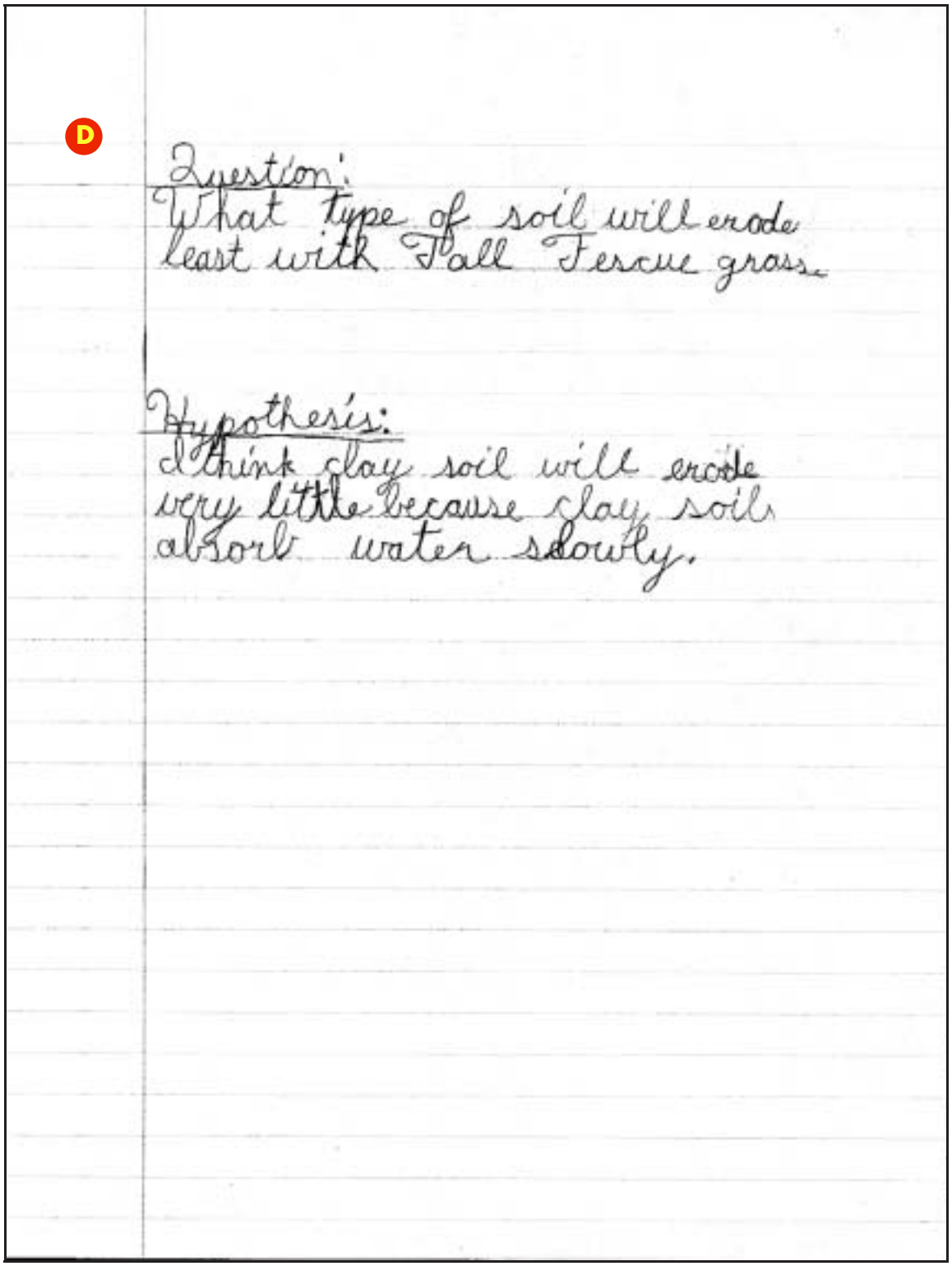
S7c Scientific Communication: The student communicates in a form suited to the purpose and the audience, such as writing instructions that others can follow.

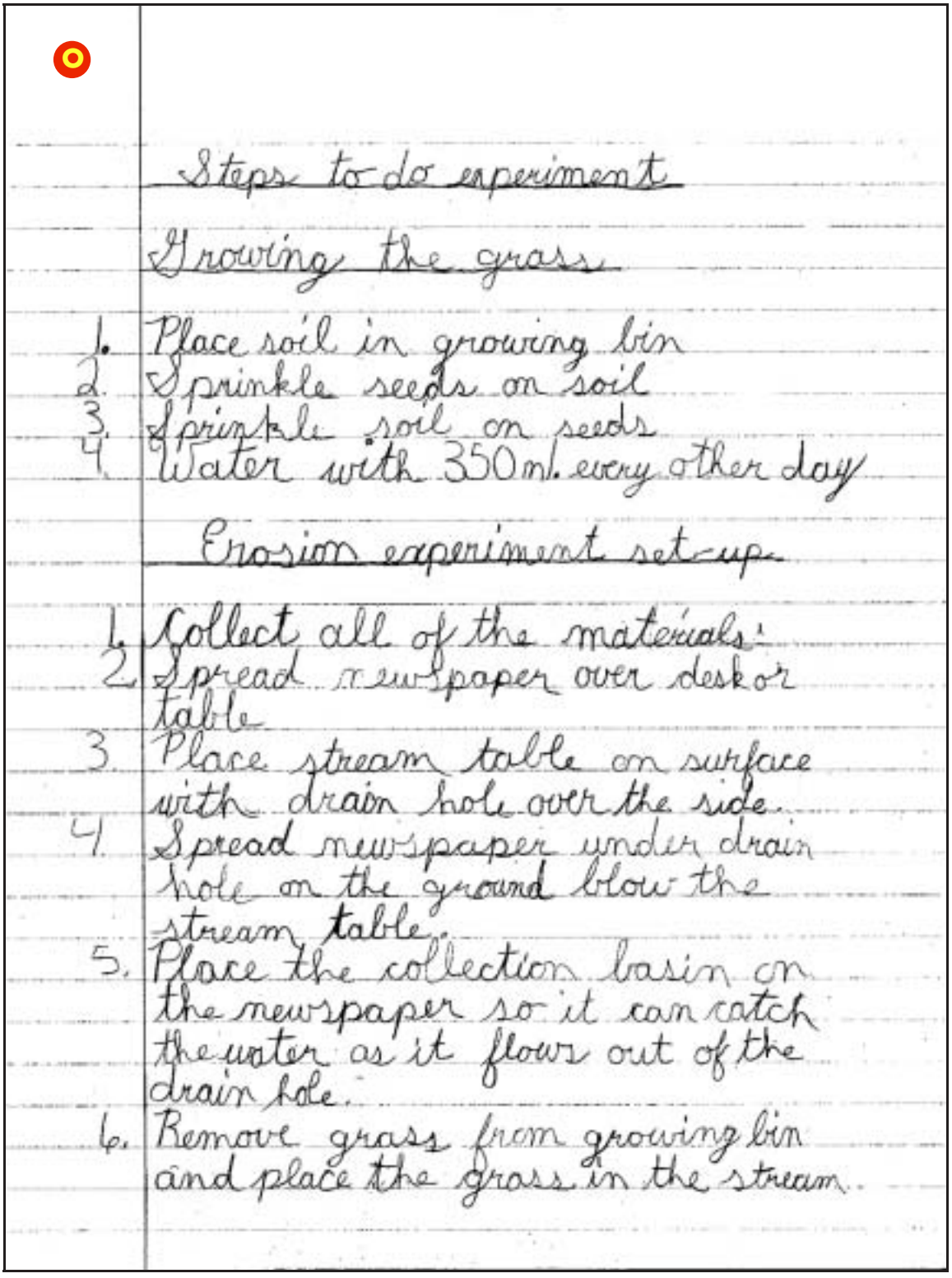
(O) The procedures are well explained.

The attention to detail, and the recording and use of qualitative and quantitative data, support the judgment of this work as standard setting. Evidence of conceptual and applied understanding of Earth science is shown throughout.



Native Colorado Soils and Grasses
A Water Erosion Experiment
Our class has been studying the effects of erosion. We broke into groups and did erosion experiments. In our group, we had four people, , , , and . For our experiment, we decided to plant Tall Fescue grass seeds in three different types of soils. During our experiments we learned how Tall Fescue grows in different soils and how the grass effects soil erosion.


D
Question:
What type of soil will erode least with Tall Fescue grass.
Hypothesis:
I think clay soil will erode very little because clay soils absorb water slowly.



Steps to do experiment

Growing the grass

1. Place soil in growing bin
2. Sprinkle seeds on soil
3. Sprinkle soil on seeds
4. Water with 350 ml. every other day

Erosion experiment set-up

1. Collect all of the materials
2. Spread newspaper over desk or table
3. Place stream table on surface with drain hole over the side.
4. Spread newspaper under drain hole on the ground below the stream table.
5. Place the collection basin on the newspaper so it can catch the water as it flows out of the drain hole.
6. Remove grass from growing bin and place the grass in the stream.

table opposite the drain hole
7. Place ruler on top of the stream table above the grass 6-7 cm. from the end of the stream table.
8. Balance flood cup on end of the stream table at the ruler.
9. Fill liter container up to the top (100 ml. of water)
10 Place the wooden angle under the stream table opposite the drain hole.

Names _____ Date _____

STREAM TABLE PLAN

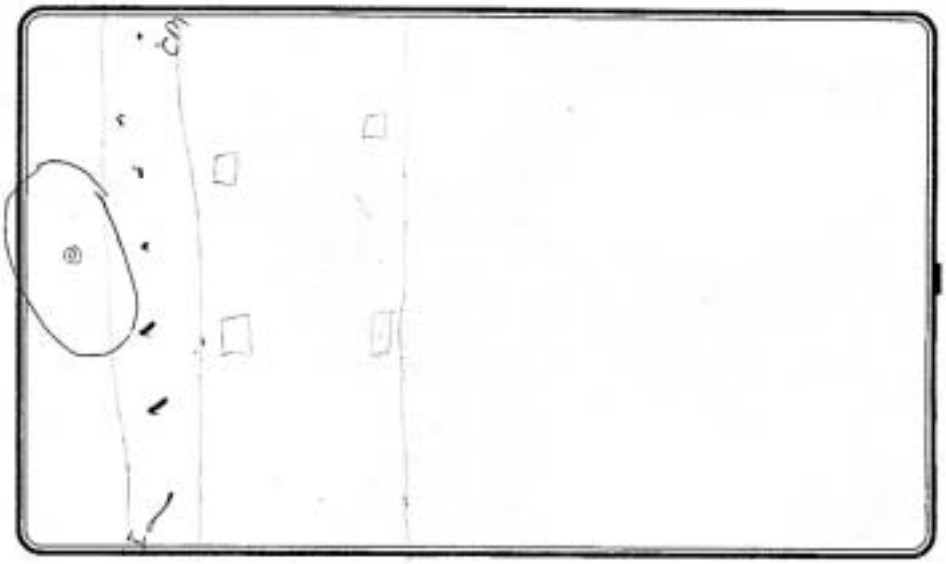
We are trying to find out what happens when We put houses at the end of the sand.

We will need these materials:

Stream table	water
cup with hole	duct tape
ruler	3 houses
sand	

We will set up our tray like this:

F



Landforms Module
PART NO. 542-0106 (no. 7 of 12)

GO WITH THE FLOW
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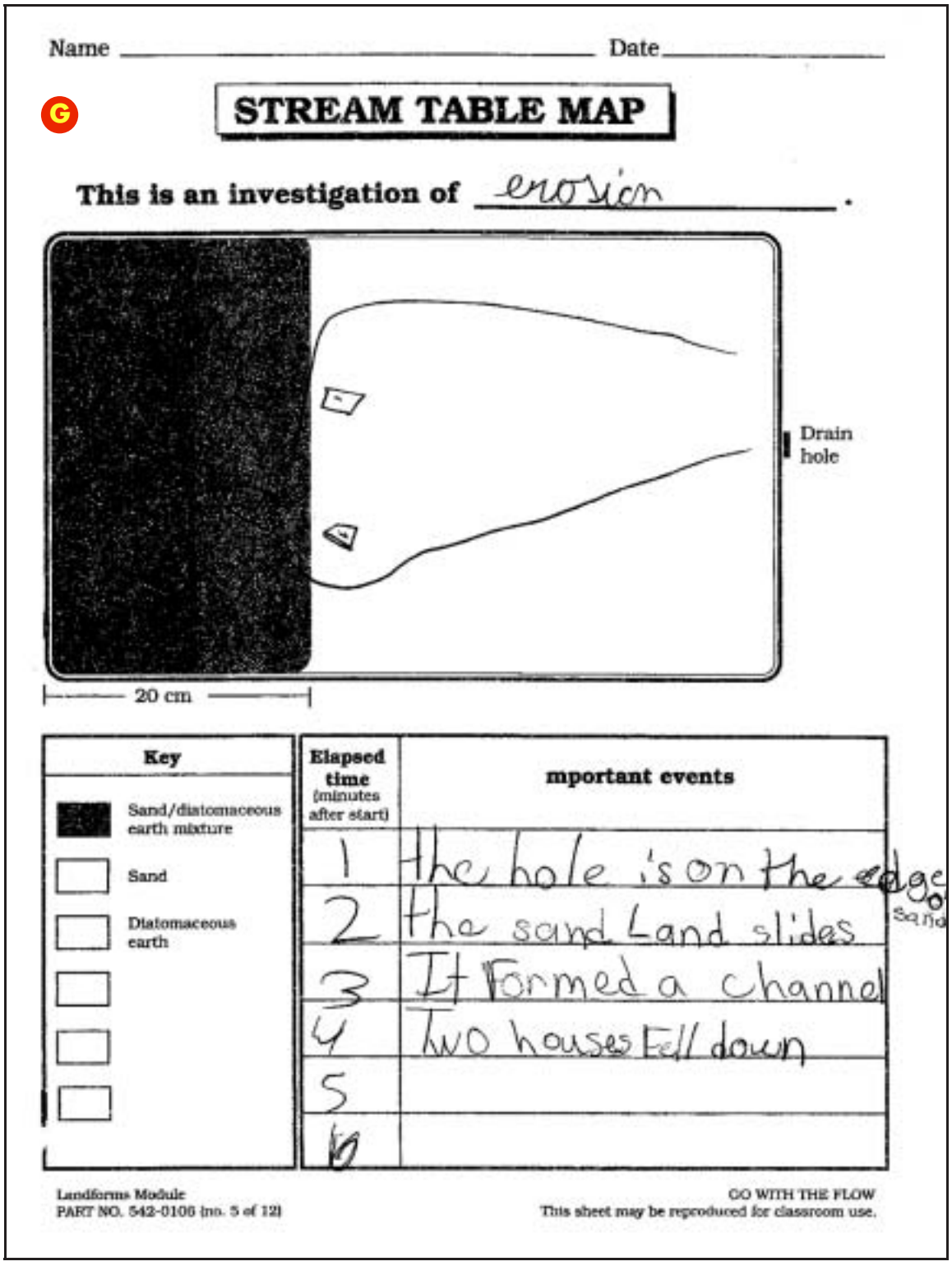

Name _____ Date _____

G

STREAM TABLE MAP

This is an investigation of erosion .

Key

- Sand/diatomaceous earth mixture
- Sand
- Diatomaceous earth

Elapsed time (minutes after start)	mportant events
1	the hole is on the edge
2	the sand Land slides
3	It formed a channel
4	Two houses Fell down
5	
6	

Landforms Module
PART NO. 542-0106 (no. 5 of 12)

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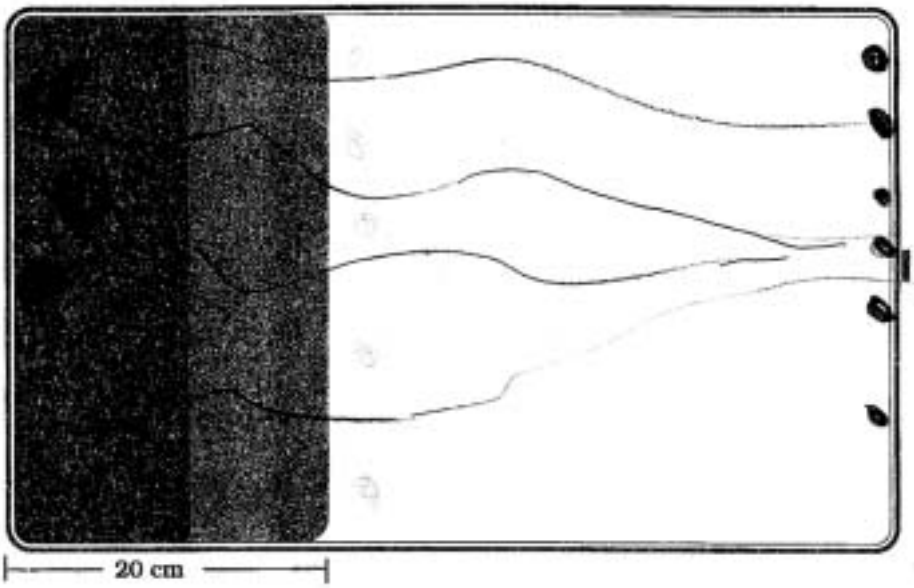
Name _____ Date _____

H

STREAM TABLE MAP

This is an investigation of erosion.



Key	Elapsed time (minutes after start)	Important events
Sand/diatomaceous earth mixture	1	Holes formed
Sand	2	land channeled
Diatomaceous earth	3	tunnel closed
	4	tunnel opened again
	5	took more sand down
	6	

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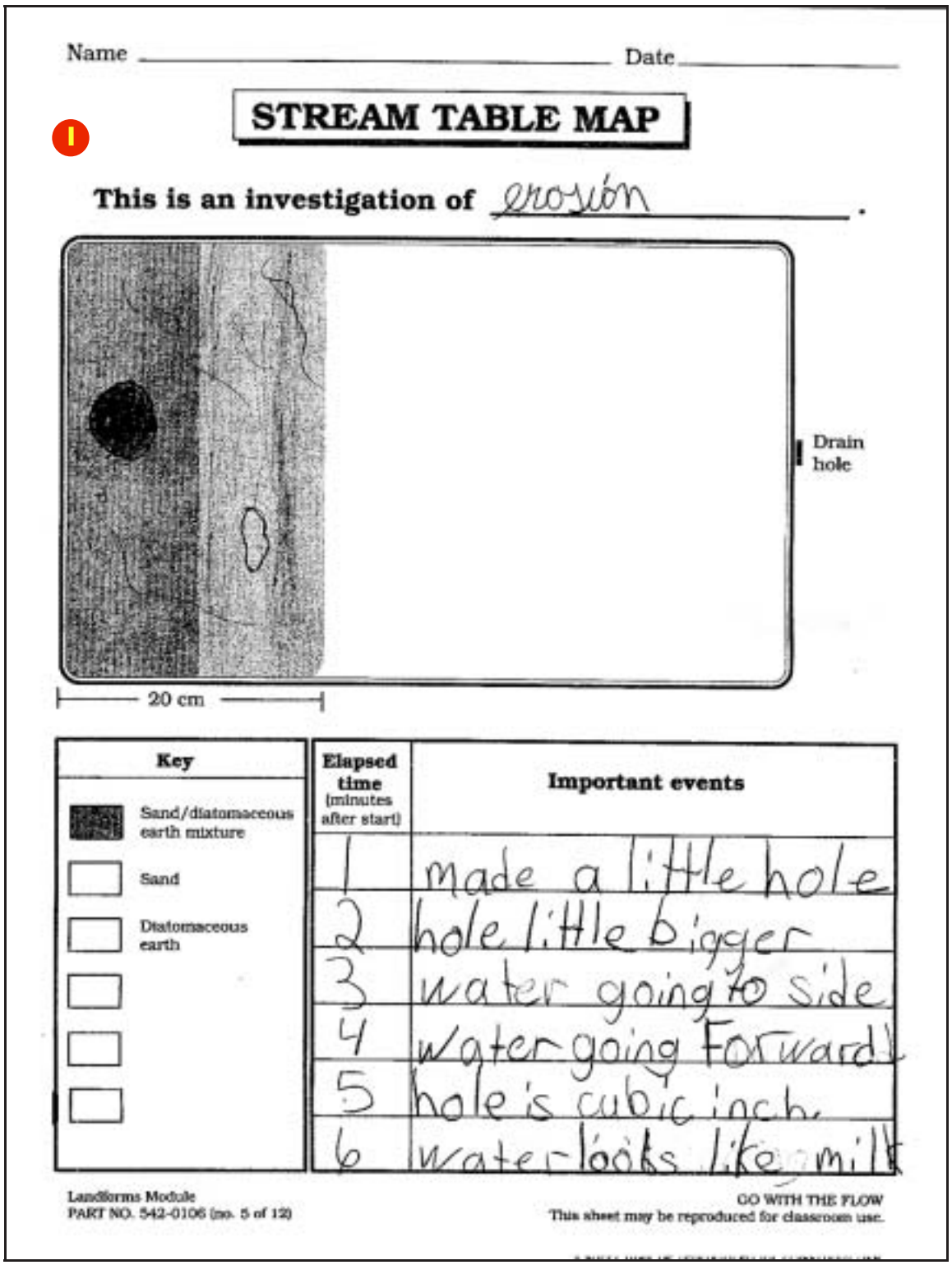

Name _____ Date _____

STREAM TABLE MAP

I

This is an investigation of erosion .

Drain hole

20 cm

Key	Elapsed time (minutes after start)	Important events
Sand/diatomaceous earth mixture	1	made a little hole
Sand	2	hole little bigger
Diatomaceous earth	3	water going to side
	4	water going Forward
	5	hole is cubic inch.
	6	water looks like mill

Landforms Module
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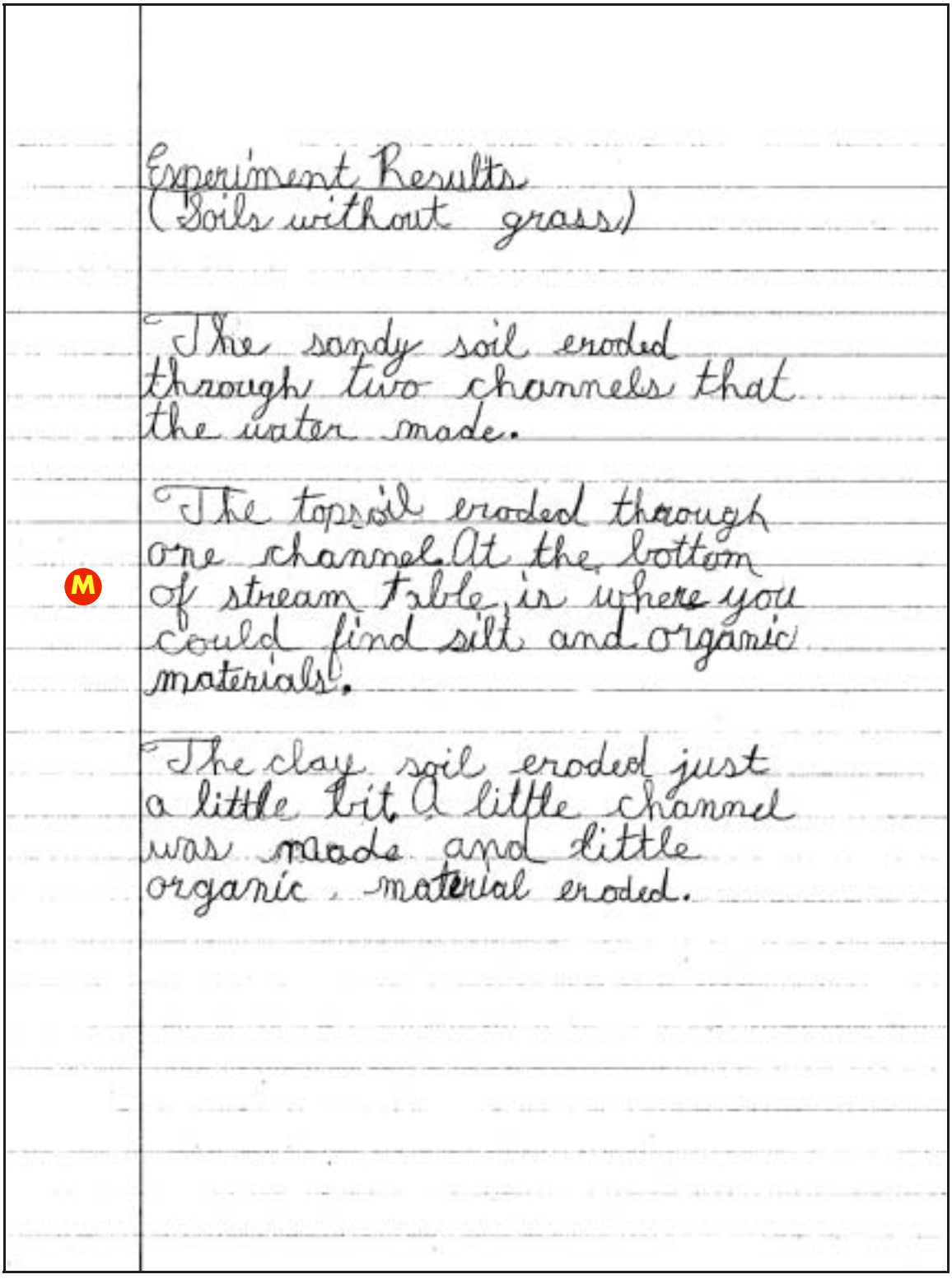
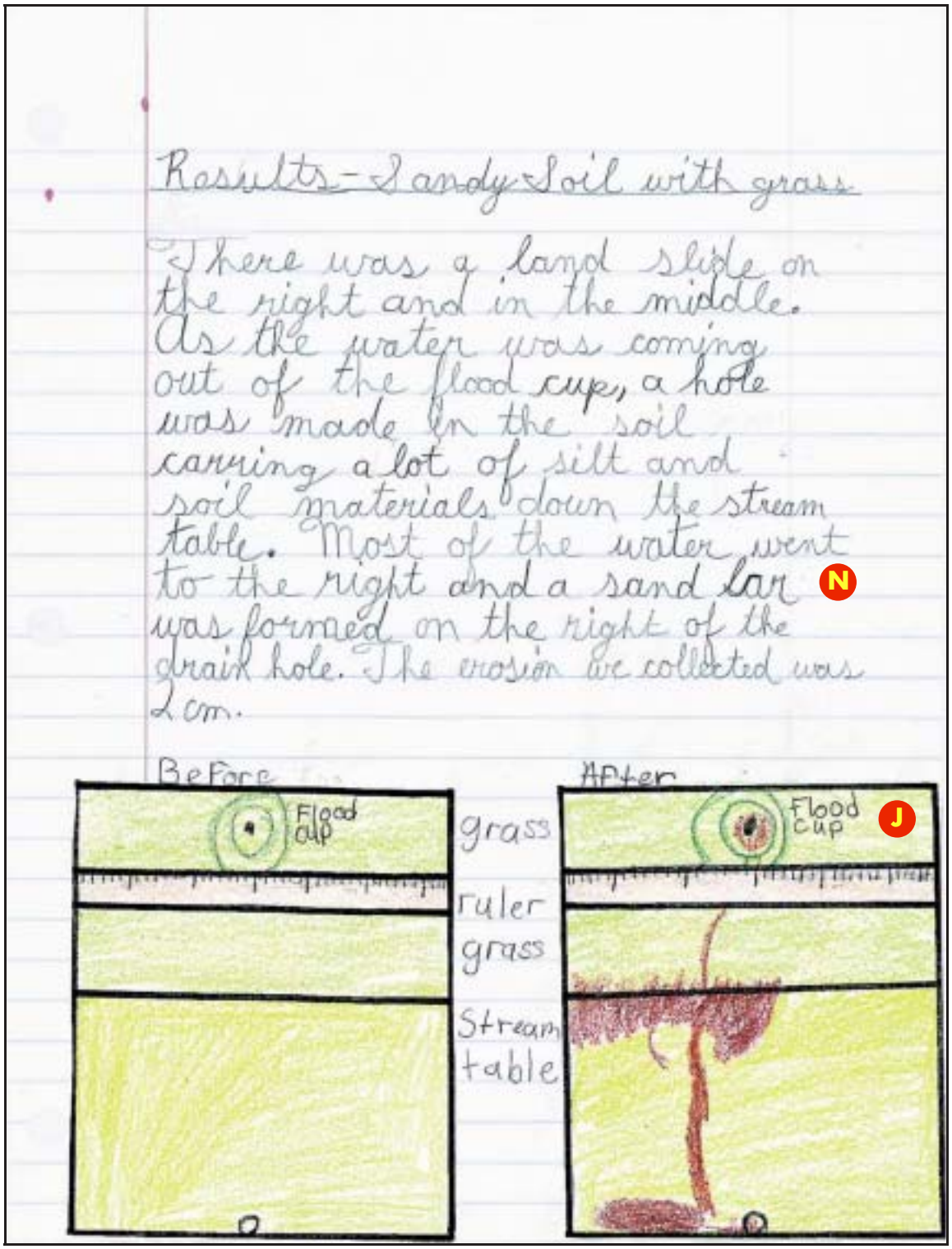


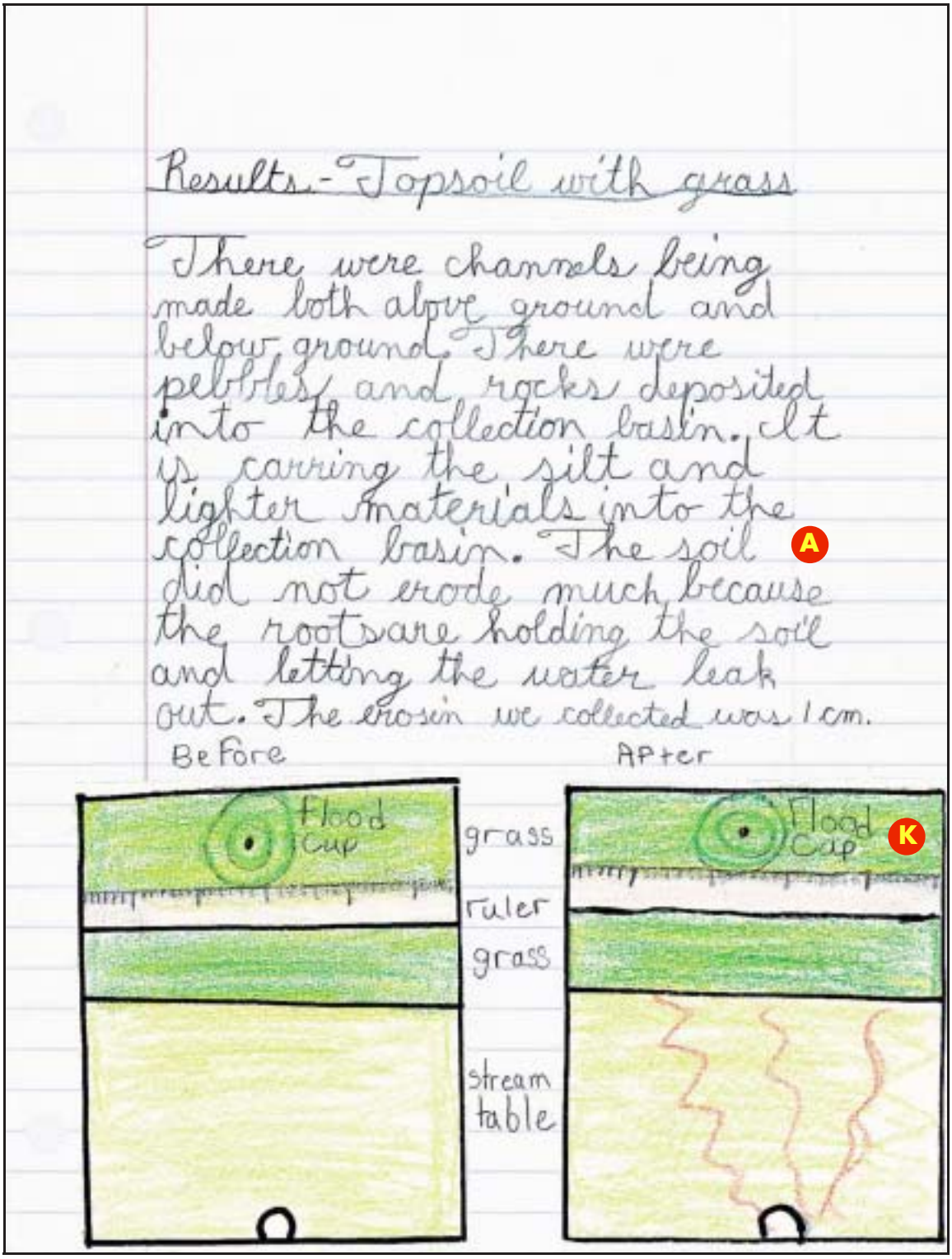
Experiment Results
(Soils without grass)

The sandy soil eroded through two channels that the water made.

The topsoil eroded through one channel. At the bottom of stream table, is where you could find silt and organic materials.

The clay soil eroded just a little bit. A little channel was made and little organic material eroded.


Results - Sandy Soil with grass
There was a land slide on the right and in the middle. As the water was coming out of the flood cup, a hole was made in the soil carrying a lot of silt and soil materials down the stream table. Most of the water went to the right and a sand bar
N
was formed on the right of the drain hole. The erosion we collected was 2 cm.
Before
After
Flood cup
grass
ruler
grass
Stream table
Flood cup
J



Results - Topsoil with grass

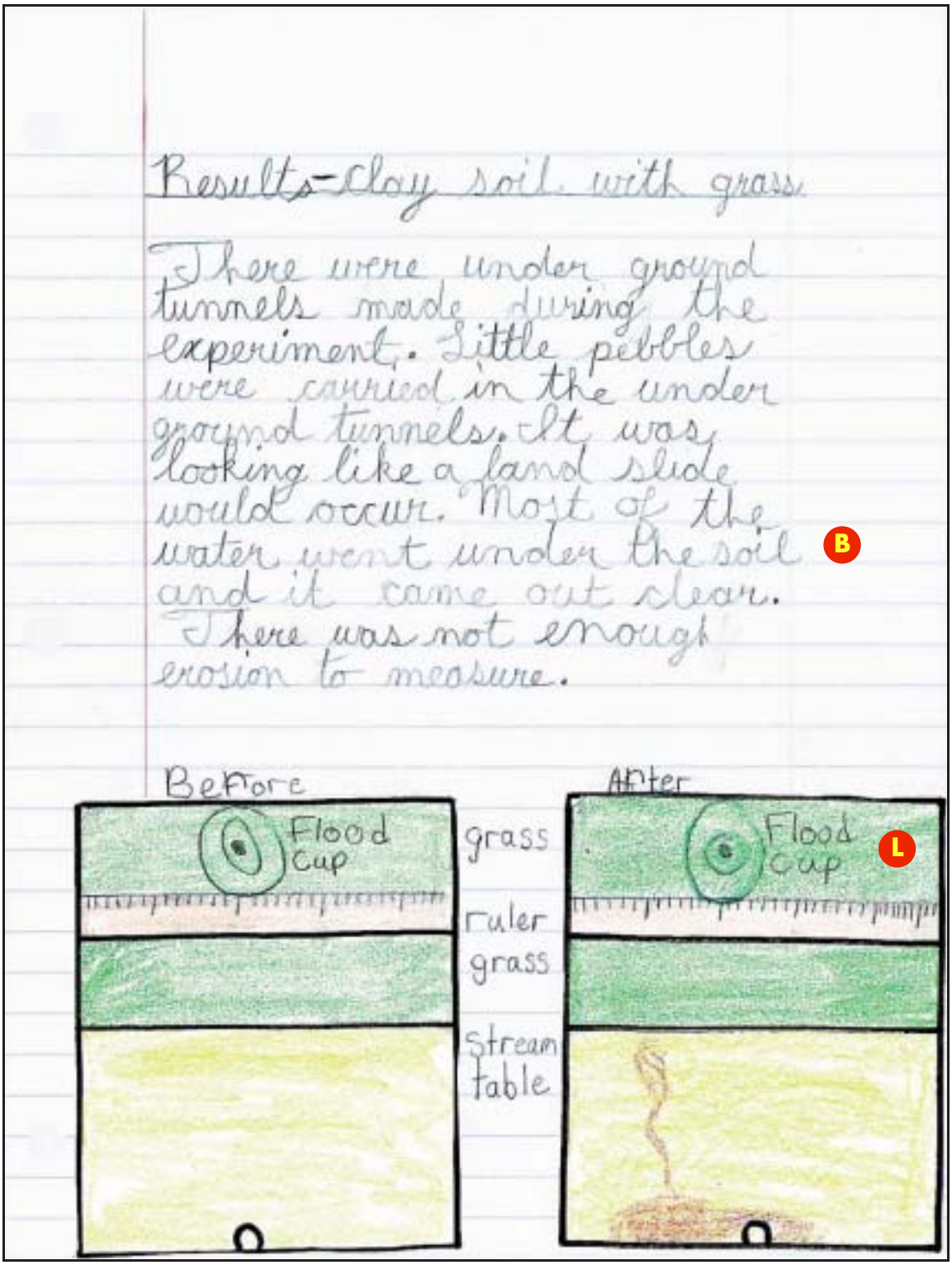
There were channels being made both above ground and below ground. There were pebbles and rocks deposited into the collection basin. It is carring the silt and lighter materials into the collection basin. The soil did not erode much because the roots are holding the soil and letting the water leak out. The erosin we collected was 1 cm.

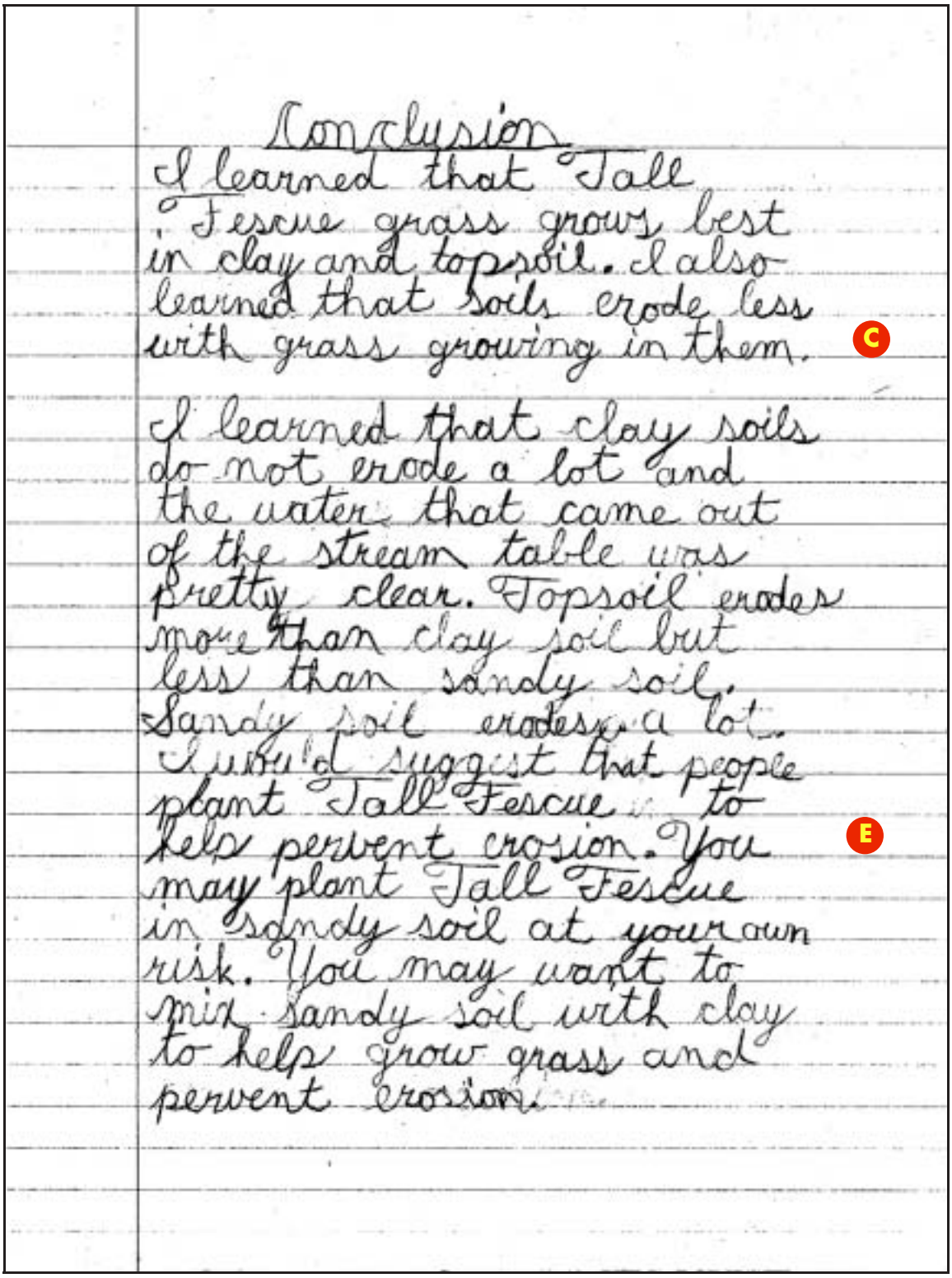
A

Before

After

K


Results-clay soil with grass
There were under ground tunnels made during the experiment. Little pebbles were carried in the under ground tunnels. It was looking like a land slide would occur. Most of the water went under the soil and it came out clear. There was not enough erosion to measure.
B
Before
After
Flood Cup
grass
ruler
grass
stream table
Flood Cup
L



Conclusion

I learned that Tall Fescue grass grows best in clay and topsoil. I also learned that soils erode less with grass growing in them. C

I learned that clay soils do not erode a lot and the water that came out of the stream table was pretty clear. Topsoil erodes more than clay soil but less than sandy soil. Sandy soil erodes a lot. I would suggest that people plant Tall Fescue to help pervent erosion. You may plant Tall Fescue in sandy soil at your own risk. You may want to mix sandy soil with clay to help grow grass and pervent erosion. E