

Should I Be Teaching Writing During Science, Social Studies, and Math?

Not long ago I attended a school district math in-service. As we discussed the challenges of meeting all subject requirements, teachers voiced concern about the issue of “not enough time.” The question I heard over and over was, “How do we find the time to teach all subjects well?”

There are new state assessments in social studies and science, and we recognize that these subjects are important too. So, how do we teach the content area subjects without taking time away from the core subjects of reading, writing, and math? Where’s the time?

For me, the answer is this: writing in all subject areas helps us teach all subjects well. Why? *Writing can lead to better learning*—perhaps because writing is a form of thinking. I know this to be true for myself. Whether I am a student in a class or studying something on my own, I take notes. I record important ideas. I reflect and ask questions. I write to remember and I write to learn. Similarly, when I have students write diagrams, summaries, responses to information, questions, or short reports, this writing leads to better understanding.

Take Ryan. In math, he explains why 26 is an even number (Figure 1). In order to write, he truly has to think about the concept of even numbers. Writing to explain cements this math learning.

Before Demetry studies about plants, he activates his prior knowledge by writing what he already knows (Figure 2). He has to think about plants to write this list. This thinking sets the stage for a great class discussion as we begin our study. Later in the unit, Reilly draws a diagram of his plant, labeling the parts (Figure 3). Again, he has to think and understand in order to write.

And in social studies, Johnny reflects on the question: How do people become part of our country? (See Figure 4.) Johnny not only begins to explore

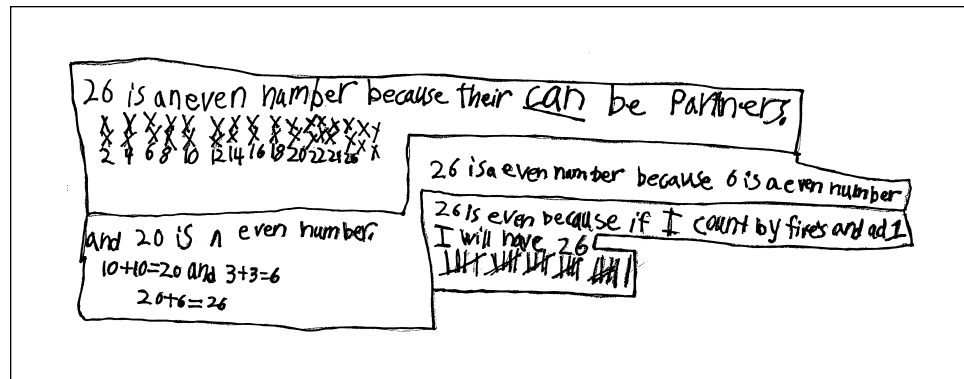


Figure 1 Ryan's Math Explanation

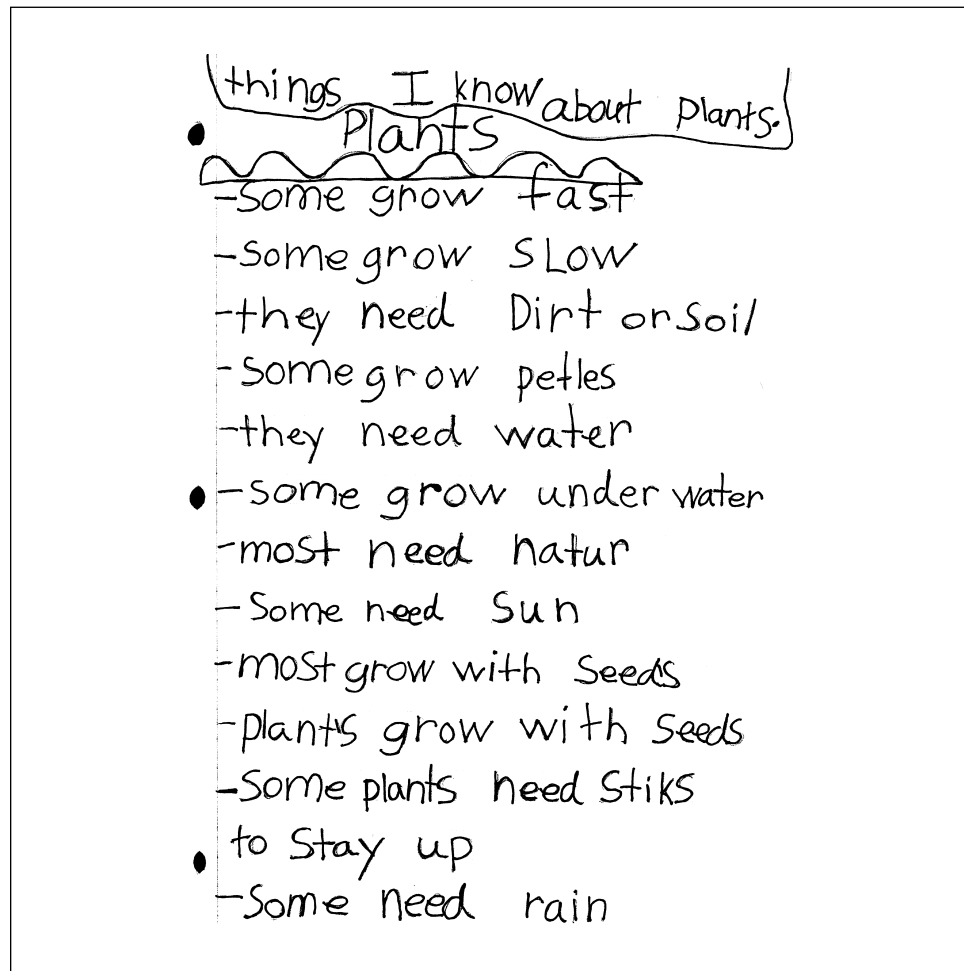


Figure 2 Demetry's List

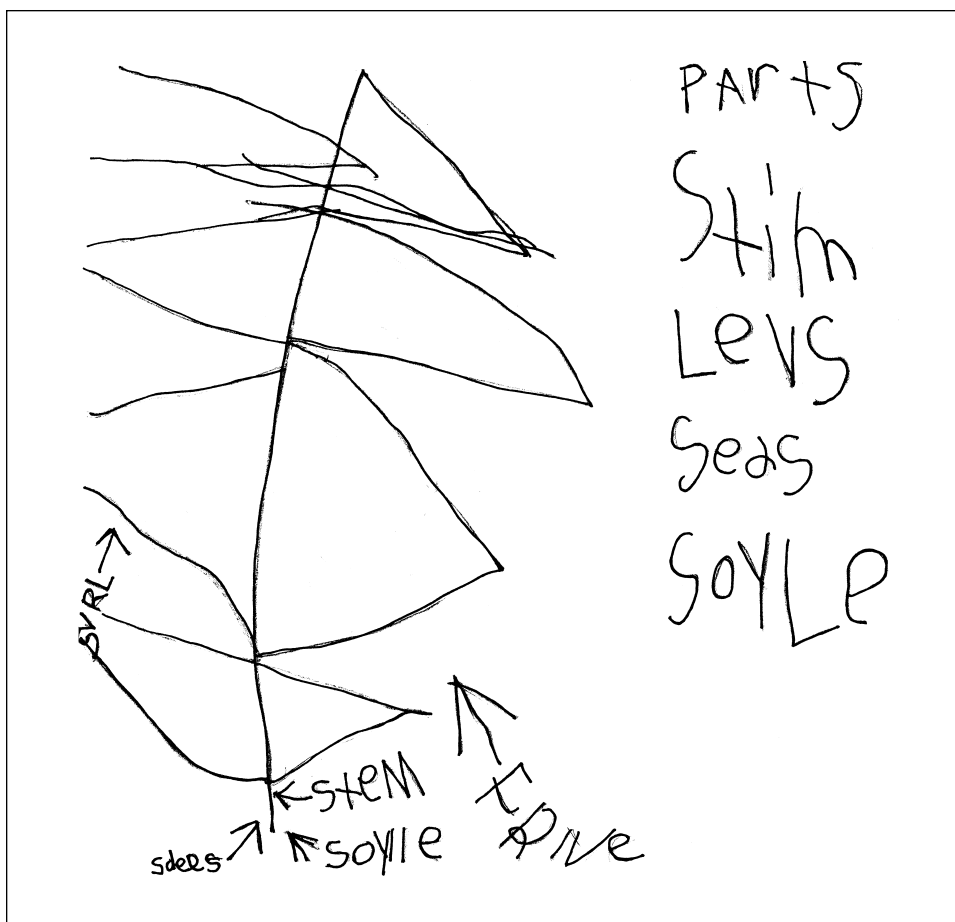


Figure 3 *Reilly's Diagram*

an important content-specific word (*immigrant*), but when he shares his final question with classmates, he begins a thought-provoking discussion that leads to deeper thinking.

Ryan explains, “My mom and dad are immigrants. They came from Korea.”

Jena adds, “My grandma is from Laos, and my grandpa is from Cambodia. There was a war and they had to leave their homes.”

I ask, “Do you think it is hard to be an immigrant?”

Jane says, “I think so, because people don’t always treat you like you belong here.”

“But we are all related to immigrants. Someone in our family came from somewhere, maybe a long time ago,” says Johnny.

I share, “My great-great grandma came from Ireland during the potato famine. There was not enough to eat, so she came to America all by herself when she was seventeen. That must have been scary. I am an immigrant through her and through all of my relatives who came from somewhere else.”

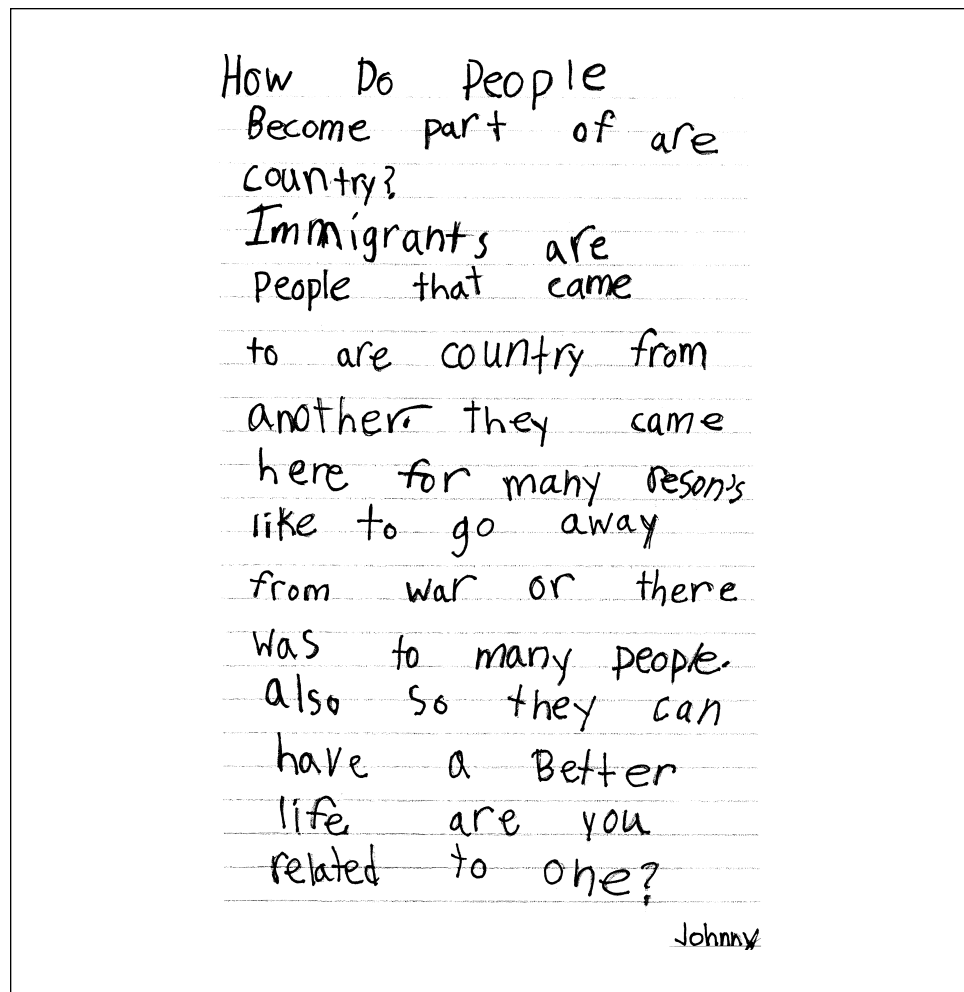


Figure 4 Johnny's Writing

Tatum adds, "So we should all be treated the same. It doesn't matter whether you just came to America, or your relatives came, we all come from somewhere else."

Taylor adds, "Except the Native Americans. They have been here a long time."

Miya adds, "We all deserve to be here in America if we want to be."

This discussion is a clear example of how writing generates ideas that might otherwise remain dormant. Through his writing, Johnny processes what he has learned and challenges others to think more deeply.

Regie Routman (2005) says, "Writing enhances thinking and helps develop it" (42). William Zinsser (2001) states, "Writing is thinking on paper" (148–49). If we want our students to think deeply, if we want their thinking to develop, we must have them write. So the answer to the question "How do we find the time to teach all subjects well?" is "We make the time." We com-

bine. We integrate. We infuse reading and writing into the content areas. We use writing as a vehicle for learning, and we teach writing through the content areas.

So how does this work? Writing workshop remains an important part of my week. Several days each week—daily when possible—I devote time to teaching writing in a workshop environment. Again, this means that I teach a short minilesson, give students opportunities to write about self-chosen topics, provide students with time to draft and meet in one-to-one writing conferences, and include some sort of reflection and/or sharing time. However, I also teach writing during math, science, and social studies—not just integrate, but really teach. While I help students use writing as a strategy for deeper learning, I also teach the qualities that make good writing: elaborating on ideas, using strong and specific language, organizing text clearly, and using correct conventions.

For instance, when I teach students to record facts they have learned after reading a nonfiction article for social studies, I demonstrate and expect them to elaborate with details. I ask students to use interesting words, perhaps content-specific vocabulary. Similarly, as students record observations during science lessons, I teach about including examples to support observations, and definitions to elaborate upon ideas. I teach about purpose and audience and what type of writing each of these formats are. For instance, are we writing something that will help us keep track of changes in plant growth? Are we creating poems for another class about great people in history? Finally, in math, I expect students to explain their thinking clearly, using correct math language.

Why wouldn't we teach writing in the content areas? Students write to convey knowledge, record observations, explain, and respond. They write to explore ideas in their own words. It's natural to teach writing through the other subject areas, as long as we have students writing for authentic purposes and audiences.

What does writing instruction look like during science?

Science offers wonderful opportunities for teaching about good writing and for writing to learn. Elaborating on ideas, organizing thoughts, including specific word choices (including content-area vocabulary), using language to make comparisons, and using correct conventions of print can all be taught through science writing.

Writing in science is clear and concise. Predictions should be well stated, and observations should be objective and accurate. That is our goal. However,

writing with clarity and accuracy can be a challenge for young children, and we need to make allowances for approximations.

Our first step in teaching writing through science is to help students understand what it means to write scientifically. In science, we help students:

1. Identify materials and procedures.
2. Make predictions or form hypotheses.
3. Observe.
4. Draw conclusions.

At the same time, we teach students to record these statements with detail, clarity, and correct conventions (capitals and periods to start and end sentences, age-appropriate spelling, and correct spelling of scientific words provided).

Before we begin a unit on plants, I ask students to record all the things they already know about plants. I encourage them to elaborate, adding as many details as possible. Here are some of their notes:

My Schema About Plants

- They need sunshine to grow.
- They need water to grow.
- Some of them grow in dirt and some grow in water.
- Some grow in the desert and some grow here! (Ryan)

What I Already Know About Plants

Plants need special food for them to grow. (Amber)

What I Know About Plants

They sometimes grow fruit and vegetables. Also, if you want to make them grow you have to give them a drink of water and let Mother Earth do some work. There are different kinds of plants. We love plants! (Grant)

Then we come together and make a shared list of student ideas. This becomes our base list for “What We Know About Plants” before our unit begins. Again, students benefit because they bring familiar ideas and concepts to the discussion when they write down what they already know.

Writing About Materials and Procedures

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As we begin our first lesson about plants, I discuss the materials we will use and the procedure we will follow. Students then plant brassica seeds in small cups, adding soil, seeds, more soil, and a small bit of water.

We gather together to discuss how students will record materials and procedures in their journals. We talk about our purpose: to keep a written record of all of our work. I explain that scientists record everything they do so there will be a record of their work and findings. I model in my own journal, recording the materials used: one cup, soil, brassica seeds, water. We discuss the procedure again and I record students' ideas on a chart (Figure 5).

I think aloud how important it is to write down our procedure in the correct order. Jason suggests we use numbers to show the order: "Why don't we write 1, 2, 3, 4?"

I respond, "That's a great idea. Sometimes scientists use numbers to show order. Does anyone have another idea to help us show the order?"

Jordyn says, "We can write *First . . .*, *Next . . .*, and *After that . . .*."

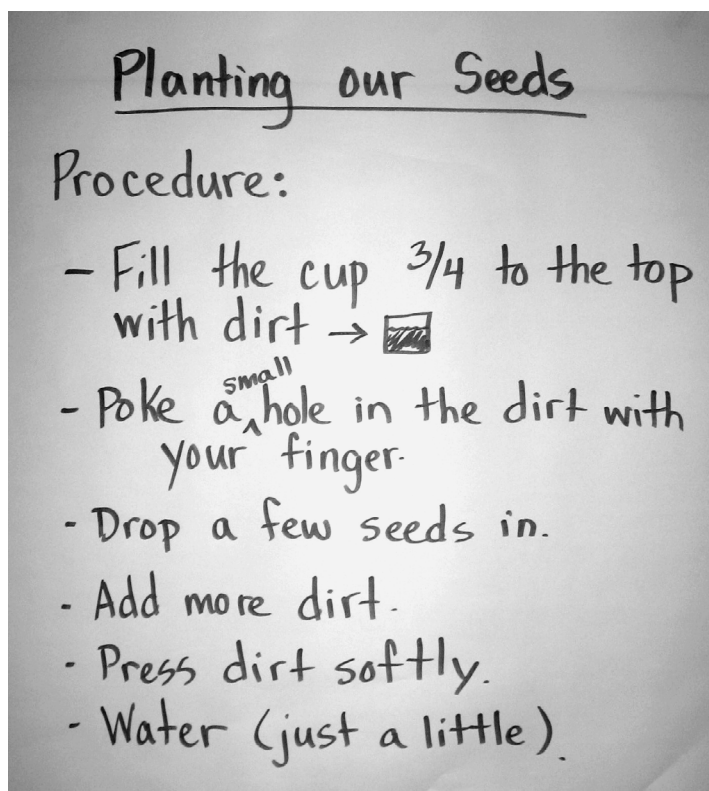


Figure 5 Student-Generated List of Procedures for Planting Seeds

“Yes. Sometimes for scientific writing, words like *first*, *then*, and *after that* help us remember the order we used for a procedure. When you record in your journal today, you may choose to use numbers or words to show order.

“Your task today is to record the materials used and the procedure you followed. Again, that means the steps you took to plant your seeds: what you did first, second, and so on.”

By writing about the procedure, students recall their process and remember the steps to apply in future planting. Kylie’s journal entry appears in Figure 6.

Teaching Students to Write Down Their Predictions

Students can make oral predictions with a sense of possibility. This is a great place to start. However, when students write down their predictions, there is a sense of commitment. They must think about what they know and integrate that knowledge with new learning. Then they must commit to their thinking as they write it down on paper.

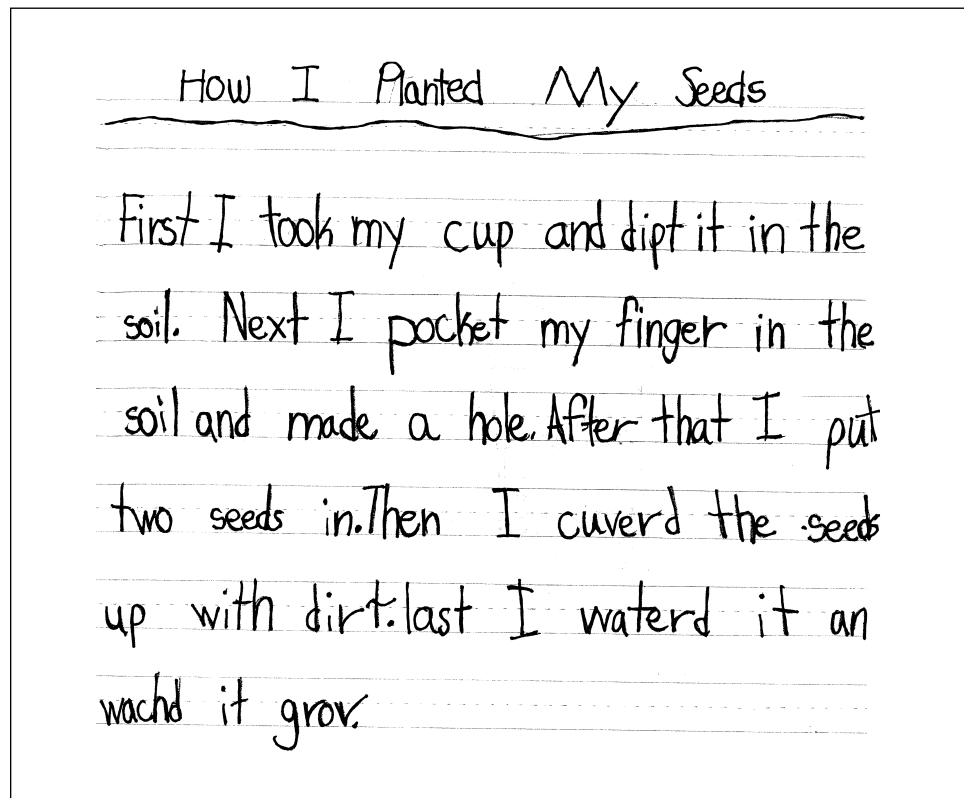


Figure 6 Kylie’s Science Journal Entry

Students can also learn to elaborate by writing predictions. When conducting experiments, students write “I think _____ will happen because . . .” The *because* makes students give reasons why, which is one way to elaborate. Writing predictions also teaches students to write in specifics. I tell students, “Don’t just say, *Plant A will grow better than plant B*. Be specific. Say, *I think plant A will grow taller and at a quicker pace because it is receiving plant food*.” In addition, writing predictions can be our first opportunity to teach students to use specific vocabulary. For instance, “Plant A will *sprout* leaves before plant B.”

Recording Observations

A few days later we are ready to record our observations. I teach students to elaborate by:

1. giving examples,
2. including statistics (numbers),
3. using specific language to describe, and
4. giving definitions.

I model what this looks like. For example, to show how to elaborate by using statistics I tell students, “Wow, my plant has really grown.” I write this sentence in my journal. Then I say, “I’m trying to think of a way I can tell more.”

Nolan suggests, “You can tell how tall it is.”

“Great idea,” I agree. I measure my plant with a ruler and find it is five inches tall. I add a sentence to my journal. It now reads:

My plant has really grown. It is five inches tall now.

I tell students, “I began with *My plant has really grown*. Then I added a statistic: *It is five inches tall*.”

I do the same modeling for the other ways to elaborate: giving examples, including definitions, and using language or specific words to tell more. I want to show students how a writer can tell more using these specific strategies for elaborating. We make a list of what we might include in an observation record.

- Record what you see.
- Tell if it looks like anything.

- Include descriptive words, such as colors.
- Use statistics (numbers to show how tall, how many), definitions, and language to tell more.

I encourage students to try it out as they record their observations in their journals (Figure 7). Here are some more student journal entries.

Giving Examples

My plant is many colors. It has yellow flowers, green leaves, and a lighter green stem. (Jordyn)

Including Statistics

My plant looks really green and it looks like it is a inch long. (Alex)

My plant has sprouted two inches. It has two leaves. It is green. (Amber)

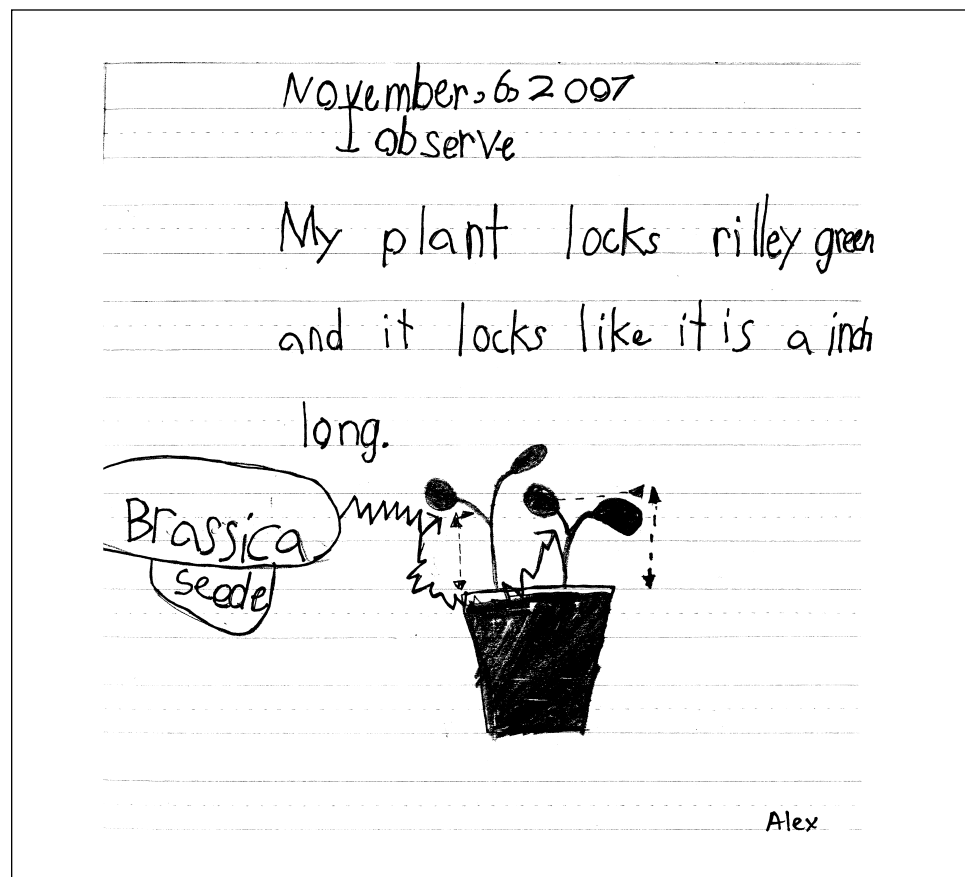


Figure 7 Alex's Journal Entry

Including Definitions

My plant has two green sprouts poking out of the dirt. A sprout is the beginning of the plant. (Laurelle)

Including Content-Area Vocabulary

My plant is swirly. It is leaning over. The height of it is about 3 1/2 inches.

It has green leaves on it. (Claire)

My plant has 8 leaves and it is bright green and it is 7 inches long.

(Nolan)

My brassica plant is just starting to grow. It just has two little seedlings.

My first plant, Greeny, is one centimeter long. It is this big. My other plant, "Greeny Two" is half a centimeter. (Eleanor)

It has 3 clovers. It is half a finger. (Chloe)

When students record observations, writing down what they see, their level of understanding about plant growth increases (Figure 8). They mimic real scientists by making a record of the changes happening in front of them. Students are not just participating in a fun science activity; they are serious as they record and then discuss their findings.

Making Conclusions or Recording "What I Learned"

Summarizing is a skill students need to learn for all subject areas. In science, we can teach students to write short summaries of their findings. They can begin to consider, and then write down, the most important things learned in a unit of study. This writing cements their learning. As they write summaries, students practice elaborating on ideas, organizing thoughts in a clear manner, using scientific vocabulary, and using correct conventions. And on top of that, they learn and remember more information.

Shared writing is a great way to teach students to write summaries for science units. I often gather students at the end of a unit, and we talk about what we learned. Students share facts, observations, and conclusions. They use content-specific vocabulary. I record these ideas in random order. Then we work together to write our findings in a clear and organized way. We write a lead sentence, add details in an order that makes sense, and then work to write an ending sentence that wraps it all together. Students use this shared writing as a model. It becomes an anchor chart in the room for writing scientific summaries all year.



Figure 8 *Amber Records Her Observations*

How can social studies provide excellent opportunities for writing instruction?

I weave reading and writing into my social studies lessons. Skills such as skimming, scanning, and summarizing—as well as understanding nonfiction text features such as headings, bold print, questions, and bullets—can be taught effectively using social studies texts.

Communities, the environment, historical figures, and change in our world are worthy topics, filled with opportunities to teach and practice writing. And writing enhances the learning of these topics. So where do we begin?

A Lesson on Landforms

In a unit on landforms and water, students read about deserts, mountains, valleys, plains, islands, and peninsulas—as well as oceans, rivers, and lakes. In individual journals, students summarize each, defining, elaborating, and using content-specific vocabulary.

We read about mountains. Our text defines a mountain as the tallest landform. We discuss how students might elaborate upon that in their journals, and I record ideas on a class chart.

Bobby suggests, “We can tell the mountains we know, like Mt. Rainier.”

Tatum adds, “And Mt. St. Helens. It’s a volcano.”

“You’re right,” I say, “We learned that volcanoes are mountains, but mountains are not always volcanoes. Does anyone know the name of the tallest mountain in the world?”

Students are unsure. We gather around our world map. I point to Asia and show students where Mt. Everest stands.

Jarrett says, “Oh, I’ve heard of that mountain. People climb it and some people died.”

“Yes, some people do climb Mt. Everest, and other mountains too. It is very hard to climb any mountain, especially the tallest one in the world.” I continue with more questions, “What else do people do in the mountains? Think of things you do when you go to Mt. Rainer or Mt. St. Helens.”

“We hike and we camp,” says Taylor.

Joelle adds, “And we go skiing at Stevens Pass. That’s in the mountains.”

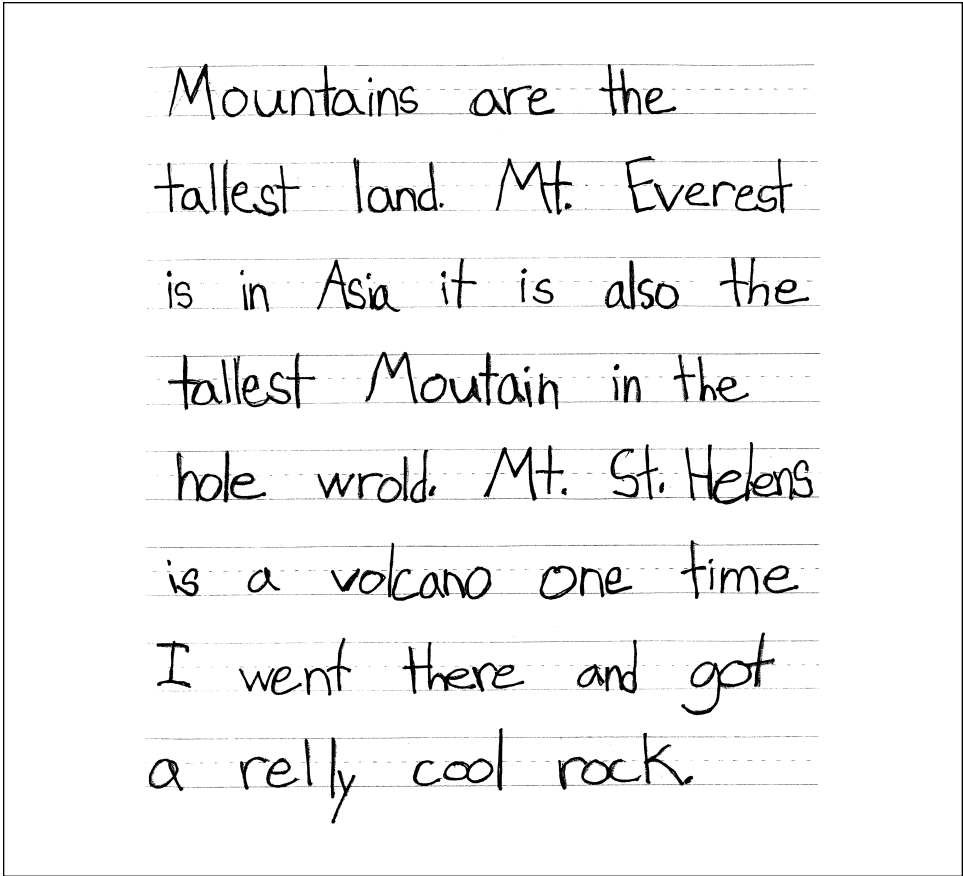
“Yes, Stevens Pass is part of the Cascade Mountain Range.” I point out some of the mountain ranges on the map: Rockies, Appalachian, and Olympics.

I sum up, “Well, now we have more information about mountains. When you write in your journals, you want to define what a mountain is, perhaps in a sentence like *Mountains are the tallest landform*, and then elaborate by telling some of the mountains you know and what people do in the mountains. You might even mention the tallest mountain in the world. Look to our chart for ideas.”

I also remind students about conventions. “Please start your sentences with capital letters and end them with periods. If you ask a question, use a question mark at the end. And remember to use your spell-check card. Content-specific vocabulary is on our chart. Look there to spell specific words about mountains.” Figure 9 shows Jesse’s journal entry about mountains.

Extending Our Study with Poetry Writing: Shared Writing

After we learn and write about mountains, I gather students together for a shared poetry writing experience. When I ask if students would like to write our poem for anyone in particular, they agree they would like to write for another second-grade class, which is also studying about landforms. We look at pictures of mountains for inspiration. I ask students to think about words



Mountains are the
tallest land. Mt. Everest
is in Asia it is also the
tallest Mountain in the
hole wrold. Mt. St. Helens
is a volcano one time
I went there and got
a rellly cool rock.

Figure 9 Jesse Writes About Mountains

and phrases that come to mind when they think about mountains. I share first.

“I think of the word *majestic* (like a king or a queen) when I think of mountains.” I record my word on our chart. “What words or phrases do you think of?”

Students share their ideas:

- majestic
- jagged arms
- tallest land
- rule the kingdom
- looking over earth
- reach to heaven

- glorious
- snowy tops
- beautiful

As students share, I encourage them with positive comments about their choice of words. I tell students, “We can put these words and phrases into a poem. We don’t have to include them all, but let’s think of what should go first.”

We decide to begin and end the poem with the word *mountain*. Students share their thinking as we move words and phrases around the page to make our poem (Figure 10). Two students deliver the poem to Mrs. Roepke’s second-grade class, reading it to them as well.

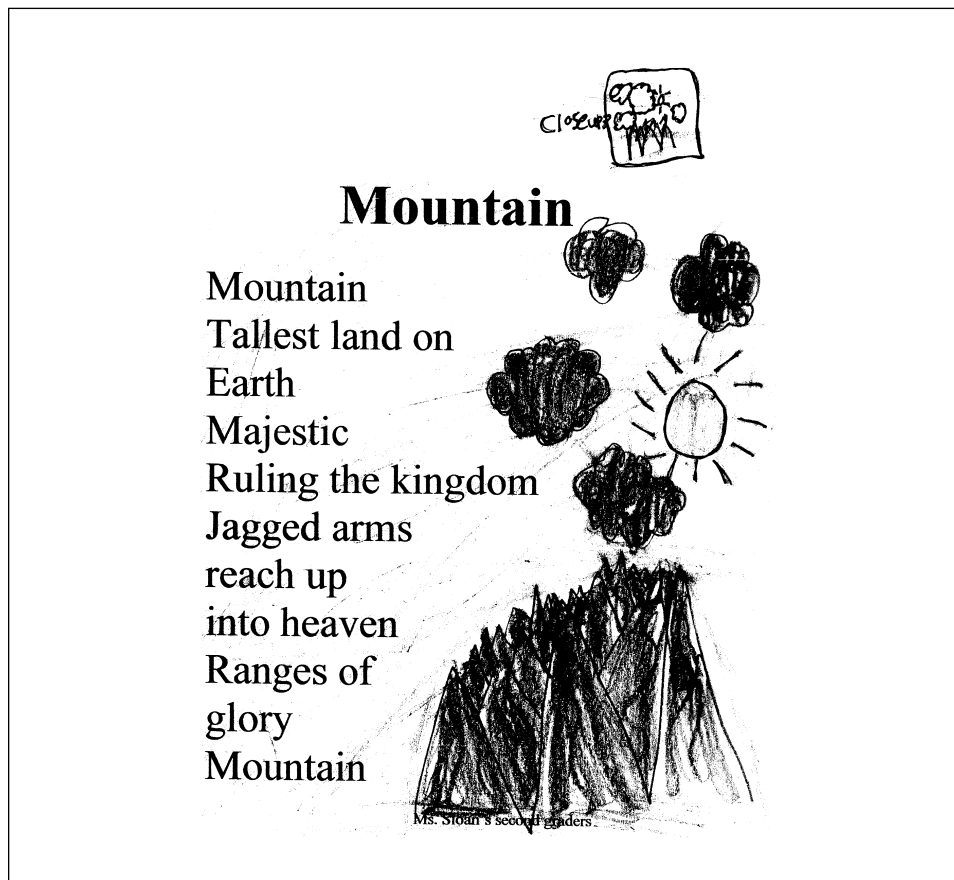


Figure 10 *Shared Writing: Mountain Poem*

On subsequent days we read about deserts, first in our social studies text and then in other trade books such as *Deserts* by Gail Gibbons, *Cactus Hotel* by Brenda Z. Guiberson, and Byrd Baylor's book of poems, *Desert Voices*. Our discussions are rich with descriptions of the land, weather, and animals that live in deserts. I ask students to write in their journals, focusing on elaboration, word choice, and conventions as they write.

As a first grader, Robbie struggles a bit with writing. He writes, *Deserts are hot. Roadrunners live in deserts* (Figure 11). In his entry, Robbie does attempt to elaborate. He tells something about deserts (*Deserts are hot*) and then gives a detail by naming an animal that lives there (*Roadrunners live in deserts*). He uses the content-specific words *hot* and *roadrunner*.

Joelle writes:

Deserts are hot dry places. The largest desert is in Africa. It is the Sahara Desert. Camels live there because they can handle the dryness. We have

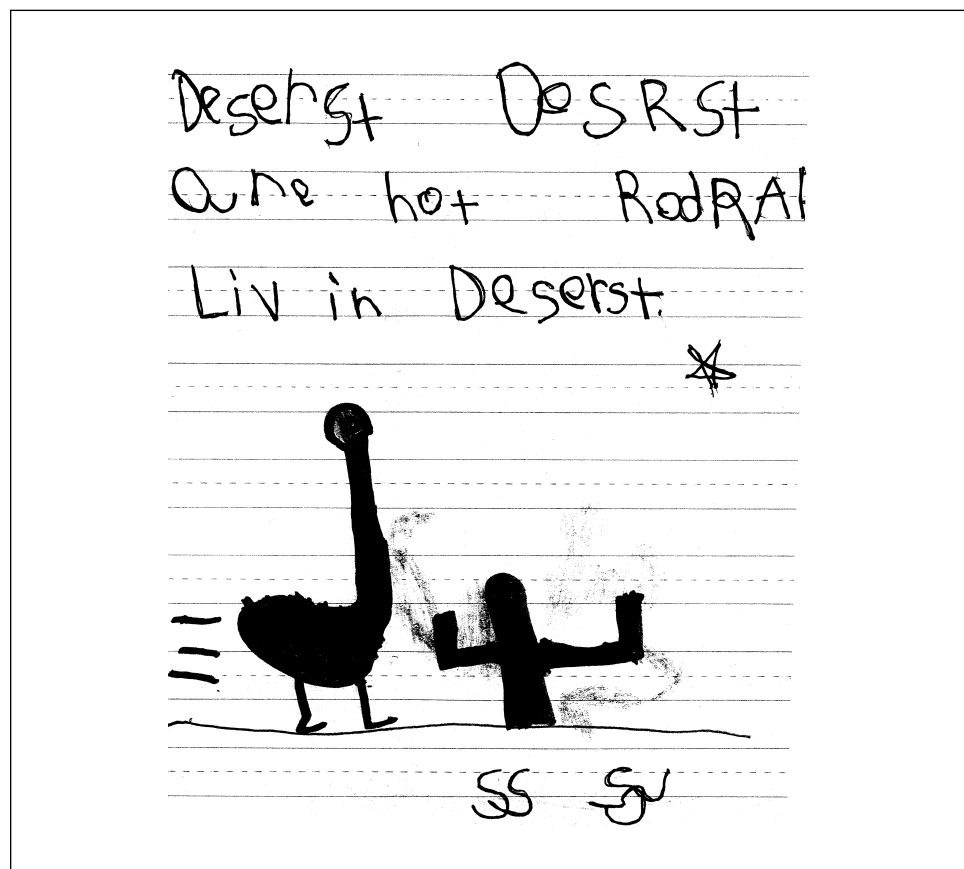


Figure 11 Robbie Writes About Roadrunners

desert land in America too. Arizona and New Mexico are desert lands. Cactus live there because they don't need lots of water. Snakes and scorpions live in the desert, and roadrunners too. The desert is harsh. It is hard to survive in the desert.

Joelle is a second grader. She gives a definition for deserts. She elaborates by giving the location and name of the largest desert in the world. She mentions desert-like land in America. Joelle also mentions animals and plants that live in the desert, and she includes content-specific vocabulary, such as *cactus*, *Sahara*, *scorpions*, and *roadrunners*. Finally, Joelle ends her journal entry with a closing statement about deserts, using interesting words (*harsh* and *survive*).

It is clear that Joelle's writing extends her learning. To create a journal entry, she must process new knowledge. By writing it down, she increases her ability to retrieve and apply this newly learned information in the future.

An extension on deserts: Writing poetry

Students are so interested in deserts, enjoying the language they have learned and read, I decide to have everyone write an individual poem about this landform. The day we begin our work, we receive a gift from Mrs. Roepke's students—a class-written poem about deserts. This becomes our model and inspiration.

We have already immersed ourselves in the language about deserts by reading nonfiction and poetry books aloud as a class, in small groups, and individually. We revisit photographs of different kinds of deserts, and students talk about what they see.

We continue our pre-write by brainstorming words and phrases about deserts. Students share their ideas as I record them on a big chart (Figure 12). Then we review the things we know about poems.

1. They don't have to rhyme.
2. Lines don't always go to the end of the page.
3. Repeat words you want your readers to remember or hear again.
4. Use words, phrases, or sentences.
5. Use words at the end that will satisfy your readers and let them know your poem is finished.

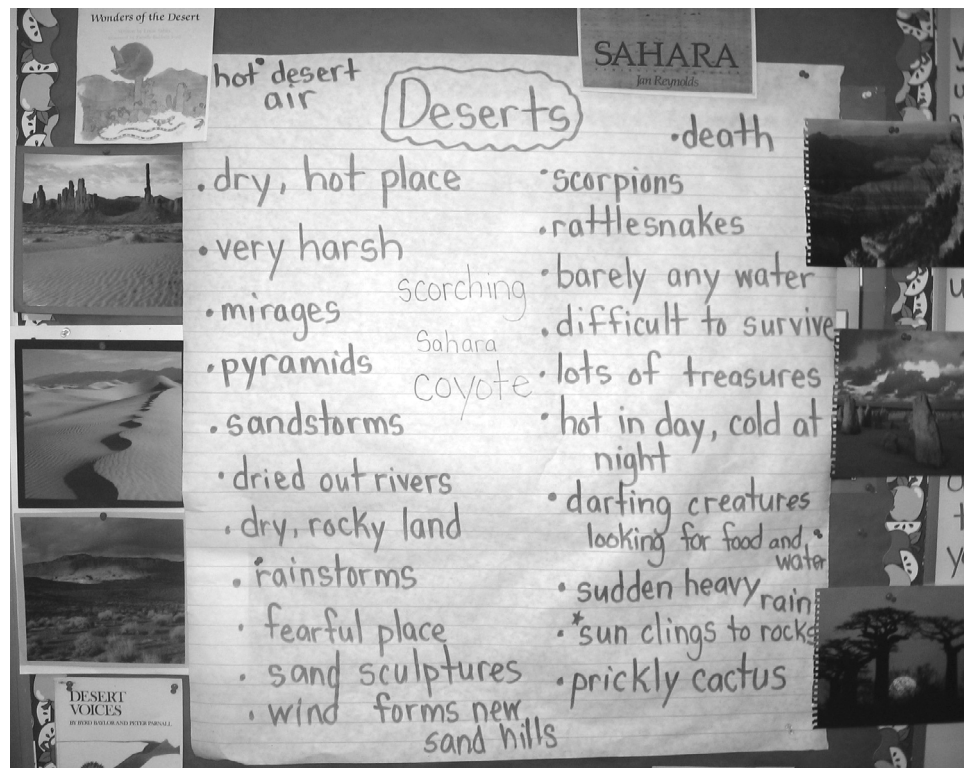


Figure 12 Student-Generated List of Words and Phrases About the Desert

I encourage students to use the chart for ideas as they write their poems. Here is Emelia's:

Desert

*Ocean of sand,
wind making it wave,
lizards curling
up on rocks,
snakes throwing
their head
left, right, left, right,
large trees
shade for animals
cacti palace,
so many visitors
some never leave
a desert*

This is Kyle's:

Desert

*Desert
the land
of
death,
snakes,
cactus,
killer sun,
freezing moon,
horrible downpours,
the land
of
death.*

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Corwin's is next:

Desert

*A pool of sand,
camels rule the
world of sand,
legendary creatures
crawling around,
buzzards eating
the dead,
low chance of
survival.*

Studying About Historical Figures

As we study specific time periods and historical figures, it is natural to have students write about them. When we read about important people in history such as George Washington, Ruby Bridges, and Chief Joseph, I teach students to discern which facts are most important about these people, and which details provide interesting information. Both elements serve students well as they begin to write, but knowing the difference will help them organize their information. After students read about a historical figure, I encourage them to write personal responses (what they think, feel, notice, and wonder) about this

person. I ask students to elaborate, use specific word choices, and apply age-appropriate conventions. Figure 13 shows Adena's response to learning about Ruby Bridges. Figure 14 contains Miya's response to studying Harriet Tubman.

Even though Miya is random in her thinking, she does elaborate, and her voice shines through. Miya shows a sense of organization at the end by leaving us with a couple of sentences to sum up her thinking.

I also encourage students to write short summaries or reports on the lives of people they have studied. Hannah writes with a sense of organization in her short report about Harriet Tubman:

Harriet Tubman

Harriet Tubman was born in 1820 or 1821. She was a slave as a child. Harriet was not happy with it. When two people ran by she got hit with a weight. She got cut in the forehead.

Harriet escaped! Then she saved many people. She saved three hundred other slaves when she worked on the Underground Railroad. Harriet is famous for her hard work and for freeing slaves.

Now today, children learn about her hard work from all over the world.

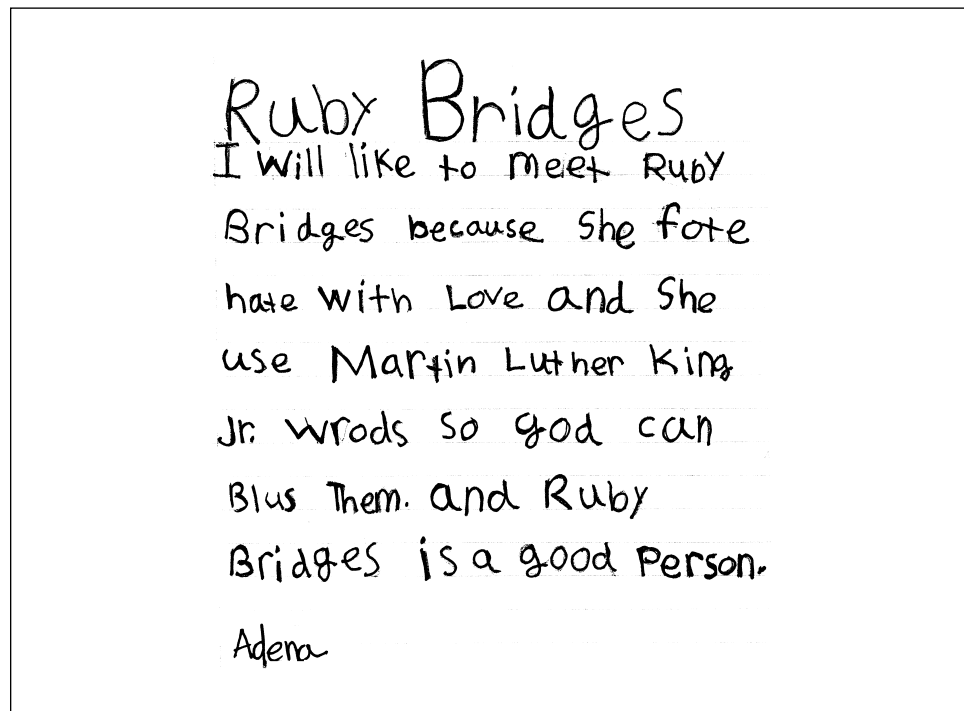


Figure 13 *Adena's Response*

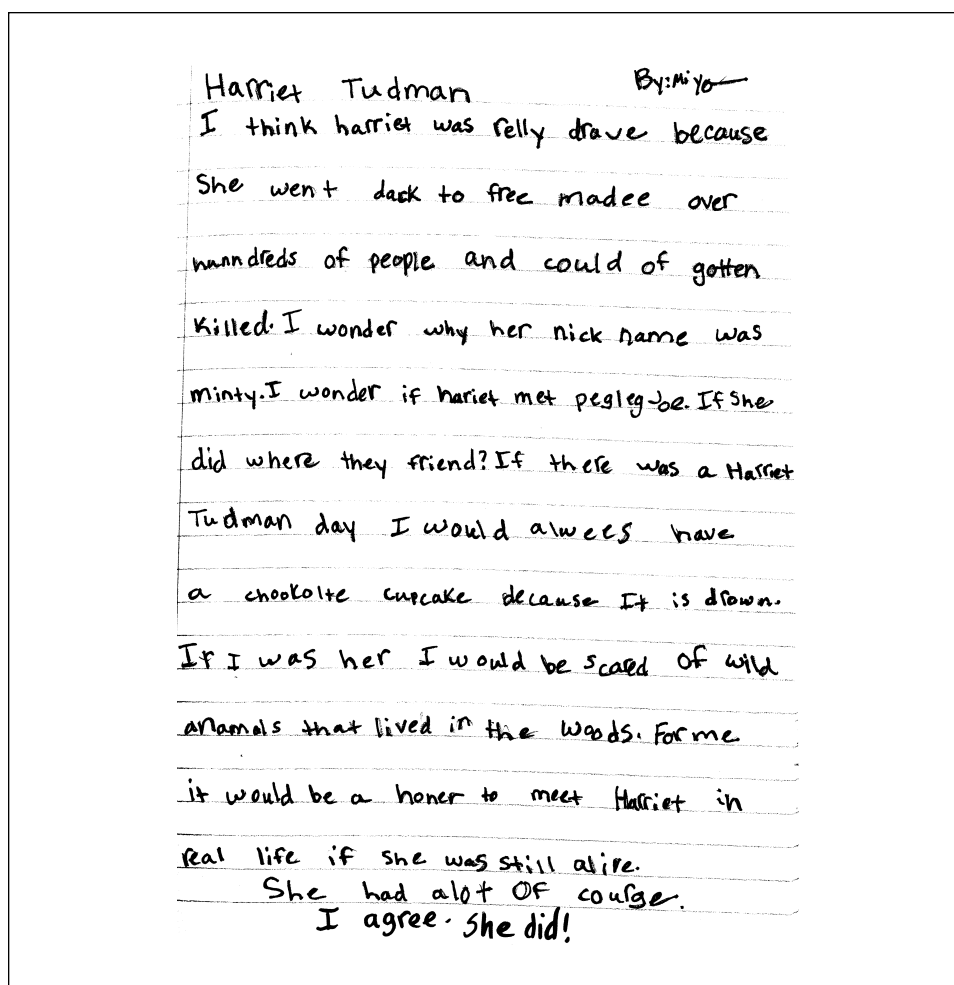


Figure 14 *Miya's Response*

She has appropriate beginning and ending sentences. Hannah elaborates with a few details and uses content-specific vocabulary, while also conveying the most important information about Harriet Tubman's life.

Other Opportunities for Writing in Social Studies

There are many possibilities for writing in social studies. Reports are not the only choice. As we have seen, poetry is another wonderful genre for social studies writing. Students can also write speeches arguing different opinions about the environment. (Yes, even young students are passionate after specific learning.) They can write about how communities change over time. They can write plays about historical events. Students can research and write about important places (countries, states, cities, national parks), applying text features such as tables of contents, bullets, labels, captions, comparisons, diagrams, and

tables, just to name a few (Figure 15). Students will discover their own ideas for writing about social studies topics—if we open the door and model the possibilities first.

Writing in Math

Writing in math looks different than writing in the other content areas. Students usually write in math to explain their thinking. At the beginning of this chapter, I introduced you to Ryan, who explained how he knew 26 was an even number by using a couple of sentences and a picture. Students also write to explain how they solve problems. Take this story problem:

Jenny has 36 marbles in her bag. She lost 12 marbles but then she found 14 more. How many marbles does she have now?

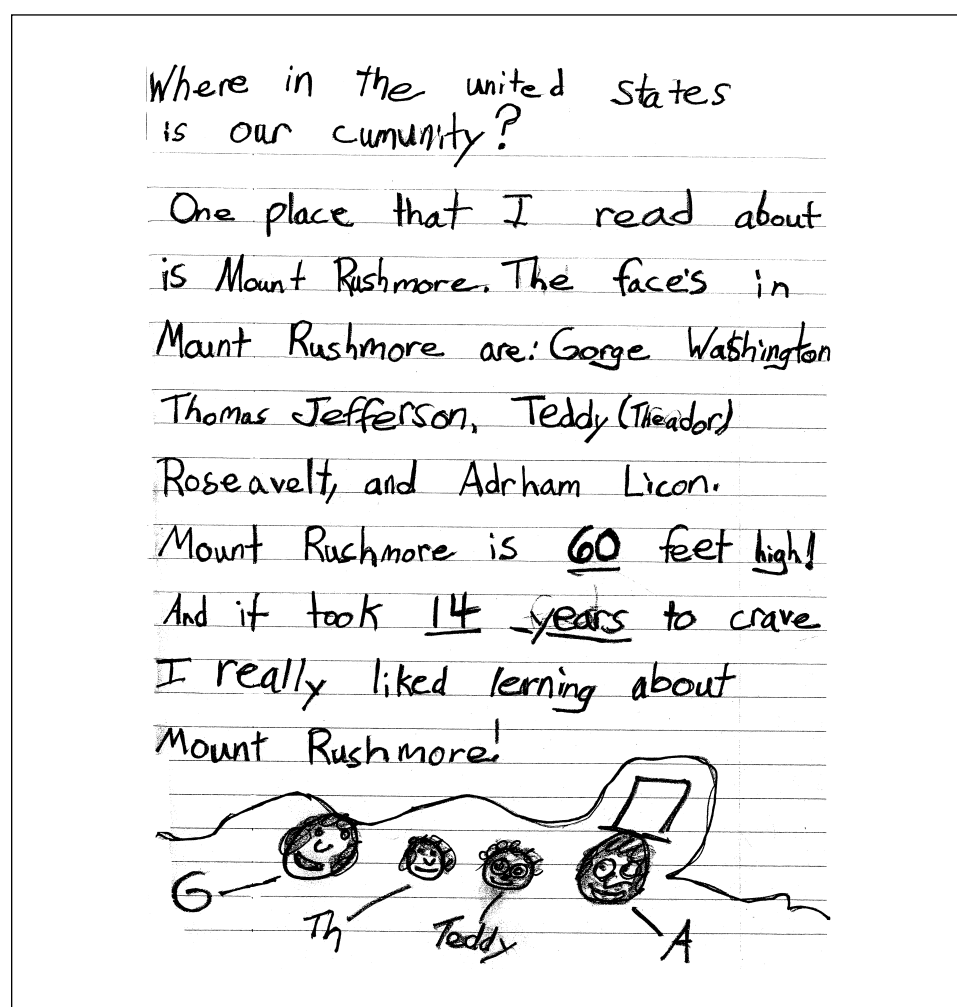


Figure 15 Miya Writes About Mt. Rushmore

Mary explains her thinking through writing:

Well, I decided to do my adding first and my subtracting second. I knew Jenny had 36 marbles and at the end she found 14 more. I took the 30 from 36 and the 10 from 14 and added them. $30 + 10 = 40$. Then I added $6 + 4$ and that equaled 10. $40 + 10 = 50$. So Jenny has 50 marbles but in the middle, she lost 12. $50 - 10 = 40$. Then I have to subtract 2 more. $40 - 2 = 38$. Jenny ended up with 38 marbles.

Mary is very organized. She writes clearly and uses content-specific vocabulary (*added, subtracted*), which shows a greater understanding of math terms.

I also have students write their own story problems. Here students can have fun, be creative, and use interesting word choices. Ben writes:

Five spotted owls are sitting in a tree. They are watching for their prey. One swoops down and catches a terrified mouse. How many spotted owls are left in the tree?

In this kind of writing, students need to be clear and organized. They practice using correct conventions (capital letters, periods, question marks, as well as spelling). Ben gets creative when he uses the words *prey*, *swoop*, and *terrified*. He chooses words that are strong and make his story more interesting.

Writing in math helps students better understand the processes they follow to solve problems. Again, when we write down our thinking, it cements our learning. Writing in math also builds vocabulary. When students use math terms in writing, they develop a deeper understanding of their meaning. And math writing can be fun. Students enjoy being creative by writing story problems for others to share. They practice what they know good writers do (elaborate, write clearly, use strong word choices, and use correct conventions), and they learn more about math too.

Final Thoughts

Content-area writing is important. As students get older, they will write more and more for science, social studies, and math, and they will be expected to write with specific skills in mind. As primary teachers, we are expected to teach writing. Because we also teach science, social studies, and math, we have great opportunities to prepare students for writing in the content areas. When we teach students to write about solving math problems, we model the use of correct math vocabulary (*I subtracted 7* rather than *I took away 7*). When we ask

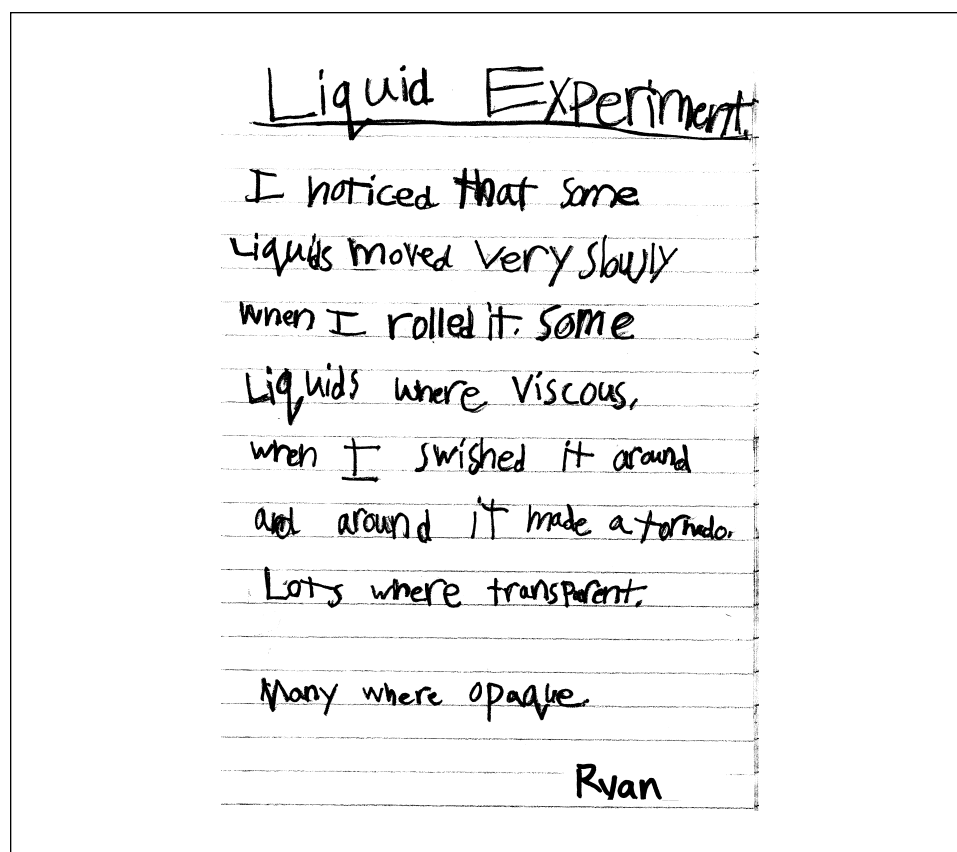


Figure 16 Ryan Writes About Liquids in Science

students to describe liquids in a science unit, we teach them to use scientific language such as *opaque*, *translucent*, and *viscous*. (See Figure 16.)

The content areas provide fertile ground for teaching writing, which deepens and enhances learning. When students use their own words to say what they know, they internalize the concepts they have learned. Throughout the content areas, we can teach students to organize their writing and elaborate upon ideas by using definitions and examples. Even young students can achieve this in their writing. We need to expect much from our primary students as they write for science, social studies, math, and all the other content areas.