Essential Keys to Equitable Achievement for Underserved Students

by Ana Crossman

When I first started teaching in New York City, in a school that served primarily low-income Latina girls, I had a vague sense that I could somehow make a difference in these girls' lives. After seven challenging years there, I came to learn that it was not my political beliefs, my Latina background, or even my commitment to education that would help my students grow and learn. They needed something else.

After earning my master's degree in education, I moved home to Seattle, where I got a position teaching fourth and fifth graders in a multiaged class in a public school that had a high poverty rate and predominantly bilingual population. The majority of my students performed a year or two below grade level in their basic skills, and a few were three or more years behind. About 75 percent of my students spoke a language other than English at home.

My students loved the hands-on, inquiry-based investigations in science, and it soon became a favorite subject for most of them, as well as for me. I noticed that my English language learners and students with special needs were often drawn to science even more than other students. I believe this was because they were freed from the traditional paradigm of learning in which they had to read books and confront blank pieces of paper. In science, they could learn by actively exploring new materials, asking their own questions, and working and talking with their classmates.

Discussion, Modeling, and Scaffolding

I came to learn the value of having a rich, reflective discussion after each investigation. This gave students the additional time to reflect on the investigation with teacher support, and it provided me with another opportunity to gain insight into students' understanding of critical concepts. This experience was especially important for my English language learners and students with special needs as the modeling and discussion provided them with an opportunity to practice the language and learn key concepts in a safe, supportive environment. But even after lengthy reflective discussions, I often felt that I still did not have a clear enough picture of how well each of my students understood the targeted science concepts and skills. My interest in having students write about their science learning came partly from this frustration; I needed a concrete way to assess both my own science teaching and my students' science understanding, and regular written entries in their science notebooks addressed both of these needs.

I also felt strongly that all my upper-elementary students needed more instruction in expository writing than was offered by my school's writing curriculum, which centered on narratives for all grade levels. I felt this was insufficient for my fourth and fifth graders because I believe that strong expository writing skills are critical for success, not only in higher education but in the workforce as well. My English language learners had an especially strong need for more supported writing instruction. They needed help in learning basic vocabulary and the structure of written English, and they needed reinforcement of content-area concepts.

Learning the components of this science-writing approach well enough to implement them effectively with my students took time. For example, at first it seemed sufficient to create and post a word bank containing both content and process words at the front of the classroom. However, as we progressed through each unit, I realized that my students needed physical as well as visual access to the words. They internalized a science term more easily if I held up its word card as we discussed it. I also noticed that students were better able to use a term in their writing if they had its word card at their desk while writing. Making the word bank an accessible, interactive part of our science instruction allowed my students to use it as a key resource in their science writing.

When I first began using this science-writing approach, I thought that English language learners and students with special needs required very detailed writing frames in order to be successful. I created my own writing frames that were essentially fill-in-the-blank tasks. But after using these throughout several science units, I realized that they actually limited students' writing more than they supported it. As I persevered through many lessons, I came to see how my students could be successful using just a few sentence starters or key phrases from the science-writing program.

I found that students could be more successful in their independent writing when I provided meaningful supports, such as the rich reflective discussion after a science investigation, the modeling of the writing through a shared writing experience, and a simple writing frame and/or checklist to remind them what they needed to include in their entry. Then my students could write thoughtful entries that truly reflected their own science thinking and writing skills. While finding the right amount of scaffolding has always been a challenge for me, especially for my students who are learning English as they are learning science, I know now that students of all writing abilities learn a great deal more from following a simple writing frame and generating their own thoughts and sentences than from using an overly detailed writing frame.

Jessica: One Student's Success

One English language learner typified the increasing growth I was seeing in my students' science understanding and expository writing skills. Jessica came to my classroom a couple of months after the school year had started. She had previously been enrolled in our district's Bilingual Orientation Center for about a year after moving from Mexico. She read at a pre-primer level in both English and Spanish and was largely dysgraphic, having trouble forming letters on paper. Her written words and sentences often seemed to have no beginnings or endings. While her oral Spanish was appropriate for her age, her oral English was very limited. She had attended school only sporadically while in Mexico.

In addition to her limited basic skills, Jessica had very little family support at home, and had yet to develop appropriate school behaviors. Initially I lined up as much individual support for Jessica as I could, primarily through community tutors. However, she would refuse to cooperate with her tutors, and was often defiant and rude to them. While she generally behaved well in class, if she felt too much pressure or frustration, she acted out. Like most preadolescents, regardless of background, Jessica wanted to be part of the group and treated just like everyone else. I also realized that she responded best when she was expected to do the same work as all the other students in our classroom.

Through all of this, I discovered that Jessica responded positively to small-group or individual attention within the context of the whole class, as well as to scaffolding and support provided at her level—and she loved science. During science investigations, Jessica was focused on the materials and participated actively. She could work in a group and took her group responsibilities seriously. She worked particularly well with other Spanish-speaking girls, who could answer her questions and translate for her when necessary. She thrived in an atmosphere where she was not constrained or left out because of her limited reading and writing skills.

Because Jessica was able to have positive, meaningful experiences in science investigations, she was able to build her own understanding of the science concepts and skills they covered. By working and talking with other students in both English and Spanish, Jessica was also able to develop her language skills while further deepening her science understanding. I believe that because Jessica was invested in and enjoyed science, she was willing and able to write about her science learning as well. While she consistently used the word bank and scaffolding to complete writing assignments, her dependence on modified assignments and individual support decreased a great deal during her two years in my classroom. At the beginning of fourth grade, Jessica could do little more in her science notebook than make a labeled diagram; by the end of fifth grade, she could write multiple paragraphs of organized, detailed science writing.

Jessica's writing sample (Figures 1 and 2) is from June of her fifth-grade year, after almost two years of consistent science and science-writing instruction. Her sample comes from about halfway through *Circuits and Pathways*, an Insights unit on electricity, after students have had considerable experience building and investigating series and parallel circuits. Toward the end of these particular investigations, students compare and contrast series and parallel circuits.

As a teacher of students who typically carry an unfair share of "weaknesses," focusing on the strengths in their work has been one of my greatest challenges as well as my most valuable lesson. In reading Jessica's sample, for example, the errors in spelling, capitalization, and punctuation jump off the page. However, when I look beyond these mistakes, I can find a great deal that is there in terms of scientific thinking, content understanding, and writing skills.

The box and T-chart organizer is critical for students to use in organizing their understanding of the content. In her box, Jessica gives four distinct, accurate similarities between series and parallel circuits: bulbs in each circuit have the same brightness, the circuits have the same energy source, they have electricity, and each circuit starts at the negative terminal of the D-cell. (Jessica's statement shows her understanding that the electric current in both circuits travels in the same direction.) She expresses the similarities as bulleted notes, as is appropriate, rather than in complete sentences, and uses the phrase "they both" in the margin of her box to remind her of what similarities are.

With the scaffolding provided by her notes from her box and T-chart and a writing frame, Jessica is able to write two complete paragraphs that show her strengths as a scientist and as a writer (Figure 2). Her writing shows she understands key concepts about series and parallel circuits, including their similarities and differences. She uses scientific vocabulary consistently and correctly, as well as transition words, a topic sentence, and concluding sentences. Above all, though, I feel Jessica's writing sample shows sophistication in thinking and in writing that too often is considered impossible for English language learners to achieve. By looking beyond the errors in conventions, I see the remarkable progress

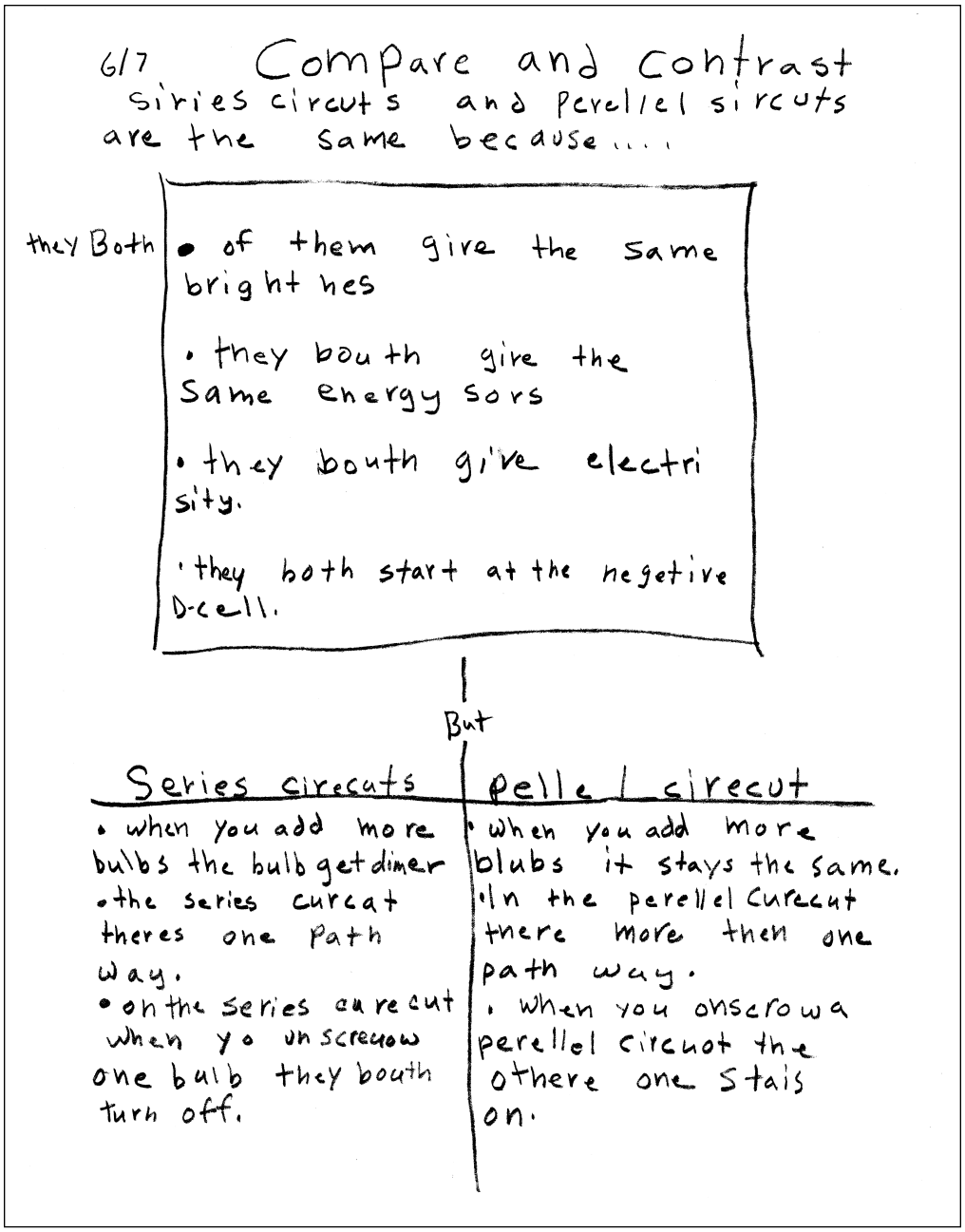
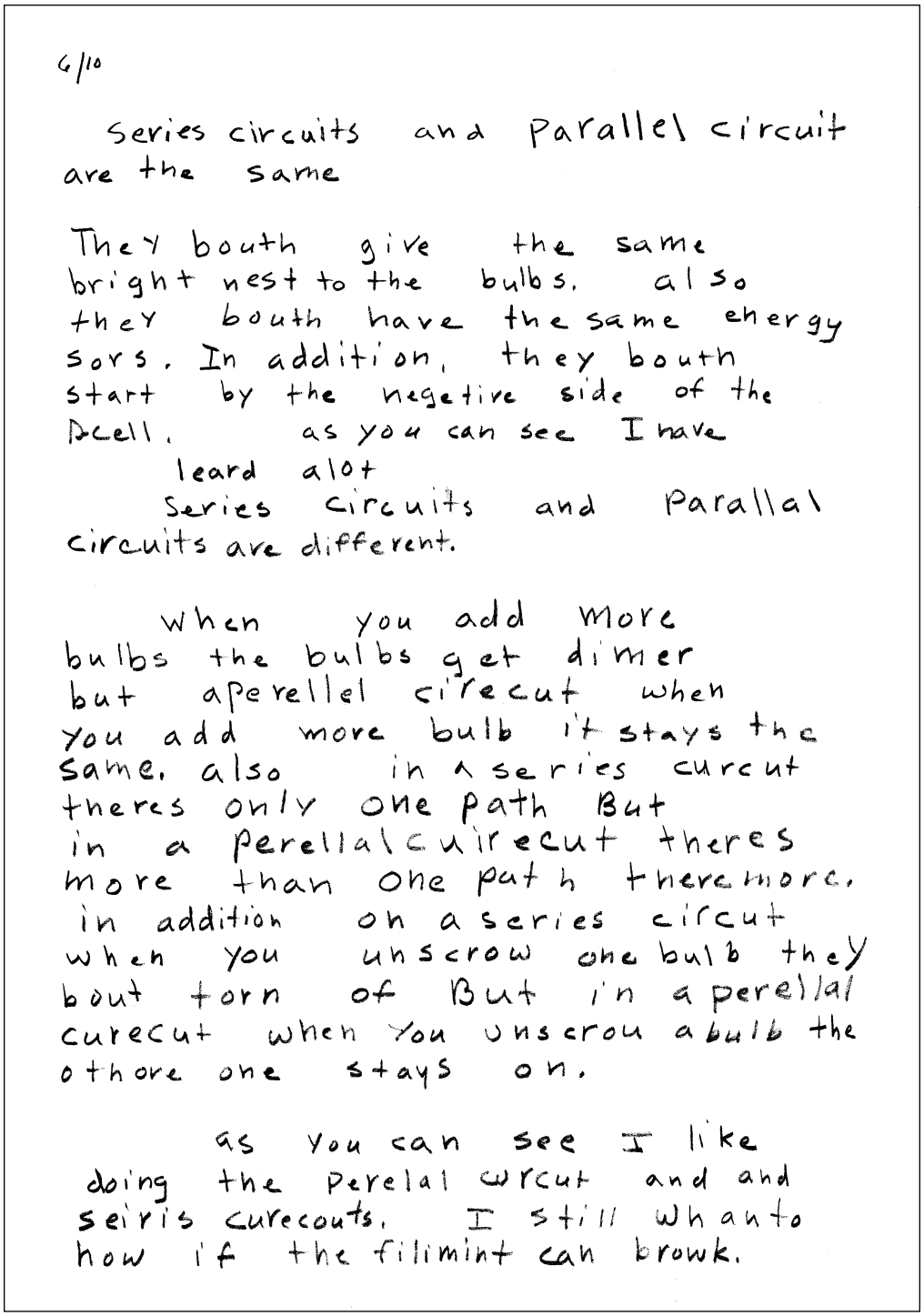


FIGURE 1 *Jessica's box and T-chart*

Jessica has made in her English language development and expository writing skills. As her teacher, I believe this progress would not have been possible without the meaningful integration of expository writing and inquiry-based science instruction.

Meaningful Assessment and Feedback

At the beginning of each school year, my students thought of science notebooks as just another school material. But their work in their notebooks helped them view themselves not just as students doing science, but as real scientists, doing the work that scientists do.



6/10

Series circuits and Parallel circuit are the same

They bouth give the same bright nest to the bulbs. also they bouth have the same energy sors. In addition, they bouth start by the negetive side of the Dcell. as you can see I have leard alot Series circuits and Parallal circuits are different.

when you add more bulbs the bulbs get dimer but aperellel cirecut when you add more bulb it stays the same. also in a series curcut theres only one path But in a perellalcuirecut theres more than one path therc more. in addition on a series circut when you unscrow one bulb they bout torn of But in a perellal curecut when You unscrou a bulb the othore one stays on.

as you can see I like doing the perelal wrcut and and seiris curecouts. I still wh an to how if the filimint can brouk.

FIGURE 2 *Jessica's comparison*

When we finished a science unit, students' science notebooks became part of their formal learning portfolio, along with "published" writing pieces, summative assessments, and student-selected pieces. When we reflected on our learning and growth over a term or over an entire year, students regularly chose to use their writing in their science notebooks as examples of their best work or greatest improvement.

The most powerful evidence I observed of how invested my students were in their science notebooks, however, was when a student came into our class one morning and the first words out of her mouth were, "Did you read my science notebook?" I teasingly replied that she at least had to say good morning to me before she could ask about her science notebook, but her question, and similar questions from other students, made a lasting impression on me. My students could not wait to read my comments and answer my questions about a writing entry. When I returned their notebooks to them, they would immediately read my responses and answer the questions I asked them. Often this led to a discussion between the student and me to clarify some aspect of the science or writing or both, which helped students further develop their understanding from that particular lesson. The more I practiced this approach to responding to student work, the clearer it became to me how meaningful positive, constructive feedback is for students and how ineffective rubric-based scores are for helping students deepen their understanding of concepts. As a result, I stopped scoring notebook entries and focused my time and energy on reading and responding to entries in this more meaningful way.

The combination of meaningful concrete experiences; scaffolded language and writing instruction; and positive, formative assessment made science a rare positive educational experience for my students who were not, at least initially, meeting academic standards. These students benefited enormously from having genuine science experiences in the classroom about which they could then talk, think, and write. The graphic organizers, writing frames, and word banks also helped my special needs students with their greatest challenges in writing: organizing their thinking, starting their sentences, and remembering scientific terms. These supports transformed my reluctant, resistant writers into capable, successful ones.

As I learned to teach science and science writing, I came to see how my students, including those who struggled year after year to meet grade-level standards, were able to exceed my own expectations for them when given appropriate scaffolding in an engaging, meaningful context. Through my work with students like Jessica, I came to see how children's educational experiences can be profoundly changed through high expectations, challenging curriculum, and the specific supports that allow them to be truly successful with the curriculum. This meaningful, supportive approach to science and science writing provides these keys to transforming all students—and especially those from underserved communities—into proud, competent scientists and writers.