

**Supporting L2 Elementary Science Writing with SFL in an Age of School Reform**

**Kathryn Accurso  
Meg Gebhard  
Cecily Selden**

**ACCELA Alliance  
University of Massachusetts, Amherst**

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In the United States, English language learners (ELLs) now account for over ten percent of K–12 public school enrollment. This demographic shift coincides with a succession of school reforms, such as *No Child Left Behind* legislation, English-only mandates, and the adoption of the Common Core State Standards, which place new demands on all students and their teachers (Brisk, 2015; Gebhard, Chen, Britton, 2014; Palincsar & Schleppegrell, 2014). These demands are prompting a renewed interest in how teachers can support students in simultaneously developing academic language proficiency and disciplinary content knowledge. As teachers, administrators, teacher educators, and policy makers attempt to respond to the demands of these reforms, a new national discourse regarding the relationship between language and content learning is emerging. This new discourse is one many teachers are struggling to grasp in their attempts to design more effective instruction, particularly for the growing number of ELLs in their classes (Bunch, Kibler, & Pimentel, 2012; Burke & de Oliveira, 2012).

Teachers are not alone in their struggle to link the teaching of language and content; both L1 writing research and second language acquisition studies have longstanding traditions of separating the study of formal grammar and subject matter knowledge (Byrnes, 2002; Gebhard & Martin, 2011). However, this conceptual and pedagogical separation has hindered L1 and L2 students' progress toward learning how language works to make meaning in the types of texts they are routinely required to read and write in school (Christie & Derewianka, 2010; Rose & Martin, 2012; Schleppegrell, 2004). Halliday (1985) makes a powerful case for reconceptualizing grammar as a functional social semiotic system, rather than seeing it as a set of decontextualized rules or list of fixed edicts regarding correct usage. A number of L2 literacy scholars have demonstrated that combining this view of language with a social theory of learning can support K–12 students, including ELLs, in making simultaneous gains in subject matter knowledge and academic reading and writing abilities (de Oliveira & Lan, 2014; Fang &

Schleppegrell, 2008; Fang & Wei, 2010; Schleppegrell & de Oliveira, 2006; Schleppegrell, Greer, & Taylor, 2008).

To contribute to this growing body of research, this chapter presents a case study from co-author Cecily Selden's fourth grade classroom. Cecily was a participant in ACCELA (Access to Critical Content and English Language Acquisition), a professional development program that supported K–12 teachers from high poverty urban schools in earning a masters degree in education and state license in teaching reading and/or ESL (Gebhard & Willett, 2008). Participating teachers were introduced to Halliday's systemic functional linguistics (SFL) and genre pedagogy while they conducted action-oriented research projects in their classrooms, schools, and communities with the support of university researchers. Co-authors Meg Gebhard, co-director of the ACCELA program with Jerri Willett at the time, and Kathryn Accurso, a researcher interested in SFL and teacher education, supported Cecily in her collection and analysis of classroom data. During Cecily's ACCELA coursework, she designed a unit that drew on genre pedagogy to address narrative writing in English language arts. Encouraged by her students' receptivity to the unit and progress in developing genre knowledge of narratives, Cecily continued to explore the potential of genre pedagogy in other areas of her teaching after she graduated from the program.

This chapter reports on a twelve-week writing unit on the genre of scientific explanation Cecily designed and taught as part of this exploration of the potential of SFL-based pedagogy to support her continued professional development and her students' academic literacy development. She designed this writing unit to parallel three shorter units of study in science, with her teaching staying focused on the genre of explanation across the changing science content. In what follows, we describe how Cecily used Halliday's (1985) SFL and Rose and Martin's (2012) genre pedagogy as core constructs to design the unit and to analyze students'

emerging science literacy practices. In particular we focus on the literacy practices of a fourth grade ELL named ‘Ana Sofia’ (a pseudonym). We conclude with a reflection on the potential for using SFL and genre pedagogy to narrow the persistent opportunity gap that exists between ELL and non-ELL students attending public schools in the United States in the context of current high-stakes school reforms.

### **Conceptual Framework: A Functional Perspective of Grammar**

As outlined in Gebhard, Chen, and Britton (2014), a functional perspective of grammar is rooted in Halliday’s SFL, which attempts to explain how people use language and other semiotic means as resources for getting things done within cultural contexts (Halliday & Matthiessen, 2004; see also de Oliveira & Schleppegrell, 2015). This view conceptualizes language as systemic in the sense that users make functional selections from a system of choices that operate simultaneously at the phonological, lexical, syntactic, and discourse levels depending on the context in which communication is negotiated. In other words, when we use language, we consciously and unconsciously choose particular ways of pronouncing or graphically rendering words, making grammatical constructions, and creating coherence across stretches of discourse depending on the ideas we are trying to communicate (such as everyday experience versus discipline specific concepts), the relationships we are attempting to construct or maintain with our audience (for example, social distance and status), and the mode through which the interaction takes place (oral, written, computer mediated, and so on). Halliday (1975) maintains that all languages realize these types of meaning simultaneously through three generalized metafunctions. The ideational metafunction realizes ideas and experiences; the interpersonal metafunction constructs social relations, and the textual metafunction manages the flow of ideas to make discourse coherent. Halliday and Matthiessen (2004) summarize this perspective of

language by stating that ‘every message is both about something and addressing someone’ and that the flow of information in a message is organized to create ‘cohesion and continuity as it moves along’ (p. 30).

The ACCELA program drew on this conception of grammar to theorize L2 literacy development, noting that as learners mature and learn varieties of their L1, as well as additional languages, the cultural contexts in which they interact also expand and become more diverse (for example, home, school, work, social media). As this range of contexts expands, the three metafunctions also expand and become more diverse, creating more meaning potential and choice within the system. This diversification drives L2 learners’ development of semiotic resources in regard to phonology/graphology, lexicogrammar, and semantics, as well as the evolution of the system as a whole (see also Halliday, 1993).

### **SFL-Based Pedagogy: Martin’s Genre Pedagogy**

Within social contexts, language users encounter recurrent language patterns Martin (1992) terms genres, or ‘staged, goal-oriented social process[es]’ (p. 505). Within the context of schooling, these social processes include such goals as describing a natural phenomenon in science, narrating a story in language arts, arguing a perspective regarding historical events in social studies, or explaining a statistical analysis in mathematics. Following Halliday and Martin, we maintain that as students participate in expanding networks that use different genres, they are socialized into new ways of knowing, being, and doing, which expands the semiotic resources available to them.

Martin’s conception of genre captures how learning academic English reflects and constructs cultural linguistic practices (Martin & Rose, 2008). For example, while canonical scientific explanations in English have patterned genre moves (that is, identification of a

phenomenon followed by an explanatory sequence that tells how or why that phenomenon exists), individual texts may vary depending on the local context of situation. This variation is reflected in grammatical choices depending on purpose, audience, and the channel through which the explanation unfolds. For instance, an explanation that a student gives to their peer face-to-face as they read an assigned text is apt to be grammatically different from one they might write on a unit test for the science teacher. To analyze variations of this sort, Martin uses Halliday's concept of register, which consists of specific field, tenor, and mode choices that realize the three metafunctions described above (Martin & Rose, 2008, p. 11). The field of a text refers to how students use ideational resources at their disposal to realize the content or subject matter of an explanation (such as the use of content specific noun phrases and verbs); tenor refers to how they use interpersonal resources within their repertoires to position themselves and their audience (for example, use of declaratives versus imperatives or interrogatives to construct an authoritative persona); and mode refers to how students use different textual resources to manage the flow of the discourse (such as the use of causal connectors to show the relationship between ideas).

To support teachers in making the workings of these different kinds of linguistic choices transparent and potentially transformative for students, Martin and his colleagues at the University of Sydney began collaborating with teachers in the 1980s to develop a genre-based approach to designing curriculum and instruction. Together, they developed a teaching and learning cycle as a way of apprenticing students at all grade levels to reading and writing the genres they were likely to encounter in school. This cycle provides a model for teachers to use in planning, delivering, and evaluating academic literacy instruction through three phases: deconstruction of model texts in a target genre using a functional metalanguage to notice, name, and critique patterns of language features; joint construction of a text in the target genre to make linguistic know-how visible and the nature of linguistic choices within the system explicit; and

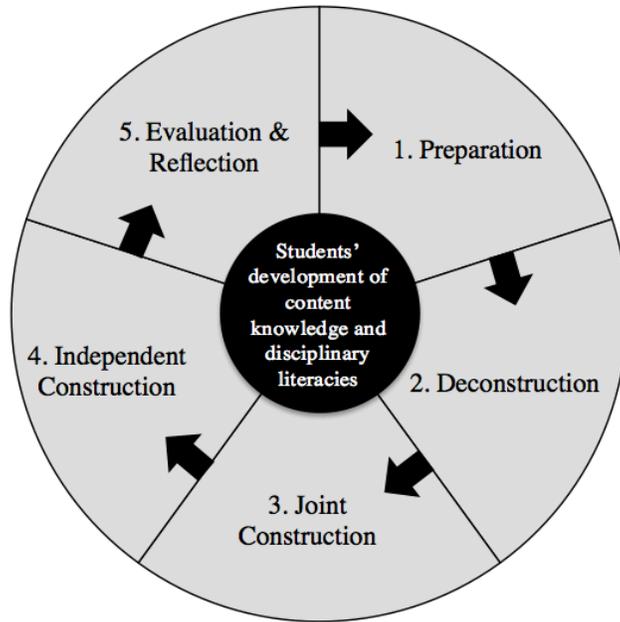


Figure 8.1. Teaching/learning cycle (adapted from Derewianka, 1990; Rose & Martin, 2012)

gradual apprenticeship toward independent student construction of oral and written texts by providing less scaffolding as students become more proficient users of a particular genre over time (Rose & Martin, 2012).

ACCELA teachers followed a modified version of this cycle in unit planning to adapt curricular materials they were required to use in their schools (Figure 8.1). For example, teachers would choose a target genre and content area focus (for example, explanations and fossils) and move through these phases in ways that drew on students' collective linguistic knowledge, provided opportunities for students to use talk and print to construct new scientific understandings, and made the linguistic know-how needed to construct new meanings and understandings visible and explicit. The goal of this approach to teaching and learning is to expand students' meaning-making repertoires by providing them with hands-on experiences, dialogic interactions, models, explicit instruction, and critical analysis of authors' and their own

grammatical choices as they learn to read, write, and critique academic texts across a variety of disciplines (see also de Oliveira & Iddings, 2014; Gibbons, 2015).

As Cecily used this conceptual understanding of language teaching and learning to support her fourth grade students in building new semiotic resources for reading and writing scientific explanations, our analysis of her work was guided by three main questions:

- How did Cecily attempt to enact the teaching/learning cycle in the context of school reform?
- What pedagogical choices did she make and why?
- What were the implications of these choices for the academic literacy practices of L2 students over the course of a curricular unit?

## **Method**

### **School Context**

This study took place at the beginning of the 2013–2014 school year. At the time, Cecily was teaching in a midsize urban elementary school in a formerly industrial city in Massachusetts. ‘Turner Elementary’ (a pseudonym), served predominantly Puerto Rican and African American students who lived in the neighborhoods surrounding the school, which include some of the most impoverished residential blocks in the state. Over a third of students were officially designated ELLs, a percentage that is more than twice the state average. Like many schools in cities experiencing rapid economic and demographic changes, Turner struggled to meet the needs of its diverse learners, and in 2011, was labeled one of the lowest performing elementary schools in Massachusetts. As a result, the state awarded Turner a three-year multi-million dollar school improvement or ‘turnaround’ grant designed to bring student performance up to state standards, particularly in academic writing. Administrators initiated several changes during this time,

including mandated daily writing instruction at all grade levels to prepare students for open response prompts on state tests, and a redistribution of instructional time in fourth grade specifically to focus mainly on the high-stakes test subjects of mathematics and language arts. They also invested in an intensive quarterly assessment system that offered students timed writing practice and helped the school better predict annual standardized test performance. For Cecily and her students, this heightened focus on writing, math, and language arts meant that science was reduced to a ‘special,’ or 30-minute pullout class taught by another teacher, ‘Ms. Stryker,’ three days a week.

Cecily was increasingly frustrated with demands of these school, district, state and federal school reforms (Common Core initiatives, English-only mandates, merit pay attached to high-stakes test scores, and so on). She felt they constrained rather than supported her ability to design and implement effective instruction and were, therefore, paradoxically leading to a decline rather than an increase in students’ engagement and learning. She also worried that these reforms normalized a single definition of student success (for example, a minimum required test score), made learning more of a rote activity, and replaced the practice of teaching with testing in ways that were counter productive. For example, 22 of Cecily’s 25 fourth-graders were reading and writing below grade level, and 13 of them were officially designated ELLs. Based on her prior teaching experiences, she worried that the heavy emphasis on test-taking and limited exposure to certain content areas would constrain rather than help expand students’ semiotic resources for engaging with different types of academic reading and writing tasks. She predicted they would suffer most in science because this content area was getting pushed to the margins despite the fact that all of her students would be required to take a state-wide test in science the following year in grade five. For these reasons, and because she would potentially have these same students in grade five, Cecily made a concerted effort to find ways to teach science to

support students' academic literacy and content knowledge development in ways that were aligned with the state science curricular frameworks.

## **The Unit**

While school reforms meant it was no longer Cecily's responsibility to deliver science instruction, she saw the mandate for daily test preparation and writing instruction as an opportunity to expand and deepen the kind of literacy instruction she provided students while simultaneously supporting what they were learning in their pullout science class with Ms. Stryker. Therefore, Cecily chose to begin the year with a study of scientific explanations with two broad goals in mind: first, to help students become active and critical science readers and writers by exploring how language makes meaning in this genre; and second, to balance the curriculum in ways that would better prepare students for science learning the following year. Cecily justified this study of scientific explanations to her principal as a series of test preparation activities focused on writing, citing the increased emphasis on informational texts in the Common Core State Standards. After receiving approval, Cecily used the teaching/learning cycle to design a twelve-week<sup>1</sup> writing unit focused on scientific explanations. This unit spanned three science content units Ms. Stryker covered, including states of matter, tornados, and rock formation. By using texts that addressed the topics students were already discussing in science, Cecily intended to build their awareness of text structure (genre), content language (field), authorial tone (tenor), and cohesion (mode).

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<sup>1</sup> Cecily initially planned a six-week explanation writing unit. In the course of teaching, it grew in length as she decided to spend additional time building genre knowledge (see *Deconstruction*). Further, schedule interruptions (such as district assessments, school photos) prevented writing from being taught some days. These interruptions accounted for 25% of the ultimate twelve-week span.

## **Implementing the Teaching/Learning Cycle at Turner Elementary School**

As Cecily began the unit, students were studying states of matter in science class. To establish a baseline of the nature of the linguistic resources students drew on for constructing written explanations, she asked them to do a ‘cold write,’ in which they produced uncoached writing samples on the topic they were studying.

### **Deconstruction: Noticing Linguistic Features of Explanations Using Model Texts**

The initial writing samples revealed that many students were unfamiliar with the purpose of explanation texts in school settings and needed to spend time with multiple sample texts to build an understanding of this genre. Accordingly, the first six weeks of the unit were spent establishing contexts in which the genre of explanation might be used, as well as discussing the stages and language features of the genre by deconstructing authentic examples. Cecily provided a blank note-taking template to support students’ reading of these model texts and guide them in making explicit observations about the linguistic features authors used to explain scientific phenomena. Each week, students were asked to note similarities and variations across model texts, and to analyze which linguistic features seemed obligatory or optional for writing an explanation of a scientific phenomenon.

Students identified the following genre and register features as obligatory using metalanguage they generated in class (Graham, 2015): ‘explanation organization’ is naming or describing a ‘big idea’ and then giving ‘important details’ about that topic using a ‘title, paragraphs, subheadings, and ordering words,’ ‘everything has to do with the same topic,’ and it must include “‘need to know” or specific content words,’ ‘behavioral and existential verbs,’ and have a ‘serious tone,’ while avoiding ‘I and me.’ Cecily compiled these features on a large piece of chart paper and hung it on the classroom wall for continual reference. She drew particular

attention to these features because she recognized that learning to read and write scientific explanations requires the use of specialized language for constructing scientific ideas and coherent relationships between these ideas. She wanted to support students in developing an explicit metacognitive and metalinguistic awareness of how specialized language differs from everyday language and therefore designed the deconstruction phase of this writing unit as a series of mini-lessons that focused on four of the key linguistic features her students had observed: use of specific content vocabulary, 'serious tone,' cohesion, and text structure.

For example, in teaching students about the function of content vocabulary in academic texts, Cecily contrasted academic language with students' everyday communication, which is marked by linguistic choices that reflect a shared understanding of a concrete 'here and now' reality. As students were studying states of matter during this phase of the unit, Cecily illustrated this difference using the example of a physical reaction that takes place in a bottle of soda when a Mentos candy is dropped in and a geyser of foam shoots out. Students had witnessed this reaction in a class experiment, and therefore understood what she meant when she explained the reaction as, 'This thing and that thing together went boom!' However, a distant audience reading about the experiment rather than watching it would struggle to understand this statement without the shared context. Students came to agree that a more effective explanation for this purpose and audience needed to include specific and technical content vocabulary, as in, 'When the smooth candy is dropped into the carbonated soda it causes a physical reaction like an explosion to occur.' Students could then see how technical terms function to make precise meanings that can be understood by those outside the contexts in which the event occurred (Halliday, 1993; Lemke, 1990). In sum, through deconstructing authentic texts Cecily guided students to notice the linguistic choices more expert authors make in writing scientific explanations and the purpose these choices serve.

### **Joint Construction: Guided Practice for Planning and Writing Explanations**

By the time Cecily arrived at the joint construction phase of her unit, students had moved on to a new content topic in science class: tornados. Consequently, her goal during this three-week phase was to continue building students' knowledge about the linguistic features of scientific explanations by collaborating with them to research, plan, and co-write a class explanation about the topic they were studying at that time. Students began by reading published scientific explanations of how different types of tornados are formed. They collected factual information from these texts and continued their analysis of how authors make specific linguistic choices in producing scientific explanations. Based on their analysis, the class jointly planned what information to include in their text, what to exclude, and how to organize their writing by creating an outline for a four-paragraph explanation. This outline followed the organizational pattern students observed in the deconstruction phase of the unit in that their first planned paragraph introduced the 'big idea' of the text and set out three points about the big idea that would then be elaborated in a subsequent paragraph.

As this outline developed into a more fully formed explanation, students' responsibility for writing increased. Initially, they contributed ideas orally as Cecily scribed the first paragraph for them as a whole class activity. For the second paragraph, she provided sentence starters using language from the co-constructed outline (such as *Tornados are formed by \_\_\_\_*) and students completed the sentences with information from their research. For the third paragraph, students contributed their ideas orally as other students scribed. And for the final paragraph, students worked in small groups where they each contributed sentences to build information about the details in their outline. During each of these activities, Cecily made explicit reference to the genre knowledge students had built in deconstructing previously studied explanations about the states of matter. Thus, the deconstruction phase provided the basis for students to negotiate the

process of choosing how to represent their collective ideas to explain how tornados form. During this phase, writing collaboratively with the teacher as the more expert guide was intended to scaffold students' learning by giving them the opportunity to practice making disciplinary meaning in a supported environment before writing on their own (Gibbons, 2015).

### **Independent Construction: Preparing for and Writing Individual Explanations**

The independent construction phase of Cecily's writing unit paralleled a third content topic in students' science class: rock formation. During this phase, students drew on their existing and expanded linguistic resources, as well as experiences with the genre of explanation to write individually authored explanation texts related to this new topic. However, before students began drafting, Cecily devoted some time to explicitly building students' knowledge of the topic and attending once more to the generic structure of the text they would be writing. She capitalized on a recent field trip students had taken to observe different types of rocks and geological processes at a preservation area, using their shared experience as a springboard for class discussion about the rock cycle and as the basis for additional research, which they conducted using the Internet and texts provided by their science teacher. Students organized their research notes using a graphic organizer Cecily provided. Only after these steps did they begin writing rough drafts, which they had the opportunity to submit for feedback before writing their final explanations. The independent construction phase, as enacted in this context, was therefore comprised of several sub-phases that are associated with a process approach to writing instruction. In other words, students did not simply sit down to write independently; rather, they were guided in using their developing metalinguistic knowledge of text features to make choices about how to explain their scientific ideas regarding rock formation logically and precisely with an audience that did not share their knowledge or experiences.

Cecily evaluated students' final papers using a four-point rubric that was similar to the one used on district and state writing assessments. It included two standards-based criteria (content accuracy and mechanical conventions) and two of the linguistic features students had identified as obligatory for explanations in the deconstruction phase of the unit (text structure and use of content vocabulary). Some students used the rubric during independent construction to complete self- or peer-evaluations before revising and submitting their final drafts. For these students, the rubric may have supported the process of internalizing genre knowledge and making linguistic choices in their independent writing. Cecily's use of the rubric, however, was mainly to report quarterly writing grades and helped fulfill administrator requests for formal assessment. It was the analysis of students' final drafts as compared to their initial 'cold write' samples that allowed Cecily to gain a more nuanced understanding of how students' linguistic repertoires had developed over the twelve weeks they had been studying explanations, and ultimately to defend her approach to administrators given that she was straying from the school's standard writing curriculum. To illustrate the impact of her use of SFL and the teaching/learning cycle on the academic literacy practices of L2 learners, we now describe changes in one student's literacy practices across the unit.

### **Ana Sofia: Changes in the Scientific Literacy Practices of an L2 Writer**

Ana Sofia and her family arrived in the United States from Puerto Rico in 2007. At the time, she was the only child in a bilingual household with her mother, father, and maternal grandfather. She began attending Turner as a kindergartener and received daily pullout English support through kindergarten and first grade that gradually diminished throughout her second and third grade years. According to her third grade scores on the WIDA ACCESS test, Ana Sofia's English language proficiency was considered 'bridging,' meaning she had nearly

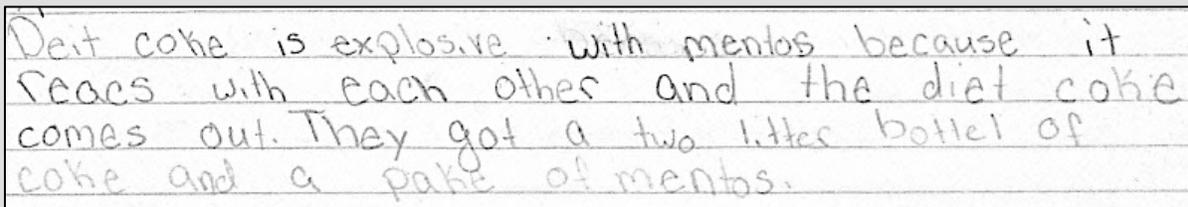
developed grade level English skills, and Cecily remarked that she had a ‘great command’ of English compared with other ELLs in the class, though she continued to need support with spelling, mechanics, and words with multiple meanings. As a new fourth grader, Ana Sofia reported enjoying writing in school because she felt she was good at it and was especially proud of her tidy handwriting. Despite her English proficiency and comfort with writing, Ana Sofia struggled with assessment activities that required fluency with disciplinary discourses.

### **Ana Sofia’s First Attempt at Writing a Scientific Explanation**

Ana Sofia was studying states of matter in science class when Cecily’s writing unit began. She had watched a series of videos depicting the combination of a liquid and solid (diet soda and Mentos candies), where a geyser of foam shoots out of the soda bottle after the candies are dropped in. After replicating this experiment in class, Cecily gave students 15 minutes to write, prompting them to ‘explain what happens when you put together Diet Coke and Mentos.’ Her goal was to see what linguistic resources students used for the purpose of explaining a scientific phenomenon. In the allotted time, Ana Sofia produced a two-sentence response (Figure 8.2).

Though Ana Sofia’s response was brief, an SFL text analysis allowed Cecily to note several strengths and areas for targeted instruction. For example, at the generic level, Ana Sofia seemed to be attending to the communicative purpose of explaining the phenomenon by opening her text with a statement about the nature of diet soda and the candies when combined. This attempt to communicate a generalized understanding of what she had witnessed suggested some familiarity with the types of information a distant audience may be interested in. In this part of the text, Ana Sofia used the present tense and established a causal chain to provide details about why the explosion occurs (*Diet coke is explosive with mentos because...*), and drew on specific language from her existing content knowledge of chemical and physical reactions (*reacts*,

### Ana Sofia's initial language choices for constructing an explanation



Diet coke is explosive with mentos because it reacts with each other and the diet coke comes out. They got a two liter bottle of coke and a pake of mentos.

'Diet coke is explosive with mentos because it reacts with each other and the diet coke comes out. They got a two liter bottle of coke and a pake of mentos.'

**Genre** – hybridized genre resources to explain a specific physical reaction and recount procedural details from an experiment involving that phenomenon

**Field** – used some 'specific content vocabulary' (*explosive, reacts*) alongside everyday language (*comes out*)

**Tenor** – avoided personal reference, constructing self as both scientific authority and objective reporter

**Mode** – established a thematic chain to keep text on-topic (*diet coke > it > bottle of coke*)

Figure 8.2. Ana Sofia's initial explanation writing sample (September 2013)

*explosive*) to signal a scientific understanding of the phenomenon. However, Cecily noticed that Ana Sofia followed this statement with a recount of specific procedural details from the videos, a more everyday language choice that relies on readers having the shared experience of seeing the experiment. This assumption of shared context was further reflected in Ana Sofia's choice of the pronoun *they* to refer to the scientists who conducted the experiment in the videos.

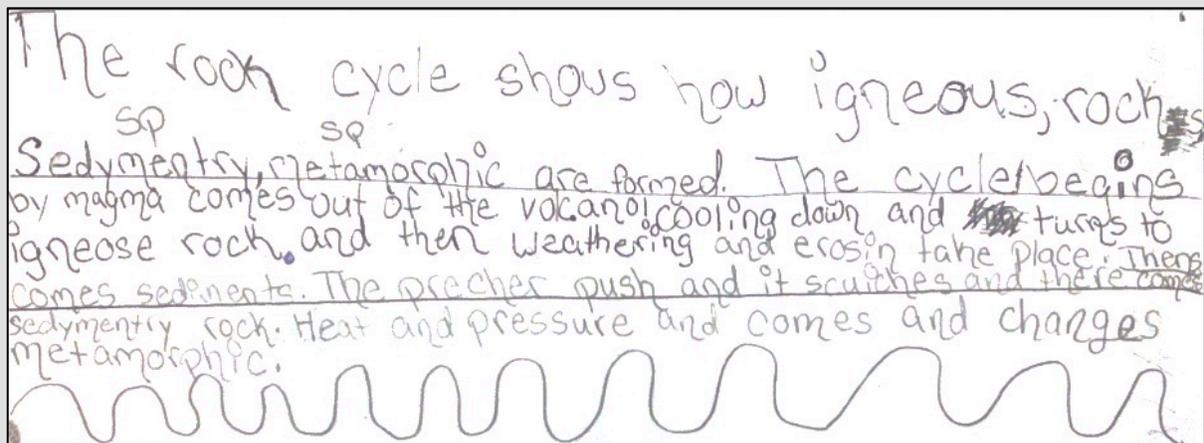
### Becoming a More Expert Author: Ana Sofia's Rough Draft

As the unit progressed, Ana Sofia built expertise related to different content topics while continuing to study the same genre with Cecily. She practiced using her developing genre knowledge and content knowledge of geological processes to write an explanation of rock formation. Before drafting the explanation, Ana Sofia collected research notes and illustrations in a graphic organizer Cecily provided. She then selected which information to include and exclude

from her text by circling in her notes what she planned to include and making the order in which it would appear clear to herself before drafting. Finally, she composed a paragraph (Figure 8. 3).

In this text, Ana Sofia used a more typical explanation text structure than in her initial writing sample. She first identified and described her ‘big idea’ (*The rock cycle shows how igneous, rocks, sedimentary, metamorphic are formed* [sic]), then launched into an explanatory sequence that provided ‘important details’ about the topic of rock formation (*The cycle begins by...*), drawing on the organizational pattern she had noticed in model texts during the

### Ana Sofia’s evolving language choices for constructing an explanation



‘The rock cycle shows how igneous, rocks, sedimentary, metamorphic are formed. The cycle begins by magma comes out of the volcano! Cooling down and turns to igneous rock. And then weathering and erosion take place. There comes sediments. The precher push and it scuiches and there comes sedimentary rock. Heat and pressure and comes and changes metamorphic.’

**Genre** – organized text using typical explanation genre moves (‘big idea’ followed by ‘important details’), including an expanded explanatory sequence

**Field** – used ‘specific content vocabulary’ (*igneous, sedimentary, metamorphic, magma, weathering, erosion*) supported by everyday language (*push, squishes, turns to*) to communicate ideas

**Tenor** – avoided ‘I and me’ and personal commentary to construct self as scientific authority

**Mode** – relied on additive conjunction *and* to link ideas and move text forward

Figure 8.3. Ana Sofia’s rough draft (early November 2013)

deconstruction and joint construction phases of the unit. This explanatory sequence was significantly expanded compared with her initial writing sample. Ana Sofia's early writing identified a single scientific process and resulting action (that is, *a reaction results in an explosion*), whereas now she connected multiple related processes to help explain her main topic (for example, *magma cools into igneous rock; weathering and erosion create sediment; pressure turns sediment into sedimentary rock*).

Ana Sofia's use of more expert field, tenor, and mode resources was apparent as she constructed this explanatory sequence. For example, Ana Sofia drew on a much broader range of technical language to represent the field of knowledge than she had earlier in the unit. Her use of content specific vocabulary was still supported by everyday language, but as she planned and wrote the rough draft, Ana Sofia had begun to think beyond the 'here and now' to make language choices she felt would best communicate her ideas and understandings to a distant audience. She presented multiple connected ideas about the processes involved in rock formation, mainly using the conjunction *and* to link these ideas and move the text forward. Ana Sofia's use of *and* allowed her to build information regarding the topic by making connections within and between clauses. As she constructed her explanation, she adopted an authoritative tenor by using declarative mood and avoiding personal pronouns to construct the 'serious tone' the class has discussed as obligatory of scientific discourse.

### **Constructing an Academic Identity through Explanation: Ana Sofia's Final Draft**

Cecily was impressed with the growth in academic language use Ana Sofia demonstrated in her rough draft, but encouraged her to continue to work toward developing the ability to construct a more expert text in the final weeks of the unit. As she revised her writing, Ana Sofia also received support from the class paraprofessional in the form of spelling corrections,

sentence boundary advice, and a suggested concluding phrase (*and the rock cycle begins again*).

Figure 8.4 shows the final draft Ana Sofia submitted to Cecily, which incorporated much of this

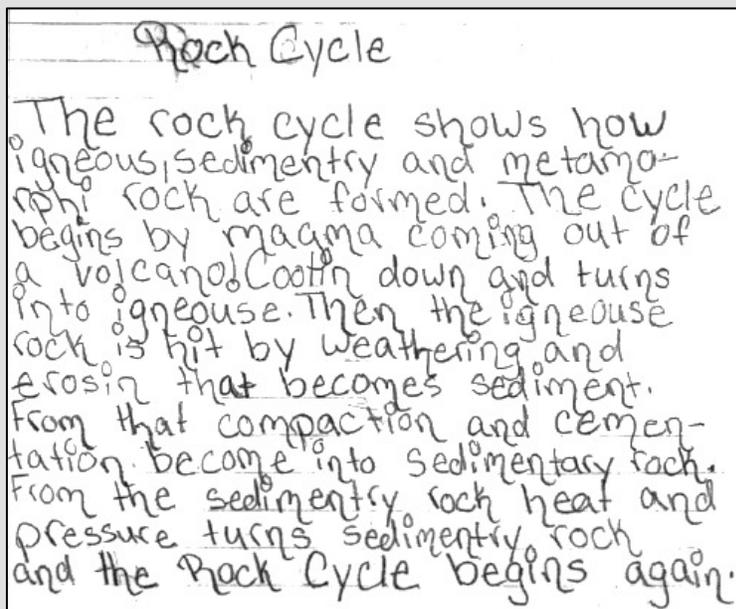
feedback. An analysis of Ana Sofia's texts demonstrates some notably different field choices.

For example, during revision she identified her own use of everyday vocabulary in the rough

draft, marking words such as *push* and *squish*, and attempted to replace these with more 'specific

content vocabulary' from a resource book while preserving her intended meanings (for example,

### Ana Sofia's language choices for constructing a final draft explanation



Rock Cycle

The rock cycle shows how igneous, sedimentary and metamorphic rock are formed. The cycle begins by magma coming out of a volcano! Coolin down and turns into igneous. Then the igneous rock is hit by weathering and erosion that becomes sediment. From that compaction and cementation, become into sedimentary rock. From the sedimentary rock heat and pressure turns sedimentary rock and the Rock Cycle begins again.

### Rock Cycle

'The rock cycle shows how igneous, sedimentary and metamorphic rock are formed. The cycle begins by magma coming out of a volcano! Coolin down and turns into igneous. Then the igneous rock is hit by weathering and erosion that becomes sediment. From that compaction and cementation become into sedimentary rock. From the sedimentary rock heat and pressure turns sedimentary rock and the Rock Cycle begins again.'

**Genre** – organized text using typical explanation genre moves (descriptive statement followed by explanatory sequence)

**Field** – attempted to replace everyday language with 'specific content words' to increase precision (for example, nominalizations such as *weathering*, *erosion*, *compaction*, *cementation*)

**Tenor** – used a 'serious tone' and avoided personal reference to construct self as scientific authority

**Mode** – oriented the reader with a title; controlled the flow of information with ordering language (such as *begins*, *then*), reference (*that*) and a zig-zag pattern

Figure 8.4. Ana Sofia's final draft (late November 2013)

*The precher push and it scuiches and there comes sedymentry rock [sic] → From that compaction and cementation become into sedimentary rock).* Though Ana Sofia treated the nouns *compaction* and *cementation* as concrete things instead of nominalized processes, she correctly identified these as the more technical terms for the ideas she expressed in her rough draft, and in using them was attempting to more expertly describe the forces involved in rock formation.

As she explained the process of rock formation, Ana Sofia used three main resources to control the flow of information and create cohesion: a title, ‘ordering words,’ and a system of reference. Early in the unit, students noticed that model academic texts nearly all included titles that signaled the ‘big idea’ of a text. Therefore, in choosing to include a title for her final product, Ana Sofia oriented her readers to the topic of her explanation by using a convention Cecily had reinforced as functional for this purpose. Ana Sofia also created more logical connections between the ‘important details’ she presented about rock formation by relying less on conjunction to link the content (field) of her text, instead using embedding with *that* clauses to connect new ideas to previous stated ones. Additionally, she began to use a ‘zig-zag’ pattern to build information logically and incrementally, a strategy common in informational texts (Eggins, 2004, p. 324). Throughout much of her final draft, Ana Sofia introduced a theme at the beginning of a sentence, presented new information regarding that theme, and then drew on some piece of the new information to begin the next sentence (Figure 8.5). Though Cecily did not explicitly

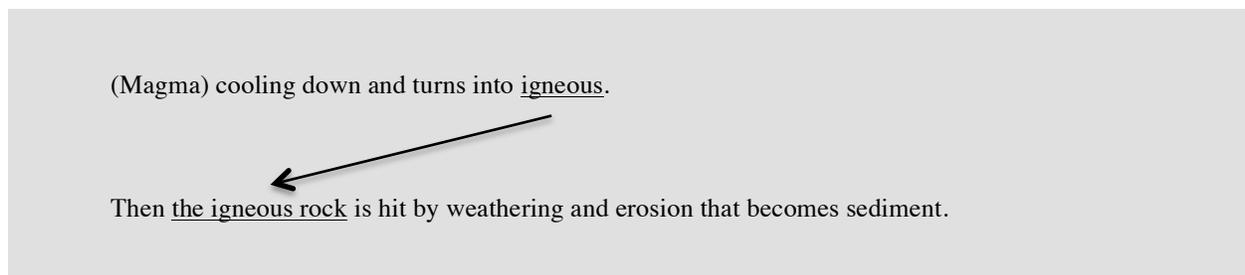


Figure 8.5. Ana Sofia’s use of a ‘zig-zag’ pattern to present information incrementally in her final draft

discuss this zig-zag pattern with students, she did encourage them to notice how they connected their ideas from sentence to sentence. In her final draft, Ana Sofia made more explicit connections between sentences using ‘need to know’ words for readers, which resulted in a zig-zag pattern characteristic of more expert disciplinary discourse.

### **Discussion**

By analyzing Ana Sofia’s attempts to produce more decontextualized scientific texts over the course of the unit, Cecily was able to see a movement from the use of language to construct everyday experience to the use of language to construct more discipline-specific scientific knowledge. At the end of the unit, Ana Sofia was drawing on a wider range of linguistic resources to construct scientific meanings as well as a stronger academic identity.

Accomplishing this cognitive and social work involved her choosing to use genre stages typical of school-based explanations, discipline specific lexical resources, identifiable textual resources to create precision and cohesion in her text, and tenor resources to construct herself as a ‘serious’ or knowledgeable student. Our analysis, however, does not suggest that Ana Sofia mastered these aspects of scientific discourse, or that she no longer needs sustained academic English language support. For example, though she made gains in using ‘specific content vocabulary’ to represent the field she was studying, Ana Sofia struggled to control more abstract uses of language (for example, nominalized processes like *cementation*; see Martin & Veel, 1998 for more on abstraction and grammatical metaphor in science texts).

Cecily facilitated Ana Sofia’s content and language development over the course of this unit by implementing genre pedagogy using the teaching/learning cycle to guide her and other students through explicit discussions and activities focused on learning to recognize and use the

language of science to construct scientific meanings. Throughout the unit Cecily provided students with time, instructional scaffolding (such as graphic organizers to support the reading and writing of disciplinary texts), and sociolinguistic supports (for example, use of classroom talk in whole class discussion, small group and pair work activities to construct new understandings) to develop ELLs' understanding of and ability to produce grade level information texts central to the elementary school curriculum (Common Core State Standards, 2010; WIDA Consortium, 2012). In addition, Cecily's practice included highly valuing the knowledge and linguistic resources ELLs bring to learning to read and write challenging texts, strategically selecting grade-level model texts to help students collectively notice linguistic patterns associated with academic writing, providing students with multiple ungraded opportunities to try out new language practices in small groups and on their own, discussing the social function of different linguistic choices to support students to make critical decisions about how to convey ideas and construct themselves as students, and dedicating ample time to drafting and revising during the independent construction phase of the unit. With these supports, Ana Sofia was able make linguistic choices required to construct disciplinary knowledge and favored school identities.

Despite these successes, Cecily faced a number of challenges with unit design and implementation related to the intensification of test preparation activities at her school. For example, a reduction in prep time had led many teachers to collaborate less and to adhere to a district-wide scripted writing curriculum. However, Cecily was invested in conducting research in her classroom, and in using her professional knowledge and understanding of her students to design materials that would prepare them to pass high-stakes exams in the short term and graduate from high school in the future. Consequently, she dedicated a great deal of extra time to this pursuit that other teachers may not be able to commit even if they had the will. Moreover, as

mathematics and English language arts moved to the forefront at Turner and science was no longer officially part of Cecily's role, she worked much harder to design more robust curriculum, instruction and assessments, and had to continually lobby the school administration for permission to do so.

### **Conclusion**

Cecily's implementation of the teaching/learning cycle and Ana Sofia's progress across the unit suggest there is a great deal to be gained from applying this pedagogical approach to support ELLs' academic literacy development in the context of current school reforms (Gebhard, 2010; Palincsar & Schleppegrell, 2014). Cecily and Ana Sofia's experiences using SFL and genre pedagogy contribute to the growing body of qualitative and quantitative studies that demonstrate the potential of a Hallidayan perspective of language to inform literacy research and approaches to teacher education (Bunch, 2013; de Oliveira & Iddings, 2014). Specifically, over the course of the unit, Ana Sofia demonstrated changes in her ability to make linguistic choices to support the construction of scientific explanations and herself as a 'good student' (Harklau, 1994). She began the unit by participating in an explicit exploration of the explanation genre, using both her own language and a metalanguage Cecily provided (*genre, tone, obligatory, optional*, and so on) to discuss the specific ways that home and school language differ. As students' unconscious linguistic choices became more conscious over the different phases of the unit, Ana Sofia talked about and practiced using language in different ways to construct information for a particular audience and for a particular purpose. By the end of the unit, she was able to articulate and draw on specific knowledge about the linguistic features of written explanations, and used an expanded repertoire of linguistic resources to communicate her ideas and experiences in ways that are valued in formal educational contexts.

It is important to note that Ana Sofia's experiences are not generalizable. Like all students, she relied on her individual resources for making meaning in addition to Cecily's instruction to complete her assignments. These resources include drawing on her home language, prior experiences, and scaffolding from her teachers, peers, and others to support the development of her academic work. Further, Ana Sofia had a level of English proficiency that allowed her to participate in English-only instruction—something not all ELLs who are in English-only classes have. Accordingly, her case does not predict how students in the very beginning stages of academic English development might participate in a unit like this one, or how other students will engage with their own sets of cultural and linguistic resources in choosing how or whether to participate in this type of academic writing instruction.

Likewise, Cecily's experiences are not generalizable given that not all teachers are invested in conducting action-oriented research in their classrooms and in taking up oppositional stances to current school reforms with their administrators, especially given the degree to which many teachers are already over worked and discouraged by the demands of current school reforms. However, the findings from this case study support the findings from other studies of teachers using SFL and genre pedagogy to support their students' academic literacy development and their professional practices (Bunch, 2013; Gebhard, Chen, Graham, & Gunawan, 2013). For example, at the end of this study, Cecily reflected:

Before now, I hadn't fully made the connection between analyzing how science texts function and our ability to write within and about [the genre of explanation]. This was important for me and my students, especially for ELL students. We so often use model texts to simply teach emulation in writing and students come away with empty knowledge. Teaching them how the obligatory parts function together to create meaning and flow in different genres of writing is really effective.

However, Cecily also remarked that contextual constraints made it difficult for her to realize the teaching/learning cycle directly as it was proposed. For instance, school reform efforts removed academic writing from content instruction to a separate test preparation block, making implementing genre pedagogy difficult professionally and personally given other demands on Cecily's time. Though Cecily believed the gains she documented in students' writing substantiated the commitment of time and energy to the process of teaching academic text production, she felt school reforms were increasingly forcing teachers to focus almost exclusively on writing as a product of testing. She captured this sentiment when she stated:

The major problem with teaching this way in a high-stakes environment and with testing accountability is that there is an expectation that pacing will be rapid. Writing in different genres and knowing how to do so takes time – time for studying, understanding, and praxis. All of which is impeded with testing demands. I think if we took more time with the different writing types and showed students the *why* as well as the *how* we would see even greater gains.

Cecily's experience in attempting to incorporate the teaching/learning cycle into her practice makes clear that for genre pedagogy to reach its potential in U.S. classrooms, aspects of the theory will be recontextualized because of school reform efforts unique to an American context. The Sydney School's genre pedagogy was developed with the goal of equalizing students' access to the genres of schooling and exposing the mechanisms of marginalization at work in schools (Rose & Martin, 2012). However, to continue this work and instantiate a robust version of this model in a U.S. policy context, we must take into account institutional constraints and teachers' professional development. Nevertheless, the success of this unit indicates that when literacy instruction is explicit and anchored in authentic content texts supported by meaningful

discussions about how language functions to accomplish disciplinary purposes, L2 writers like Ana Sofia can demonstrate strong growth in science writing.

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