

Discovering Disciplinary Linguistic Knowledge With English Learners and Their Teachers: Applying Systemic Functional Linguistics Concepts Through Design-Based Research

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A focus on how language varies in its forms and meanings can help English learners (ELs) in K–12 classrooms engage in disciplinary discourses that enable them to learn both language and content. Systemic functional linguistics (SFL) offers promising ways of talking about language in support of disciplinary learning. SFL’s meaning-based metalanguage offers analytical tools for making sense of text, but its description of complex systems in language is not readily accessible to teachers and students. This article offers a case study of how a design-based research (DBR) process yielded findings, materials, and instructional theory over a 3-year project to develop SFL-based approaches to engaging ELs in talk about language. In this study, conducted in an urban school district in the midwestern United States, the authors worked collaboratively with teachers and literacy coaches at six schools with high proportions of ELs, supporting them in using SFL metalanguage to talk about language and meaning as they engaged in grade-appropriate literacy activities: reading and responding to texts and writing subject-specific arguments. This article shares both what the authors learned about the implementation of SFL pedagogies and the affordances of DBR methodology for learning to apply a complex theory to support ELs.

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For K–12 English learners (ELs), who encounter new ways of using language as they move from grade to grade and subject to subject, a focus on how language varies in its forms and meanings can help them engage in the disciplinary discourses that enable them to learn both language and content. In fact, research is increasingly calling for all teachers to develop knowledge about language to support subject-specific language development. Bunch (2013, p. 307), for example, argues that teachers need “knowledge of language directly related to disciplinary teaching and learning and situated in the particular (and multiple) contexts in which teaching and learning take place.” This knowledge has been referred to as *literacy pedagogical content knowledge* (Love, 2010), *pedagogical language knowledge* (Bunch, 2013), or *disciplinary linguistic knowledge* (Turkan, de Oliveira, Lee, & Phelps, 2014). Turkan et al. (2014) point to systemic functional linguistics (SFL) as a theory of language that offers promising ways of talking about language in support of disciplinary learning. SFL offers a linguistic perspective that connects language and meaning in social context (Halliday, 1978; Halliday & Matthiessen, 2014) and describes variation in language in ways that acknowledge the challenges of different disciplines (Schleppegrell, 2004).

SFL’s meaning-based *functional grammar* offers an array of analytical tools for engaging in disciplinary meaning making. Recent research in primary and secondary classrooms has demonstrated that empowering teachers and students with a metalanguage, a language for talking about language, can support students’ disciplinary learning and language development. There are powerful illustrative examples in science (Fang & Wei, 2010), history (de Oliveira, 2010, 2011; Schleppegrell & de Oliveira, 2006), and English language arts (Gebhard, Harman, & Seger, 2007; Moore & Schleppegrell, 2014; for a review, see Schleppegrell, 2017). However, these tools have not become readily available to most teachers working with ELs, because SFL’s description of complex systems in language calls for study and adaptation for pedagogical purposes that teachers have little time for. That means that theory to guide the ways SFL approaches are developed and applied in classrooms is still needed.

Design-based research (DBR; Anderson & Shattuck, 2012; Brown, 1992; McKenney & Reeves, 2012) offers tools and processes that support the development of instructional theory. DBR offers a systematic way of operationalizing high-level theories, such as SFL, and supporting cross-disciplinary research that engages teachers and students in collaborative research. It supports the iterative development of *domain-specific instructional theory* (diSessa & Cobb, 2004) in authentic classroom contexts; in this project, enabling us to evaluate the ways SFL theory and tools can be used to effectively engage English learners in

disciplinary learning. We offer a case study analysis of how a DBR research process yielded research findings, materials, and instructional theory over a 3-year project to develop SFL-based approaches to engaging ELs in talk about language to support disciplinary learning.

In the Language & Meaning Project, conducted in an urban school district in the midwestern United States, we worked collaboratively with teachers and literacy coaches at six schools with high proportions of ELs, supporting them in using SFL metalanguage to talk about language and meaning as they engaged in grade-appropriate literacy activities: reading and responding to texts and writing subject-specific arguments. We began with a theory of change and design principles that drew on previous research, and used those principles to design activities and observe teachers' enactment, recognize shortcomings, and return to our principles to reevaluate and further develop them. This article reports simultaneously on the DBR processes we engaged in and the new instructional theory we developed about productive ways SFL can be used to support students' engagement in subject-specific literacy practices. Our goal is to share both what we have learned about the implementation of SFL pedagogies and the affordances of DBR methodology for learning to apply a complex theory to support ELs.

STUDYING A DBR PROJECT

This narrative case study account (Brown, 1992; Yin, 2009) of our DBR process traces the development of SFL tools for English language arts (ELA) that supported students to read grade-level narrative texts and write thesis-driven character analyses. Our research questions for this narrative inquiry are as follows:

1. In what ways did DBR processes support the systematic development and revision of instructional approaches guided by SFL? What were the critical events in that process?
2. What domain-specific instructional theory has our DBR process yielded for understanding how SFL constructs can support students' reading and writing in ELA?

To construct the account, as described below, relevant data from our study were identified and a chronological *case description* (Yin, 2009) was written to tell the story of the curriculum development, focusing on key episodes that were further analyzed. Finally, tools from *narrative inquiry* (Webster & Mertova, 2007) helped us narrow evidence and refine the analysis.

Research Context and Project Overview

We conducted our project in a school district where a majority of students speak Arabic at home and many are identified as ELs of varying levels. Data presented here come from the first two years of the project, when many of the key design decisions were made. In year one, we worked in one school, engaging with eight classroom teachers (200 children in Grades 2–5) and two instructional coaches. We introduced SFL concepts and examples of how those constructs could be used to talk about meaning in text. These educators participated in eight full-day, on-site workshops, held approximately once per month, in which we collaboratively designed activities that engaged students with texts from grade-level curricula. This work helped us better understand how SFL could be made relevant to ELA instruction, as we report below.

In the second year, we collaborated with teachers and coaches from four additional schools (21 participants from 12 classrooms serving approximately 300 students). Teachers attended a 5-day orientation prior to the start of school, and then five daylong workshops throughout the year in which researchers presented SFL concepts and modeled units of instruction that had been piloted in a subset of classrooms. These units drew on SFL to engage students in talking about meaning in curricular texts or to support their writing. Between workshops, teachers implemented these lessons (which were videotaped and observed), collected student work, and completed teacher logs in which they reflected on their experience. We also conducted focus group interviews with teachers. In the final year of research, 20 classroom teachers and 13 coaches implemented the instructional units, with further refinements, in 20 classrooms across five schools (serving approximately 500 students).¹

Data and Analysis

DBR involves iterative cycles of exploring and investigating, followed by design and construction, and then evaluation and reflection (Collins, Joseph, & Bielaczyc, 2004). Table 1 displays data collected in phases of *exploring and investigating*, *designing and constructing*, and *evaluating and reflecting* as we developed and implemented each unit of instruction in one of these iterative cycles. To answer our first research question, we systematically examined these data to report on how and

¹ For reports on aspects of this project not discussed here, see Schleppegrell (2016); Palincsar and Schleppegrell (2014).

TABLE 1
Primary Data Sources Corresponding to Research Phases

Research phase	Data collected and analyzed
Explore and investigate Design and construct	Interviews with literacy coaches prior to project, researchers' analyses of curricular texts, published research and notes Professional development materials (slides, handouts, activities for teachers); curricular materials
Evaluate and reflect	Observation logs, video of classroom lessons and transcripts, student writing, teachers' logs, analysis of student writing, focus group interviews with teachers, researchers' reflective memos

why SFL was used and how and why its use changed over time. As we engaged in this retrospective analysis, evaluation we had conducted through the DBR process helped us identify events and documentation (e.g., observation logs, reflective memos) that were central to the ways our approach evolved.

Our analysis had three stages, summarized in Table 2. One of the challenges of DBR is managing and learning from massive amounts of data, so initially the first author created an index of all events and relevant data sources, noting their relevance and significance to the curriculum development and identifying artifacts and questions to explore further. This initial inventory was reviewed by other research team members to develop notes, clarifying comments, and insights regarding tensions or patterns in the data and to allow alternative interpretations to emerge.

In the second stage of analysis, we developed a *case description* (Yin, 2009) of the curriculum development (Moore, 2014), telling the story of its evolution. For example, a classroom observer's indication that

TABLE 2
Summary of Data Analysis for Narrative Inquiry

Stage 1	Stage 2	Stage 3
- Create an index of all events and data sources - Identify data central to understanding how the work evolved - Review the data to confirm centrality for constructing a case narrative	- Develop a case narrative of project activities - Identify episodes that informed major decisions, and analyze them to identify themes or tensions that emerged - Generate preliminary theoretical propositions (answers) to research questions	- Identify and reanalyze <i>critical</i> and <i>like</i> events relevant to research questions - Engage in explanation-building process, considering how events identified support or challenge theoretical propositions - Revise theoretical propositions in response to analysis

something was going well or poorly often pointed to issues that became foci of discussion in the research group and led to changes in the approach. We explored what followed from such discussions and engaged in deeper analysis to consider how those moments had shaped changes. We identified episodes of classroom talk that had been flagged in the observation logs as being either particularly productive or unproductive. These episodes were analyzed to identify themes or tensions that had surfaced at different points in the project. The case description was redundant by design, often including multiple examples of the same themes or tensions. We then generated preliminary theoretical propositions in response to our research questions. A preliminary proposition developed as we reviewed our first year's data, for example, was that providing teachers and students with genre-specific stage labels would support students' argument writing, a proposition that was later refined in response to data collected through our DBR process.

In the third stage of analysis, we used tools from narrative inquiry (Webster & Mertova, 2009) to identify *critical events*, episodes and moments that had "impact and profound effect" that brought "radical change" (Webster & Mertova, 2007, p. 77); in this case, change in our thinking that revealed "a change of understanding or worldview" (p. 73) that further shaped our work. The identification of *like events*, illustrating or repeating the experience of critical events, confirmed or broadened our understanding of ideas that surfaced in critical events. Critical events were then analyzed using *explanation building* (Yin, 2009) to understand how the critical events might support or challenge our preliminary propositions and help us revise them to answer our research questions. An important part of this process was to consider and discuss alternative interpretations. Our examination of the development of the entire research project yielded 20 critical events that met the above criteria. For this analysis, which focuses on the ELA portion of our work, seven critical events were relevant.

SFL is a complex theory of language as social semiotic. It offers a functional grammar that connects meaning with language forms, recognizing three metafunctions of language that are always simultaneously realized as we speak and write. We always *represent experience*, *enact a relationship with a reader or listener*, and *shape a message in ways that relate it to what has come before and what is new*. The ways these *ideational*, *interpersonal*, and *textual* meanings are presented in language are described in the SFL grammar, but the grammatical descriptions come in linguistic terms that have been elaborated for and by linguists. Our purpose, as researchers knowledgeable about SFL and committed to enabling teachers to use it in ways that would help them meet their

instructional goals, was to study how we could “translate” SFL theory into useful constructs for pedagogical purposes at the level of the classroom. The DBR process enabled us to report specific ways the DBR process supported us in adapting constructs from a complex linguistic theory for ELA classrooms with children learning English. We report those findings below.

FINDINGS

Overview

In this section, we show how DBR supported the development of SFL-informed instructional approaches (research question 1) through theory- and research-based design principles that offered operational, evaluative criteria for analyzing project data. That analysis led us to revise the design principles and come to new understanding about the use of SFL theory in discipline-specific pedagogies that support ELs’ engagement in rich literacy practices in ELA. We present three claims about how the DBR process supported us, as we describe and analyze critical events that make the evolution of the new instructional theory explicit.

Claim 1: Theory- and Research-Based Design Principles Offered Operational, Evaluative Criteria for Design and Development

DBR begins by identifying a problem and drawing on research to propose a theoretically grounded intervention. Connecting the problem to research that informs the issue results in a theory of change that clearly articulates how the proposed project could lead to changes posited to have a positive impact on the problem. Our theory of change argued that, if teachers developed knowledge about language and used it to encourage students’ meaningful focus on language in reading, speaking, and writing, they would support ELs’ language development and grade-level learning. We drew on Gibbons (2006), Gersten et al. (2007), and Téllez and Waxman (2006), among others, to support the need for explicit talk and interaction about language and productive use of new language to help ELs develop academic English. Furthermore, this research indicated that teachers need to develop a knowledge base to support such work.

To that end, we drew on SFL as a theory of language that offers an explicit metalanguage for talking about language in meaningful ways (Schleppegrell, 2013). The metalanguage provides systematic ways of recognizing meaning in grammatical choices at word, sentence, and text level and relating those meanings to social context (Halliday, 1985). From a pedagogical perspective, a functional approach puts meaning first and considers attention to grammar as a “means to an end” (Halliday, 1985, p. xiv). Metalanguage based on SFL’s functional grammar can be a tool for analyzing how language functions and for helping teachers engage with students to explore “how, and why, the text means what it does” and evaluate “why the text is, or is not, an effective text for its own purposes” (Halliday, 1985, p. xv). Linguistic scholars have demonstrated the power of SFL’s functional grammar for deconstructing the language of schooling (Christie & Derewianka, 2008; Martin & Rose, 2008; Schleppegrell, 2004) in ways that help learners see how English “works.” Our goal was to further contribute to the translation of SFL theory and its powerful analytical tools into accessible pedagogical tools for engaging English learners in language learning and disciplinary meaning making.

We operationalized our theory of change through design principles that established evaluative criteria for assessing our innovations. In DBR, the principles themselves are also then evaluated and refined as the work progresses through design cycles. Our initial design principles were as follows:

Principle 1: Support explicit, meaningful attention to language.

Principle 2: Develop teachers’ explicit knowledge about language.

Principle 3: Support meaningful interaction between students and teachers.

We theorized using SFL to develop teachers’ knowledge about language, and then supporting them in using the metalanguage to interact with their students in ways that would meaningfully attend to language forms and meanings, and would enable ELs to engage in the kind of talk about language relevant to subject area learning that would support them in grade-level work. We used these principles to develop and evaluate our first attempts to design SFL-supported ELA activities.

Critical Event 1: Too much explicitness, narrow meaning making. We began our work with teachers by introducing the SFL notion that sentences and clauses can be broken into meaningful constituents, referred to as *participants*, *processes*, *circumstances*, and *connectors*. We believed this would offer a foundation of metalanguage for close analysis of texts across subject areas. When applying these tools to narrative texts, we focused on the different types of *processes* that clauses can represent:

doing processes that present actions (he *ran*), *being* processes that present descriptions or definitions (he *is tall*), *sensing* processes that present feelings or thoughts (she *liked* music), and *saying* processes that present speech (he *said*, “Let’s go!”; Martin & Rose, 2003). Tracking on a character and her or his processes can support literal understanding of story events and also offer opportunities for making inferences about characters’ reactions and motivations (Williams, 2000).

Using the notion of *processes*, teachers and researchers co-planned lessons to engage the children in analysis activities with stories from their curriculum. The SFL metalanguage served as a tool for close reading, its ultimate purpose being to support deep understanding that would prepare students for a class discussion about the story. In a typical lesson, the class first read the story interactively, stopping to focus on vocabulary or to relate the text to their own lives or other texts. Then, the teacher introduced the metalanguage of *processes of different types* and asked students to work collaboratively to identify the processes that a character in the story engaged in, working first in small groups and then sharing their findings, leading to a whole-class conversation about the text as a whole.

As we observed in classrooms, we recognized ways that the activities did not fully align with our principles. A critical event from a fifth-grade classroom illustrates a pattern of enactment uncovered by systematic evaluation of our work using the design principles. Students had read and discussed *La Bamba* by Gary Soto (1990), the story of Manuel, a boy who volunteers to perform a dance at his school’s talent show contest. In preparing the lesson, researchers and teachers recognized that Manuel’s feelings were mainly represented in *sensing processes*, such as “He wanted applause as loud as a thunderstorm.” Recognizing this, researchers and teachers planned a lesson that asked students to identify the sensing processes that presented Manuel’s feelings at important parts of the story.

Students worked in small groups for the task. In Episode 1, they encounter the sentence that describes Manuel’s motivation for participating in the talent show: “He yearned for the limelight.”² A researcher observing the lesson stops by to check in with the small group and answer students’ questions.

²Transcription conventions: Student names are pseudonyms. Narrative text quoted in dialogue in *italics*; functional metalanguage underlined. Stressed words in CAPS. Elided material marked as [...]. Pauses of 1 second or less indicated by ‘,’ longer pauses by ‘...’. Incomprehensible talk marked by xxxx. Text in [brackets] denotes overlapping speech. Interrupted speech marked by long dash, —.

Episode 1:

1.	Rayna:	Should I write <i>yearned</i> ? Should I write <i>yearned</i> in here?
2.	Khalil:	I don't think <i>yearned</i> is one.
3.	Alia:	He was worried that . . . a feeling? Yeah, worried!
4.	Khalil:	Where is it?
5.	Rayna:	Yeah, yeah, <i>yearned</i> , is a sensing. He felt surprised. Yeah, he was surprised about something.
6.	Researcher:	[hearing <i>worried</i>] That's a good sensing word, isn't it?
7.	Rayna:	Oh, yeah. What is that? What is <i>yearned</i> ?
8.	Researcher:	Oh, are you talking about the word <i>yearned</i> ?
9.	Khalil:	Yeah.
10.	Researcher:	That's a good sensing word too. Do you know, what's another word for <i>yearned</i> ?
11.	Rayna:	Amazed.
12.	Alia:	Flabbergasted.
13.	Researcher:	Ah, no. Not quite. To <i>yearn</i> for something is to want something badly.
14.	Alia:	Wanted.
15.	Researcher:	He <i>yearned</i> . He really, really hoped. He wanted.

Notes in the observation logs commented on the interactive nature of the activity (Principle 3) and that the teacher and students were using explicit linguistic metalanguage (Principle 2). But further analysis identified misalignment to Principle 1: supporting explicit and meaningful attention to language.

As Episode 1 illustrates, the activity's process focus prompted students to pay particular attention to *yearned*. Although they were correct in identifying it as a sensing process, and the discussion cleared up their misunderstanding (turns 3 and 5) of the word's meaning, absent in this exchange is conversation about what Manuel was yearning *for* (the lime-light) and what this tells us about Manuel. We saw that the activity of identifying sensing processes kept the focus on word meaning but did not connect to the overall context of exploring Manuel's emotions. We also observed that characters' feelings were often presented in other kinds of processes, such as processes of doing (e.g., at one point Manuel shivers with fear), but the activity excluded those important meanings. Observation logs for other lessons in this development cycle also identified similar shortcomings to our approach, particularly in meeting the demands of Principle 1. This led us to further consider what we meant by *explicit, meaningful attention to language*, because we recognized that just helping students learn word meanings did not meet our goals.

We often saw new words come into focus and be used enthusiastically by the students; furthermore, the search for different sensing processes promoted the noticing and focused attention that supports language learning (Schleppegrell, 2013). It introduced new vocabulary to students in this regard, addressing the common need for contextualized, meaningful vocabulary instruction with content. Relatedly, the time used for these activities and the need to focus on ELA

disciplinary goals meant we had to find ways of making the SFL meta-language more relevant to the curriculum. The lessons showed us that examining the attitudes of characters as they progress through stories was appropriate, and teachers agreed that looking closely at characters, how they feel and how they change, was central to their ELA objectives. The evaluative criteria established by the design principles enabled us to identify challenges to be addressed in future iterations of the work.

Critical Event 2: Inadequate support for students’ argument writing. After the first round of activities focused on reading, teachers and administrators requested additional support for persuasive writing across subject areas. To accommodate that request, we drew on Dere-wianka (1990) to offer a general purpose for persuasion, and also some functional stages. We defined the purpose, “to take a position on some issue and justify it” (p. 75), and identified stages as *position or claim, evidence, and analysis*. We expected these functional terms would enable students to identify evidence for making claims about characters in their writing (Principle 1). We supported students in interacting to discuss their developing arguments, providing a rich context for the exchange of ideas (Principle 3).

Again, a pattern emerged in our evaluations of the lessons and student products as we identified critical and like events through our analysis of student interactions and writing in multiple classrooms. An illustrative event comes from a group of fourth-grade students who were discussing San Souci and Perrault’s (1998) story *Cendrillon: A Caribbean Cinderella*. They were looking for evidence about whether the main character should have changed her appearance to escape her difficult situation. The observation log noted that the lesson supported students in connecting evidence with analysis, flagging the following exchange as substantive. Each student had identified a point of textual evidence (quotes from the story in italics) that she or he was defending:

Episode 2:

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- | | | |
|----|---------|--|
| 1. | Fatima: | (reading) <i>But I am strong.</i> If she is really strong, she doesn’t care whether Paul likes her or not. Just go and find somebody else. |
| 2. | Laila: | (reading) <i>She worked all day.</i> |
| 3. | Amir: | And she never says no to anything. |
| 4. | Fatima: | Give her a break for God’s sake! |
| 5. | Laila: | (reading) <i>Her hands were blistered and red.</i> |
| 6. | Fatima: | Give her a break, she needs some rest. This one [the godmother], she should change. |
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The small group structure and clarity of purpose created a context in which students interacted in meaningful ways (Principle 3),

offering interesting and insightful evaluations of the characters. Fatima and Amir both offered comments that were critical of Cendrillon's need for a Prince Charming to rescue her, saying that she should have stood up to the godmother and her abusive ways (lines 1 and 3). Laila and Fatima then recognized that Cendrillon had legitimate reasons to escape: Laila offered up two pieces of evidence about the physical toll of the situation, and Fatima offered up a fiery, sharp defense of the character. This excerpt (and others) were also evaluated positively in regard to Principle 1, as the context of the debate activity itself (an evaluative prompt), and stage labels supported students in being explicit about establishing opinions and wielding relevant evidence.

However, observations of multiple lessons indicated that students did not offer much analysis, or elaborated reasoning, connecting their claims and evidence. Episode 2 is an example. Only Fatima, in turn 1, explicitly links the evidence she presents back to the claim. The other students are on point, offering either a claim or evidence, but they do not explicitly link these or offer an elaborated rationale—a key feature of analysis.

We recognized that our materials and approach did not sufficiently support teachers to explicitly articulate what analysis is in the context of responding to narrative texts. Our materials had defined analysis as “point(s) to support position or claim, tying reason/evidence to position/claim, answering ‘so what?’ about the evidence.” This was insufficient guidance for teachers to explain what was expected. Some teachers provided examples of analysis, but none gave explicit direction. We had not supported teachers to be explicit about how to meaningfully analyze evidence. In this way, we failed to provide adequate support for development of teachers' linguistic knowledge (Principle 2).

Our assessment of student writing corroborated the patterns in the observation data: Students often provided relevant evidence for a clearly stated claim, but they generally had difficulty providing elaborated analysis. For example, after discussing *Dear Mr. Henshaw*, Cleary and Zelinski's (1983) story of a boy named Leigh who writes a journal while dealing with his parents' divorce, fifth-grade students responded to this prompt: *Does writing help or hurt Leigh? Provide evidence and explain your reasons why.* Mustafa's response, below, claims that Leigh's writing had helped him because it was a way to express his feelings. Mustafa's strongest point of analysis elaborated on evidence from Leigh's journal entry describing a landscape on a sunny day:

My first reason is when Leigh wrote the grove was quit [quiet] and peaceful and because the sun was shining, I stood there a long time. It

helps him because he feels happy and keeps his mind off his dad. When he thinks about his dad it makes him sad.

Here Mustafa interpreted how Leigh was feeling and connected it to his claim, saying that writing was a welcome distraction from missing his dad. But his other attempts at analyzing evidence were less successful:

My second reason is [Berry] said that he liked to eat at Leighs house. That made him real happy. It was also something nice he said.

This attempt at analysis does not relate the evidence to the claim that writing helped Leigh. This was a challenging prompt, but we saw similar issues even when the writing task was more straightforward. Instead of analyzing, students often merely reported more details from the story as self-evident support of their claims. An analysis of students' writing that compared responses to the *La Bamba* text and *Dear Mr. Henshaw* (O'Hallaron, 2014) helped us develop more nuanced understanding of analysis that shaped our future work, as we report below. Related to our second principle, this critical event exemplifies an issue that surfaced in our DBR process in other tasks as well: considering all of the ways teachers need to be able to be explicit about language in order to support students.

Critical Event 3: Making linguistic knowledge meaningful. Critical event 3 emerged from our Year 1 analysis of activities focused on the ways authors infuse attitudes into texts. We had introduced teachers to concepts from SFL's *appraisal* framework (Martin & White, 2005), which offers analytic tools and metalanguage for negotiating attitudes presented in texts. Teachers learned to assess the *polarity* of attitudes (are they positive, negative, or neutral?) and the *force* of those attitudes (are they turned up [intensified] or turned down [softened]?). Consider the following two sentences:

1. The girl laughed when her father tickled her.
2. Every evening, the bubbly baby cackled when her daddy tickled her.

In the second sentence, the baby's positive attitude is *turned up* through the doing process "cackled" and by saying this happens every evening. An example of *turning down* the girl's positive response would be "she only laughed a little." We confirmed the value of this metalanguage in our classroom observations, but an interesting challenge emerged in a fourth-grade lesson focused on revising student writing.

We saw that turning up and turning down language might not always be presented in meaningful ways. During the task, the students

were to look closely at a model text provided by the teacher and identify places to revise the writing, focusing closely on attitudes in the text. However, the teacher equated highly emotional writing with good writing and only encouraged the students to turn up attitudes. This became problematic in a group discussion of Amanda’s essay. Her hero was her father, and she had written that sometimes when her dad got mad his face turned red. In a small group, the students had turned up that phrase to “when my dad gets furious, his face turns red as fire.” The teacher, listening to the small-group conversation, intervened:

Episode 3:

1.	Ms. Sadir:	I have a question. What is this paper about?
2.	Sabreen:	It’s about, like, when you have a dad.
3.	Ms. Sadir:	No, no. What was this essay about?
4.	Abudulla:	Turning up words.
5.	Ms. Sadir:	No. Ok, who wrote about their hero?
6.	Sabreen:	Amanda.
		...
16.	Ms. Sadir:	If a girl is talking about her hero, who happens to be her dad, do you think she would describe him as sometimes getting FURIOUS, or sometimes just getting ANGRY?
17.	Ss:	Angry.
18.	Ms. Sadir:	Why? Why would they rather . . . Hamad.
19.	Hamad:	She’s describing her dad, who’s her hero. If it’s her hero, why would he be furious? You can’t]
20.	Ms. Sadir:	[you mean, if someone is your hero, you don’t think they become, FURIOUS, because is furious a good characteristic to have? I mean, you could, I mean sometimes I get furious, it doesn’t mean I’m a bad person, but I just want you guys to keep in MIND this girl is writing about her dad who happens to be her hero. And that is very important to keep in mind when you are thinking about word choice.

In line 4 we see the problem: The lesson is not about “turning up words.” The teacher reorients students to the author’s purpose, perhaps recognizing she had mistakenly encouraged turning up attitudes as an exercise without considering the purpose of the text. At lines 16–20 she helps students see that turning up the dad’s anger was counter to the author’s goal.

This critical event helped us better understand a key point about Principle 2: that it is not just the linguistic knowledge itself, or the understanding of SFL concepts, that is important for teachers and students to develop. Instead, teachers need to understand why they are using the metalanguage, how it can be used to talk about meaning, and how to teach it in ways that support students to achieve curricular goals. The language features and the meanings they present need to be aligned with the writing task—its genre and its purpose—and the metalanguage needs to enable a focus on meaning that helps students

consider alternative ways of achieving writing goals. This event underscored for us that our work needed to support teachers' deeper understanding of how and why particular linguistic tools are used, and not just engage teachers in using the tools.

Claim 2: Patterns in Classroom Data Informed the Revision of Design Principles and Instructional Approach

As we worked to identify patterns in our data and generate explanatory theories about the critical events, we came to an important insight. In presenting teachers with SFL metalanguage and having them use it to analyze texts, we had organized our framework around language features. This made teaching SFL the driving force—the primary content—of our approach. Although teachers were interested in the insights they gained through the language analysis, we saw that it was unlikely they would continue to use the approach on their own without having it more clearly linked to and situated within rich content learning. We were confronted with the need to reconsider how we could focus attention on language in ways that better supported broader ELA goals.

Critical Event 4: Systematic exploration of research and theory to foreground purpose in reading and writing. The composition of our research team, including classroom educators and literacy researchers as well as systemic functional linguists, enabled us to draw on a range of theoretical perspectives and work in transdisciplinary ways. This was especially helpful in our effort to make the purpose of literacy practices more explicit in our work. Specifically, at the end of Year 1, we returned to research to consider additional perspectives on reading comprehension and disciplinary literacy. We drew on Kintsch's (1998) construction–integration model of text comprehension; in particular, his concept of a *situation model* helped us attend to what we meant by “meaningful” attention to language. Readers need to construct mental models of a text in order to make inferences suitable to their reading purpose. As discussed in Critical Event 1, our lessons had been only partially successful in supporting students to construct the situation model presented by the text. By foregrounding identification of process types as a means of recognizing characters' feelings, we had expected students to make judgments about characters without explicitly supporting that move. Without foregrounding and supporting the

overall purpose of the work, the activities did not fully address ELA goals.

We also returned to research on disciplinary literacy (Christie & Derewianka, 2008; Moje, 2008) to foreground social purpose and habits of mind important to successful participation in ELA. Among forms of participation in ELA is the writing of genres central to the subject area, and we focused on making concrete the larger goals of those genres and the literacy practices necessary for student success. SFL offers a genre theory that is well suited to a disciplinary approach to learning, because it positions genres as goal-driven social activities (Martin & Rose, 2008), and SFL scholars have done substantial work in articulating the social purposes and patterned structures of common forms of writing in school (Christie & Derewianka, 2008). This return to theory in thinking about how we were supporting reading and writing helped us better articulate what analysis is in ELA genres and identify linguistic metalanguage that is well matched to the skills and habits of mind that can support students' successful reading and writing, as we describe below.

Critical Event 5: Revising design principles to foreground disciplinary practices. In light of these cumulative formative evaluations and insights about the overall framework for our approach, we returned to and reevaluated our design principles, considering how we could revise them to focus us more explicitly on supporting the goals of ELA through our work. We reformulated the design principles to highlight, in further development and evaluation, the ways the SFL metalanguage could serve the teachers' content and learning goals. This decision was a turning point in our DBR process, with newly formulated design principles making the new focus prominent:

Principle 1: Support explicit, meaningful attention to the language of the texts students read and write *in service of achieving specific disciplinary goals of the curriculum.*

Principle 2: Develop teachers' explicit knowledge about language *for purposes of supporting curricular learning.*

Principle 3: Support interaction between students and teachers to stimulate and support students' *meaningful language use in disciplinary learning.*

As we moved forward in our work, we kept this disciplinary focus in the foreground and set about to make SFL explicitly relevant to enabling teachers to achieve their ELA goals. This decision led to a new stage of exploration and investigation to inform the structure

and trajectory of our work in Year 2. We began this work by choosing a genre specific to the subject area that would offer opportunities for analyzing narrative text. The character analysis genre described by Christie and Derewianka (2008) asks students to explain how a character changed and why, or to evaluate a character's words or actions for a particular purpose, often to engage in discussion of ethical or social issues. We analyzed multiple narrative texts, including some written by members of the research team, as well as the writing students had done to identify the language features that are functional for achieving the purposes of the character analysis genre so that we could focus on these to more explicitly support the analysis of literary texts. Through this genre analysis, we identified some specific functions of analysis in the genre: It often needed to (1) interpret evidence presented about characters' attitudes and (2) evaluate the character in light of that evidence. We thus incorporated two new stage labels, *interpretation* and *evaluation*, into our materials, described below in more detail.

We also saw ways that the linguistic metalanguage could explicitly support students in reading to identify evidence for analytical writing. The concepts and metalanguage from the appraisal framework (positive/negative; turned up/down) could support students in two ways: by attending to the strength of characters' feelings and by modulating their own claims about the characters. The metalanguage of process types could also help readers make inferences about and interpret attitudes implied in characters' actions (the doing processes that we had not earlier made a focus of attention). Guided by the overall purpose of helping students find patterns in the language used to describe, analyze, and evaluate character attitudes when reading, as well as to present claims and discuss evidence when writing about the character, we drew on this metalanguage in new ways as we moved forward.

The revised principles informed the design of the second-year ELA curriculum and enabled us to propose new instructional theories emerging from our DBR process that helped us better see how SFL could become useful to and usable by ELA teachers of ELs.

Claim 3. Revised Principles and Implementation in Additional Instructional Contexts Supported Development of Instructional Theory for the Use of SFL in ELA

Critical Event 6: Developing instructional theory for using SFL to analyze characters. In the second year of the project, we saw that the revised approach resulted in classroom work that was better aligned with our design principles. Detailed evidence of this is presented in

Moore and Schleppegrell (2014). Among the findings, students and teachers alike used the functional metalanguage to make important meaning of text, going beyond the word-level emphasis we noted in earlier iterations. The application of tools from the appraisal framework, designed especially for talking about attitudes, proved productive. Teachers often asked questions about the strength of characters' attitudes using the metalanguage of positive/negative and turn up/down, and supported attention to the author's purpose in the texts students read. The focus on process types was more productive as we contrasted the ways *doing* and *saying* "showed" characters' attitudes and helped students see how they could express these "shown" attitudes in *being* or *sensing* processes that "tell" how the characters feel as they interpreted them (see Moore & Schleppegrell, 2014). Furthermore, students acted out some of the doing processes that showed emotions—leading to more extended student contributions about what the characters were feeling, why, and how the language informed their ideas. The approach struck a balance in regard to being both explicit and meaningful (Principle 1), and the extended turns (and dramatic performances) better promoted student interaction (Principle 3).

These developments emerged when teachers demonstrated clear purposes for use of the metalanguage to achieve ELA goals. Episode 4 is an example from Ms. Sadir's fourth-grade classroom, with a different group of students in Year 2 of our project. Students read the story *Pepita Talks Twice/Pepita Habla Dos Veces* (Dumas Lachtman & Pardo Delange, 1995). In the story, Pepita becomes frustrated with having to translate for her neighbors and tries speaking only English. Her experiences ultimately help her discover how necessary and wonderful it is for her to speak two languages. As they read and prepared to write, students considered these questions: *How do Pepita's feelings about speaking two languages change throughout the story? Does she handle the situations well?*

Students engaged in language analysis and conversation about Pepita's changing emotions in the story. In the beginning, Pepita's growing frustration with having to translate is presented in an abstract grammatical *participant*, a *grumble*. "Pepita did what Mr. Hobbs asked. But deep inside of her a grumble began." As Pepita's frustration develops, so does the language of the *grumble*. At first she helped her neighbors *without a grumble*. But then, a *grumble began*, the next instance it *grew*, and then *grew larger*. Things came to a head when translating makes her miss an opportunity to teach a new trick to her puppy, Lobo. When she finds that her brother has already taught Lobo the trick, Pepita's *grumble grew so big it exploded*. In small groups, students considered how the author presents these different emotions, using the metalanguage to analyze

the polarity and strength of her emotions and discussing why Pepita was feeling that way. In a full-class discussion, the students shared their discoveries, their interpretations, and their rationale. The teacher scribed students' contributions on the white board as they shared. She arranged them on a continuum that allowed for students to record and track on language representing how Pepita's feelings were becoming increasingly negative.

Episode 4 demonstrates the teacher's flexible and purposeful use of the metalanguage. She paused the students' sharing to step back and consider the character's changing feelings:

Episode 4:

1.	Ms. Sadir:	What's happening here? Let's just stop for a moment before we continue. What's happening with how Pepita is feeling? Malak?
2.	Malak:	She's getting like more mad and she's getting not okay with it ... <i>Teacher engages students in a discussion about Pepita's feelings, and they share different words suggested to characterize her feelings.</i>
12.	Ms. Sadir:	What's happening as we're moving along in the story? [Is she getting]
13.	Student 2:	[Her grumble is growing.]
14.	Ms. Sadir:	Her grumble is growing, ok?
15.	Student 3:	Her feelings are turning up.
16.	Ms. Sadir:	Her feelings are turning up. What kind of feelings are turning up? Negative or positive feelings?
17.	Multiple students:	Negative.
18.	Ms. Sadir:	Negative feelings are definitely turning up. Very good.

The students use metalanguage to support them to describe how Pepita's frustration is presented (turns 13, 15) and amplified ("turned up negative feelings"). Their responses are specific and text-focused, as the teacher's move to step back and consider the character's changes across the text offers a clear purpose for talk about language. Beyond supporting analysis of individual examples, the metalanguage also helps students see a pattern in how the character's feelings were changing (and why)—the central purpose of the discussion. This flexible, purposeful use of the linguistic metalanguage offered us positive evidence that our second principle was being applied effectively. It wasn't just the linguistic knowledge that was in focus; instead, the linguistic metalanguage was used for specific instructional purposes, to engage students in a focused conversation about Pepita's changing feelings about her life as a multilingual person in the United States. Likewise, this more purposeful focus on vocabulary addressed the limitations discussed above, as the attitude line supported students' in-context vocabulary development. For example, by considering multiple synonyms for *mad* or *frustrated*, students focused closely on connotations and subtle shades of meaning of words presenting characters' attitudes.

Critical Event 7: Supporting argument writing with specific genre stages and related activities. A disciplinary approach to supporting students' argument writing likewise produced more positive results. We offered more precise labels to support students' analysis—labels specific to the character analysis genre. Analysis was broken down into two steps: *interpreting feelings* and *evaluation*. The purpose of interpreting feelings was presented as “telling what the author shows in the story,” with reference to the process types they might use (*sensing, being*) to *tell* the feelings that were *shown* in *doing processes*. The purpose of evaluation was presented as “making a careful judgment of the character,” using verbs such as *shows* and *demonstrates* to help link evidence back to a claim.

Here we offer an illustrative example³ from Malak, in Ms. Sadir's class, of the argument writing our work supported in the character analysis task (see also Moore, 2014).

In the “Pepita Taks Twice” Pepita was a girl who spoke two languages: English and Spanish. Pepipita would help translate for people.

In the beginning Pepita was ferious because she kept on helping everyone & she didn't have time to teach her dog Lobo. After Pepita helped Migeul's mom, then she went to her yard she saw Jaun teaching Lobo, “that the grumble grew so big it expoded.” Pepita felt outraged because she didn't teach Lobo. Pepita handles the situation well. This shows Pepita wants to have her own time to teach Lobo, because she helped alot and she nver gets time to teach Lobo.

At the end Pepita was relived because Lobo was safe when she spoke two languages. Before Lobo was about to get hit by the car in the street, Pepita called Lobo, Lobo darted back, “Pepita shut the gate firmly and hugged Lobo.” As Pepita shut the gate, she hugged Lobo, she felt so excited. Lobo was safe. This shows that Pepita did the right thing because when she spoke two languages she saved Lobo's life.

I found out that Pepita is a good person and thinks perfectly.

Malak's response is representative of the overall class set in a number of ways and suggests strong alignment of the approach with our design principles. First, the claims that he offers at the start of his body paragraphs establish clear, relevant stances about the character, and he, in turn, offers relevant evidence for each. The class as well was largely successful at both features of the writing: In 35 of 42 complete body paragraphs, students offered a strong claim and relevant textual

³ The student's response was handwritten. Here it is transcribed with the student's original spelling, grammar, and punctuation preserved.

evidence (Moore, 2014). Malak's response was successful in ways the previous year's attempts at character analysis were not. After presenting quoted evidence ("the grumble grew so big it exploded"), he interprets the feeling: "Pepita felt outraged because she didn't teach Lobo." Note that his use of "outraged" is an interpretation of *exploded* that aligns well with the amplified attitudes implied in the language of the text, indicating that the application of the functional metalanguage in the reading-focused lessons was purposeful (Principle 2) and translated to students' writing.

Malak also offers successful and elaborated evaluations of Pepita. After writing "Pepita handles the situation well," perhaps counter to expectation, defending Pepita's outburst, he offers up elaborated reasoning: "This shows Pepita wants to have her own time to teach Lobo, because she helped alot and she nver gets time to teach Lobo." He successfully defends Pepita's right to be angry in this moment: that she gives a lot and should be able to have her own time with her dog. Analysis of the class set revealed that nearly all students (41 of 42) offered accurate interpretations of Pepita's attitudes, and more than half (22) of the paragraphs offered elaborated evaluations (Moore, 2014).

Students' responses across classes demonstrated a better alignment with our design principles. The discipline-specific nature of the writing support made expectations for analysis in the character analysis genre explicit—while still giving students freedom to develop their own ideas and express them (Principle 1). We also noted that teachers' linguistic knowledge enabled them to engage students in conversations about how the different stages of the genre relate and depend on one another (see Schleppegrell & Moore, 2018, for a detailed example). These positive evaluations of the instruction thus enabled us to develop and refine instructional theories that offer specific ways SFL can support students' meaning making in ELA, as presented in Table 3.

Summary

We have described how and why our application of SFL in the context of ELA changed as we engaged in the stages and cycles of our design project, how our analysis provided data for observing the relationship between theory and practice, and how the interaction of the two contributed to their mutual development. The design principles made prior research and high-level theories usable by establishing specific goals and criteria for evaluating our approach in both formative and more formal ways.

TABLE 3
Evolution and Supporting Data for Instructional Theory

Initial theoretical proposition 1:	Identifying sensing processes in narrative texts would support students' understanding of characters' emotions.
Evidence/evaluations	<i>Critical Event 1 (and like events):</i> Approach supported explicit, meaningful discussion of vocabulary, but the instructional purpose was narrow or sometimes lost. <i>Critical Event 3 (and like events):</i> Tools from the appraisal framework were well suited for discussing attitudes in text, but teachers needed support for making this focus meaningful in the disciplinary task.
Revised theoretical proposition 1:	Using appraisal metalanguage (<i>positive, negative, turned up/down</i>) would support students' close attention to character attitudes in narrative text; a focus on <i>process types</i> could help students recognize when implied attitudes (presented in doing or saying processes) need to be interpreted in being or sensing processes.
Evidence/evaluations	<i>Critical Event 6 (and like events):</i> Approach supported students in analyzing and interpreting the ways authors present character attitudes in narratives.
Initial theoretical proposition 2:	A genre-specific writing scaffold would support students' argument writing across content areas.
Evidence/evaluations	<i>Critical Event 2 (and like events):</i> The generic argument scaffold (<i>claim, evidence, analysis</i>) did not offer enough specificity about what analysis was. Students' "analysis" often restated the claim rather than offering an elaborated rationale.
Revised theoretical proposition 2:	Discipline-specific support is needed to write arguments in ELA (being more explicit about what analysis means in a character analysis by introducing stages of <i>interpretation</i> and <i>evaluation</i> of evidence).
Evidence/evaluations	<i>Critical Event 7 (and like events):</i> Students wrote elaborated analysis of textual evidence and evaluated characters in a variety of ways.

The narrative inquiry we have presented here helped us understand that the changes in direction we had made during the project were prompted by issues in implementation that related both to the ways we had conceptualized the SFL theory and to the ways the pedagogical context interacted with the theory. Table 3 offers an overview of some ways the DBR process helped us strengthen the theoretical contributions of the SFL metalanguage in our instructional contexts.

DISCUSSION

We have shown through this case study that the DBR process helped us establish that SFL metalanguage could align well with ELA goals, enabling teachers and students to talk about meaning in text in service of character analysis and writing of literary response texts. SFL concepts of polarity and force helped students analyze attitudes; furthermore, connecting the notion of process types to the ELA

metalinguage of show/tell helped students recognize and interpret attitudes, including implied attitudes. Developing more detailed guidance for writing particular phases of the character analysis genre (interpret/evaluate) made the notion of analysis explicit and accessible to ELs in the primary grades as they read and responded to characters in literature, and teachers provided explicit, stage-based support that highlighted the natural constraints and choices inherent in the genre (Moore, 2014).

Through this analysis we have demonstrated that DBR offers valuable processes for enabling high-level theories such as SFL to be made usable. Our theory of change enabled us to start with what we knew from prior research and the design principles operationalized what the theory suggested, serving as a basis for development and evaluation in local contexts as we moved through iterative cycles of exploration in particular classrooms. The records of practice we created helped us develop conjectures about why and/or how specific instructional practices were working or not, moving toward domain-specific explanatory theories about how SFL could be used to support ELs' disciplinary literacy in ELA. We were able to recognize misalignment between our goals and the design principles (i.e., teaching SFL was not our goal; our goal was to have the SFL metalinguage and understanding about language serve the larger pedagogical goals in our instructional context) and change our direction to address them.

The DBR process supported us in not just evaluating what we had designed, but also revisiting and reevaluating our design principles. As we have shown, our principles, as initially formulated, kept us focused on making data-driven, principled decisions in attempts to improve the intervention. However, after our first year, they also helped us recognize important tensions in our work, and we determined that the principles needed revision to foreground the importance of discipline-specific curricular goals, positioning SFL as a tool rather than the content or ultimate goal of our intervention. Throughout this process, our analysis of practice identified additional theoretical perspectives that helped us make our work relevant to the ELA context and informed the revision of the design principles.

The study presented here offers methods for researchers and teachers looking to further leverage SFL to support students' language and content learning. The theories specific to ELA instruction, though relatively local, can be tried and refined in other contexts. Some of the products from this research project also offer concrete SFL-informed tools for use in both ELA and science classrooms (Moore & Schleppegrell, 2014; Symons, 2017) in service of common curricular goals. We also are working to make our scholarly research more accessible in

practitioner-facing publications as well (Schleppegrell, Moore, O'Hallaron, & Palincsar, in press).

Additionally, the design principles presented here offer a starting point for other researchers and teachers looking to modify different SFL constructs for their own instructional goals. But these principles themselves are also in need of adaptation and development. Other theoretical frameworks and research bases could improve both the principles and the instructional products. For example, a design principle informed by culturally sustaining pedagogies (Paris & Alim, 2017) could further strengthen the products presented here and inform the ways they might be adapted for students with different cultural backgrounds. In addition, there are likely other insights from research that could further strengthen this work; for example, a critical literacy lens (Freire, 2000) could support students to not only participate in disciplinary discourses, but to do so while addressing social issues important to them. The primary contribution this article makes is not in the specific discoveries about how SFL might be used to support students' learning, but rather in detailing systematic processes of learning across academic expertise and from the students and teachers who collaborated in this work.

CONCLUSION

We have shown how design-based research helped us situate an approach informed by SFL in service of specific content goals in ELA and helped us understand the different kinds of knowledge teachers and students need in order to engage in subject-specific practices that support learning language and content. We have illustrated some challenges of this work, including the potential for a language focus to be disconnected from meaning, to offer insights to others who are exploring SFL as a way of supporting talk about meaning in service of disciplinary learning. As our work progressed, and as we found more explicit connections between the SFL metalanguage and curricular goals, we were able to draw on the theory in more targeted, purposeful ways, and our revised conceptions about how to make SFL usable led to more powerful and frequent examples of teachers and students using SFL metalanguage to focus on the language in narrative texts to support broader conversations about the important themes of the stories. Both SFL and DBR are especially suited to transdisciplinary work, where researchers from different perspectives collaborate. Coming to these conclusions was supported by the different lenses we brought to the project as researchers, pointing to the need for linguists, literacy

researchers, and experienced teachers to work together to propose and test high-level theories relevant to instructional practice.

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