Handbook of Research on Learning and Instruction

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Learning to Write

Publication details

Susan De La Paz, Deborah McCutchen
Published online on: 14 Oct 2016

How to cite: - Susan De La Paz, Deborah McCutchen. 14 Oct 2016, Learning to Write from: Handbook of Research on Learning and Instruction Routledge
Accessed on: 17 Nov 2019

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INTRODUCTION

Writing can be defined in a variety of ways. In this examination of learning to write, we view writing as a complex cognitive process and examine instruction that is designed to enable writers to communicate their ideas effectively and perform well in academic settings, on standardized assessments such as the Common Core State Standards (CCSSO, 2010), and in the modern workplace (e.g., Brandt, 2005). We do not discuss literary writing as done by published authors such as Toni Morrison and Ian McEwan; nor do we examine the relation between writing and other modes of communicative expression (i.e., other aspects of the traditional language arts or combinations of text, visuals, and sound as discussed in the field of New Literacies Studies). In this review, we examine what is known about writing development from empirical research with children and youth, and we summarize 30 years of writing intervention research that addresses one or more cognitive process deemed central in theoretical accounts of the writing process.

A BRIEF HISTORY: SHIFTING THEORETICAL LANDSCAPE

A focus on the writing process in the teaching and learning of writing, as opposed to only the written product, is so widely accepted today that it may be difficult to imagine a time when this was not the case. In classrooms from elementary schools to universities, it is now common to see students taking part in writers’ workshops and explicitly discussing their planning, drafting, and revising strategies. Such a process-focused approach contrasts sharply with product-focused instructional models, prevalent even in the 1970s. Janet Emig’s (1971) publication of The Composing Processes of Twelfth Graders is often cited as the beginning of the empirical study of the writing process, at least in North America. In addition, the zeitgeist of the 1970s no doubt helped fuel an interest in writing among cognitive psychologists, who had renewed their interest in human activities such as reading (e.g., LaBerge & Samuels, 1974) and complex problem solving (e.g., Hayes, 1981; Hayes-Roth & Hayes Roth, 1979; Larkin, McDermott, Simon, & Simon, 1980; Newell & Simon, 1972). In the 1970s on the campus of
Pittsburgh’s Carnegie Mellon University, the fields of process-oriented composition studies and cognitive psychology converged in the collaboration between Linda Flower and John R. Hayes (Flower & Hayes, 1977, 1980; Hayes & Flower, 1980), who provided a theoretical frame that has influenced writing research for over thirty-five years.

Hayes and Flower (1980) described writing as consisting of three primary processes—planning, translating (i.e., the production of text), and reviewing—all operating under executive control within the constraints of the external task environment and the writer’s long term memory. The model has been revisited and revised over the years (Hayes, 1996, 2006). Yet it has retained its cognitive character, as well as its influence on the field.

Writing instruction also evolved from multiple traditions, each with a different approach to the writing process. Writers and teachers who were part of the National Writing Project, including Donald Graves (1983), Nancy Atwell (1987), Lucy Calkins (1986), and James Gray (2000), helped make what has come to be known as the process approach to writing instruction accessible to thousands of teachers. The process approach was initially characterized by an emphasis on personally meaningful writing contexts and development of students’ identities as writers. More recently, it has been applied to contexts where students are asked to use writing for learning purposes (i.e., writing to learn¹). Other educational researchers, influenced more by theorists such as Vygotsky (1978), Meichenbaum (1977), Brown (Brown, Campione, & Day, 1981), and Hillocks (1982), developed various forms of expert-novice apprenticeship models. Because the writing process is complex, requiring the coordination of multiple and simultaneously occurring cognitive processes, such apprenticeship models are forms of instruction that allow teachers to scaffold discrete thinking processes for students, and give students progressively more responsibility for decision making over a series of lessons. Other forms of writing instruction (e.g., use of models and procedural facilitation; see Bereiter & Scardamalia, 1987) are less widely practiced, but have also figured prominently in empirical intervention research in writing.

THE EMPIRICAL RESEARCH: CURRENT TRENDS AND ISSUES

Although writing warrants study from a range of theoretical perspectives (see Bazer-man, 2008), the seminal cognitive model outlined by Hayes and Flower (1980) has generated a substantial body of empirical research on cognitive processes involved in writing and on writing instruction, which is the primary focus of the present chapter. We use the three major processes proposed by Hayes and Flower (i.e., planning, translating, and reviewing) as an organizational frame, examine more current influences on writing (e.g., knowledge of genre and text structure), and highlight research on specific populations of students (e.g., English learners and students with special educational needs). For each of the major writing processes, we overview the empirical research pertaining to that process and its development, and then specifically consider findings from the instructional research that show promise for improving classroom practice. We end with calls for researchers to parse effects of individual components within complex interventions, and to attend to disciplinary writing purposes.

Planning What to Write

Processes and General Development.

Planning received considerable emphasis in early versions of the Hayes and Flower model (1980; Flower & Hayes, 1984) and was held almost as the sine qua non of writing
expertise. According to Hayes and Flower (1980), planning entails setting goals, generating content, and organizing that content in terms of the developing text. Plans can be general or local, and they can be made in advance or evolve during writing (Galbraith, 1996). The importance of planning as the hallmark of writing expertise has been downplayed considerably in Hayes’s later refinements of the model (Hayes, 1996, 2006), and currently planning is considered one thing, among many, that expert writers do more than novices, and especially more than children.

In addition to differences in the quantity of planning, the qualitative nature of planning tends to differ strikingly between experts and children, in the absence of instruction. Even without prompting, expert writers can be quite articulate about the conceptual aspects of their planning. They formulate goals for their texts (e.g., to reach a given audience, to present a particular persona) and then develop plans to achieve those goals. Consider, for example, the protocol of a particular professional sports writer as he prepared his responses to readers’ letters for his weekly newspaper column:

I try to read them [the readers’ letters] and react to them in a way that is entertaining . . . And I try to avoid being jargonistic or requiring expertise for a reader to understand the answers, because I believe that this is a pretty good way to bring a lot of nontraditional sports readers into the section. So I don’t want to alienate them by, by writing in a way, which requires them to know—presupposes that they know a lot of things.

(McCutchen, 1988, p. 309)

Most writers, including young children, engage in some form of planning. Children may use drawings to generate ideas and plan their stories (Dyson, 2008; Teale & Sulzby, 1986). Young children’s protocols, however, typically reveal little explicit conceptual planning, especially in advance of writing. Analyses of prewriting pauses reveal that children often begin writing within a minute of receiving a writing task, and they are often incredulous when told that some writers spend 15 minutes or more before they write (Bereiter & Scardamalia, 1987). The protocols produced by children in the early elementary grades frequently consist of the words being written, rather than interplay among planning, text production, and reviewing processes (Bereiter & Scardamalia, 1987; McCutchen 1988).

It is not the case, however, that children are unable to plan. When the contexts are meaningful, even children as young as kindergarten show signs of implicit planning for specific audiences (Lee, Karmiloff-Smith, Cameron, & Dodsworth, 1998; Littleton, 1998), although they are not often explicit about their reasons for doing so. Unlike those of expert writers, young writers’ plans for audience are typically not separate goals set in advance, but indications of planning can surface during the act of writing (Berninger et al., 1992; McCutchen, 1988).

Still, content planning, in contrast to conceptual planning or audience considerations, dominates children’s planning through much of the school years. Bereiter and Scardamalia (1987) analyzed protocols from children at age 10, 12, 16, and 18, and they reported that approximately 90% of the statements produced by the two youngest groups involved either (a) generation of content or (b) explicit dictation or rereading. Content generation remains the predominant form of spontaneous planning observed among students, even among college students (Langer, 1986; Torrence, Thomas, & Robinson, 1999).
When explicitly asked to plan in advance, children in the later elementary and middle school grades show signs of beginning to recognize planning as a process separate from other aspects of writing (Cameron & Moshenko, 1996), although younger children’s plans are not always predictive of the quality of their texts (Limpo, Alves & Fidalgo, 2013; Olinghouse & Graham, 2009). The 12- and 14-year-old students described by Bereiter and Scardamalia (1987) produced notes that they later expanded into text, whereas 10-year-olds typically wrote what amounted to a first draft of the composition itself (see also McCutchen, 1988). Further, children of middle-school age begin to distinguish among various types of planning. When shown a videotape of an adult planning a text, 12- and 14-year-olds correctly identified far more of the planning activities than did 10-year-olds (Bereiter & Scardamalia, 1987).

High-school students seem more likely than younger children to intentionally plan their texts and reference those intentions when asked (Bereiter, Burtis, & Scardamalia, 1988), although Paxton (2002) found that the context of the writing task influenced high-school students’ planning and attention to audience. In Paxton’s study, students who read a text written with a strong personal voice wrote essays that contained more overt references to their readers than did essays written by students who read more typical textbook excerpts, and more often mentioned conceptual plans in their protocols.

Thus, by approximately age 12, children may begin to distinguish between plans and text; however, their plans are dominated by content generation. Conceptual planning remains relatively rare well into adolescence, in the absence of instruction.

**Instruction: A Focus on Planning**

Efforts to teach children to plan before composing have varied across instructional traditions. These traditions include process approaches, expert-novice apprenticeship models, use of models, and procedural facilitation. Studies evaluating instruction in planning within a process model are relatively rare. However, Pritchard and Honeycutt (2006) compare studies within the process approach to writing instruction, and report that in contrast to earlier years, teachers using the process approach more commonly address prewriting explicitly, with the goal to create structure and organization, not only to generate content. Process models are commonly influenced by sociocultural theories of writing, which privilege collaborative writing, and writing for social purpose. Underlying principles include establishing a supportive writing environment where students engage in cycles of planning, translating, and reviewing while interacting with each other, writing for real audiences, and developing a sense of responsibility for their writing projects. Meta-analyses suggest that some tenets of the process approach, such as having students work together and assist each other during the writing process, can have a strong impact on the quality of students’ writing (Graham, McKeown, Kihara, & Harris, 2012; Graham & Perin, 2007; Graham & Sandmel, 2011). On the other hand, other approaches to writing instruction, discussed next, have consistently been found to have stronger benefits for novice and struggling writers.

Bereiter and Scardamalia (1987) proposed that students could be prompted to execute more complex composing processes through procedural facilitation—the provisions of cues, prompts, routines, or other forms of support that allow children to make better use of the knowledge and skills they already possess, or to recruit higher order strategies (Baker, Gersten, & Scanlon, 2002; Englert, Mariage, & Dunsmore, 2006). In a landmark study involving several procedural facilitators as well as an apprenticeship model, Englert and her colleagues (Englert, Raphael, Anderson, Stevens, & Fear,
Englert and her colleagues (1991) developed a similar cognitive strategy instructional program that emphasized the development of students’ metacognitive knowledge about writing (Cognitive Strategy Instruction in Writing, CSIW). Through modeling, scaffolding, procedural facilitation, and peer conferencing, teachers emphasized the role of dialogue and the use of text structure as prompts to generate text, and the transformation of writing from a solitary to a collaborative activity, and improvements in expository writing were documented even for students with learning disabilities. Efficacy data regarding CSIW date back to Englert’s original research studies (summarized in Englert, 2009); additional support for the teaching of text structure, one of the underlying tenets of CSIW, comes from Graham and Perin’s (2007) meta-analysis of instructional research on writing.
Wong and her associates (e.g., Wong, Butler, Ficzere, & Kuperis, 1997; Wong, Hoskyn, Jai, Ellis, & Watson, 2008) developed another apprenticeship model. This form of cognitive apprenticeship emphasizes the transfer of interactive dialogue between teacher and students, as well as the use of dialogue between peers, teaching students to use language to regulate their writing behaviors (planning behaviors as well as revising). Through dialogue, teachers involve students in the writing process, encouraging writing partners to request clarifications and elaborations of one another and thereby identify ambiguities in their writing (Wong, Butler, Ficzere, & Kuperis, 1996). In their early work on planning, Wong and her colleagues (1997) taught poor writers strategies for writing compare-and-contrast and persuasive essays. The strongest empirical evidence for the effectiveness of this approach to instruction comes from Wong et al.’s (2008) study in which a multilevel modeling procedure was used with three assessment waves for each dependent variable (clarity, organization, and cogency). Results revealed that planning instruction helped students learn to write stories that were more clearly developed and well organized than those written in the control condition; moreover, children in the intervention condition learned at a faster rate. Despite some variation in rate and level of individual learning, the apprenticeship model plus teacher conferencing promoted positive changes in students’ writing.

During this same time period, Harris and Graham (Graham et al., 1991; Harris & Graham, 1996) developed a similar approach that is now known as the Self-Regulated Strategy Development (SRSD) model of instruction. SRSD provides a coordinated way for teachers to unpack the writing process as well as how to teach students to manage writing tasks and the environment. This approach is similar to those mentioned earlier in that students learn specific strategies for accomplishing writing tasks. In contrast, SRSD differs in that it places a strong emphasis on self-regulation. Teachers give explicit definitions of key writing elements and examples of self-regulatory procedures, and demonstrate their use in context. Such procedures typically include goal setting, self-instructions (e.g., defining what to do to execute a strategy), and self-monitoring, which prompt students to self-regulate decisions about writing and lead to student mastery of the targeted writing process. Finally, SRSD makes explicit an expectation that teachers continue instruction until students reach criterion, by meeting individual goals as evidence of strategy mastery.

Using the SRSD model, students with LD have been taught to plan using semantic webbing (MacArthur, Schwartz, Graham, Molloy, & Harris, 1996), brainstorming (Harris & Graham, 1985), and text structure to generate writing content (Danoff, Harris, & Graham, 1993), as well as to set process and product goals (Graham, MacArthur, Schwartz, & Page-Voth, 1992). In addition, Harris, Graham, and Mason have extended the use of SRSD planning instruction to younger children in settings in which students worked with partners as they planned and composed (Graham, Harris, & Mason, 2005; Harris, Graham, & Mason, 2006). Currently, the utility of the SRSD model has been shown in the United States with below average, average, and gifted students from second to eleventh grade (Albertson & Billingsley, 2001; De La Paz & Graham, 2002), in middle and high school history classrooms (De La Paz, 2005; De La Paz & Felton, 2010), with college students (Song & Ferretti, 2012), and with adults who struggle with literacy (MacArthur & Lembo, 2009).

SRSD also seems beneficial for students with other types of disabilities such as autism or Asperger’s (e.g., Asaro-Saddler & Saddler, 2010; Delano, 2007), with students with behavioral disorders (e.g., Lane, Harris, Graham, Weisenbach, Brindle, & Morphy, 2008; Mason, Kubina, Valasa, & Cramer, 2010), and with students who are English
learners (De La Paz & Sherman, 2013). Independent researchers have validated use of SRSD in Germany with fourth grade students (Glaser & Brunstein, 2007), in Spain with sixth graders (Torrance, Fidalgo, & Garcia, 2007), and in Turkey with students with cognitive disabilities (Guzel-Ozmen, 2006).

One meta-analysis of studies involving group designs by Graham and Perin (2007) found that strategy instruction is a highly effective approach for students from the fourth through the tenth grade, with improvements in the quantity and quality of writing that maintain over time (weighted effect size = 0.62). Importantly, the effect size was even greater when strategy instruction included self-regulation (ES = 1.14). More recent meta-analyses confirm benefits in the SRSD model of instruction for teaching writing (Graham et al., 2012; Graham & Sandmel, 2011; Rogers & Graham, 2008).

Translating Ideas into Text: Transcription and Text Generation

Processes and General Development

To provide a better account of children’s writing processes, Berninger and Swanson (1994) refined Hayes and Flower’s (1980) original conceptualization of translating by distinguishing two distinct components: transcription and text generation. Text generation shares many components with oral language generation, such as content refinement, lexical retrieval, and syntactic formulation. Transcription, in contrast, entails the cognitive and physical acts of forming written (as opposed to spoken) text. Berninger and Amtmann (2003) later proposed their simple view of writing, arguing that transcription, text generation processes, and higher order executive processes (e.g., planning, revising) compete for limited working memory resources during writing. Such competition for resources has implications for young writers, as well as for students with LD (Graham, 1990). In addition, because L2 production is often more effortful than L1 writing and requires attention to linguistic features that are not automatized (DeKeyser, 2007), working memory demands may be especially acute for ELs (Kormos, 2012) and affect the text that is produced. Thus, increased fluency of transcription and/or text generation could improve writing outcomes either because of specific aspects of the language generated (e.g., more accurate spelling or more precise word choice; more varied or sophisticated syntactic structures) or because of increased working memory resources for planning and revising.

Transcription

In many cognitive models of writing, spelling is not distinguished from other aspects of translating. However, for young children, spelling can represent a considerable challenge, especially English spelling in which sound-letter correspondences are not always simple (Berninger et al., 1998). Many researchers have observed patterns in the growth of children’s spelling in English (e.g., Chomsky, 1970; Henderson & Beers, 1980; Treiman, 1993; Varnhagen, 1995), leading to various stage models of the development of spelling.

Gentry’s (1982) well-known model of children’s spelling of English is typical, entailing five stages extending through the early elementary years. The initial precommunicative stage involves the child’s emerging use of symbols to represent language. Children are not yet mapping individual letters to sounds, and they may confuse letters and numbers or the number of letters in a word with quantifiable aspects of the referent
such as size or number, writing longer letter strings to represent larger objects (Ferreiro & Teberosky, 1982; Share & Levin, 1999).

Phonological strategies begin to emerge in the semiphonetic stage, as the child begins to use letters to represent some, but not necessarily all, sounds within words. During the semiphonetic stage, children may use the names of letters to represent entire words, as in the example from Bissex (1980), RUDF (i.e., “Are you deaf?”). Children’s spelling captures more complete representations of the phonological structure of words during the phonetic stage, but often with unconventional orthography (e.g., EGL for eagle). As children move into the transitional stage and then to conventional spelling, they show a growing awareness of orthography (Varnhagen, 1995) and how English orthography reflects word meaning (morphology) as well as phonology (Carlisle, 1988; Ehri, 1992). However, controversy exists regarding the nature of such stages, especially regarding how early children’s use of morphological information emerges (Bryant & Nunes, 2008; Pacton & Deacon, 2008). Still, similar developmental trends have been observed in spelling acquisition in other languages (Ferreiro & Teberosky, 1982; Share & Levin, 1999), although for students learning English, the contribution of phonological, orthographic and morphological knowledge to spelling skill may vary depending on the nature of a students’ first language (Escamilla, 2006; Marinova-Todd, Siegel, & Mazabel, 2013).

Like spelling skill, handwriting skill develops with age and experience. Clearly, the motor and cognitive aspects of writing words on a page require effort on the part of young children, and writing researchers have examined the extent to which other aspects of writing are compromised by the effort required by transcription. Multiple correlational studies have documented that transcription-related measures are stronger predictors of writing quality for younger compared to older students (Berninger & Swanson, 1994, with young writers of English; Limpo & Alves, 2013, with young writers of Portuguese), suggesting that resource demands diminish as transcription skills become more fluent.

Resource demands imposed by transcription for writers of French were also examined in a series of experiments by Bourdin and Fayol (1994), who varied response modality (written versus spoken) in a recall task. Bourdin and Fayol found that serial recall was significantly poorer when second and fourth grade children but not college students were asked to write. Bourdin and Fayol argued that handwriting processes of children were still relatively inefficient and drew on working memory resources, whereas the college students’ handwriting processes were more automatic. In similar studies involving text recall (Bourdin, Fayol, & Darciaux, 1996) and text generation (Olive & Kellogg, 2002), handwriting was again found to impose higher resource costs for children than for adults. Interestingly, when adults’ fluent transcription processes were interrupted by novel response requirements (e.g., writing only in cursive uppercase), adults also demonstrated interference during writing (Bourdin & Fayol, 1994; Olive & Kellogg, 2002).

Text Generation

According to Berninger and Swanson (1994; see also Chenoweth & Hayes, 2001; Hayes & Chenoweth, 2007), text generation involves the mental production of a linguistic message, distinct from transcription of that message into written text. Like speech, text generation involves turning ideas into words, sentences, and larger units of discourse within working memory. Pauses in the stream of language generated during
writing are influenced by syntactic junctures such as paragraph, sentence and clause boundaries (Chanquoy, Foulin, & Fayol, 1996), text genre (Matsuhashi, 1981), knowledge of the language for students learning an L2 (Chenoweth & Hayes, 2001), and working memory demands (Hayes & Chenoweth, 2007).

There is evidence that the fluency of children’s text generation develops with age and increasing writing experience. McCutchen et al. (1994) observed that older children (seventh and eighth grades) generated sentences more fluently than did younger children (third and fourth grades), but at all grades, skilled writers were more fluent than less skilled writers. Fluency with word-level and sentence-level manipulations continues to develop across later elementary and middle-school grades (Galloway & Uccelli, 2015) and predicts essay quality (Northey et al., in press). The ability to generate language fluently remains a potent predictor of writing quality even for high-school students (Dellerman, Corrier, & Marchand, 1996). Unlike transcription, however, text generation may never approach automaticity and continues to require working memory resources even among college students (Hayes & Chenoweth, 2007; Kellogg, 2001).

Instruction: A Focus on Spelling, Handwriting, and Transcription

Early work in spelling instruction by Berninger and colleagues (1998) showed promise in teaching second graders to generalize alphabetic principles and write longer compositions. However, Graham (2000) found it was common in the 1980s and 1990s for systematic teaching of spelling to be renounced in favor of incidental teaching, such as when teachers provide rules to small groups of students during teachable moments, even in the absence of empirical support for such an approach. In contrast, Graham, Harris, and Fink-Chorzempa (2002) demonstrated the efficacy of a direct instruction approach in teaching second graders sound-letter combinations, spelling patterns involving long and short vowels, and common words that fit those patterns. Outcomes included improved spelling as well as better decoding and sentence writing skills. Berninger, Winn, Stock, Abbott, Eschen, Lin et al. (2007) randomly assigned children with dyslexia (grades 4–6 and 7–9) to an intervention focused on orthography (in which students tried to recall visual images of written words, with particular attention to the order of letters) or morphology (focused on base words, affixes, and morphological spelling rules applied to word parts) in addition to phonology. Although the reported results go beyond those mentioned here, it is relevant to note that the orthographic treatment helped students spell novel real words and the morphological treatment helped children spell pseudowords, confirming that complex interventions are needed for students who struggle to make significant progress in spelling.

Literature on handwriting instruction includes a trivial (but longstanding) controversy over the initial use of manuscript alphabet that is later replaced by cursive script, versus calls for an italic or slanted version of print that is designed to ease students’ transition (Schlagal, 2007). However, a national survey of primary teachers suggests that teachers have moved past that controversy, and most (60%) report using effective practices when teaching students to write letters (Graham, Harris, Mason, Fink-Chorzempa, Moran, & Saddler, 2008). Graham, Harris, and Fink (2000) describe one such program, using direct instruction to teach children to write lowercase manuscript letters accurately and fluently. Results indicate improved handwriting and writing skills more generally. Direct instruction in writing letters using visual cues appears an effective way to help children develop their ability to write letters automatically (Berninger
et al., 2005), which is related to length and quality of composing throughout elementary schools (Graham, Berninger, Abbott, Abbott, & Whitaker, 1997).

Speech recognition software, according to proponents (see MacArthur, 2006 for a review) provides the means to bypass the mechanical demands involved in transcription (handwriting and spelling) and in turn enables writers a more fluent means of composing. Students who are especially weak writers seem to benefit from opportunities to compose orally, especially if this is combined with planning instruction (De La Paz & Graham, 1997). MacArthur and Cavalier (2004) found that high-school students with LD derive specific benefit from composing to an adult scribe or when using speech recognition software (when they could see their text as they composed), in comparison to writing by hand (see also Quinlan, 2004). In comparison, students without special needs were not affected by different writing conditions.

Instruction: A Focus on Text Generation

Some students will benefit from direct instruction that focuses on a different aspect of mechanics (i.e., grammar) during elementary or secondary school. Unfortunately, common exercises (e.g., diagramming sentences or daily oral language exercises) do not have empirical support indicating their effectiveness, most likely because most students do not apply what they learn from these activities to their own writing (Andrews et al., 2006). Moreover, a recent meta-analysis of writing interventions for students in the elementary grades (Graham et al., 2012) indicates the overall quality of studies assessing grammar instruction is low, making it difficult to determine the full potential of grammar instruction. However, based on the equivocal benefits of grammar instruction at best, we next discuss a more promising approach for teaching sentence construction skills.

Sentence combining appears to be an effective approach for teaching syntax, regardless of the student’s age (ranging from 5 to 16), writing genre (persuasive, narrative, or expository), or presence of a learning disability (as demonstrated with fourth grade students; Saddler & Graham, 2005). This approach refers to explicitly teaching students how to revise sentences, for example, combining two simple sentences (referred to as “kernel sentences”) to form a more interesting complex sentence (often by modifying nouns, or by creating complex sentences with coordinate or subordinate phrases). Students then judge the adequacy of their new sentence combinations, using standards such as clarity and directness of meaning. When evaluating the effectiveness of this approach, Saddler and Graham (2005) randomly assigned 44 average and struggling fourth graders to receive 30 sentence-combining or grammar lessons across 10 weeks. Students in the sentence-combining group learned to use conjunctions “and,” “but,” and “because” and to embed an adjective or adverb to form more complex sentences (e.g., “They passed the ball before shooting” and “They passed quickly” were combined to form “They quickly passed the ball before shooting.”) Students subsequently learned to embed two syntactic forms into one new sentence. Students in the comparison condition learned parts of speech, to generate better target sentence parts, then wrote and revised short stories using target parts of speech. Outcomes from this and other sentence combining studies are robust. In fact, Graham and Perin (2007) reported an overall effect size of 0.50.

Vocabulary can also be a challenge in writing, especially vocabulary specific to the written academic register. Lesaux, Keiffer, Kelley, and Harris (2014) developed intensive academic vocabulary instruction that included attention to words in text, as well
as inclusion of instructed words in students’ own writing. Compared to a business-as-usual control condition, the intervention showed an overall effect on performance on a standardized measure of written expression that tapped conventions, language, and content. Moreover, the effect size was larger for students learning English (.21) than for English-only students (.04).

Reviewing and Revision

Processes and General Development

Hayes (1996, 2004) elaborated the original description of the revision process (Hayes & Flower, 1980) to include critical reading, text evaluation, and rewriting. Thus, skilled revision involves critically reading the actual text and comparing it to a representation of the intended or ideal text, noting discrepancies and initiating changes to bring the actual text more in line with the ideal text (Bereiter & Scardamalia, 1987; Flower, Hayes, Carey, Shriver, & Stratman, 1986; Limpo et al., 2013).

Several processes in this sequence can be problematic for children, the first being the representation of the intended text. Because young children are less likely to engage in much conceptual planning, they have fewer specified intentions, and their memory representations of the intended text are often vague (Bereiter et al., 1988). Second, children may have difficulty with reading critically and then differentiating their interpretations from the actual text. Young children are less able than older children to distinguish inferred from explicit text information (Beal, 1990, 1996) and less likely to add information to support necessary inferences. Such difficulty assessing readers’ knowledge and inference abilities is not unique to children, however. Even college students can seriously overestimate their audience’s familiarity with specific vocabulary, which can reduce the communicative clarity of their writing (Hayes & Bajzek, 2008).

Third, children may have difficulty generating alternative language, even if they identify problematic text, and younger children have more difficulty than older children in diagnosing and correcting text problems, even when the problems were pointed out to them (Beal, 1990; Limpo et al., 2013). Finally, among students learning English, differences in ability to revise at lexical vs. discourse levels appear at least partly a function of linguistic proficiency (Baek, Song, & Lee, 2012).

Most students (from grade school to college) focus most of their revision efforts on changing surface features of the text (e.g., spelling, punctuation, word choice), rather than attending to text meaning (e.g., Chanquoy, 2001; Faigley & Witte, 1981; Fitzgerald, 1987; Limpo et al., 2013). There is considerable evidence that critical reading is crucial for meaning-focused revision. McCutchen, Francis, and Kerr (1997) listened as middle-school students collaboratively revised, and observed that skilled and less skilled writers employed markedly different reading strategies. Skilled revisers developed a macrostructure of the text they were revising (see Kintsch, 1998) and considered large sections of text as they worked, whereas less skilled revisers edited sentence by sentence. Thus, sophisticated revision may depend, in part, on sophisticated reading strategies (see also Beal, 1996) that go beyond reading for surface understanding. Such reading strategies can, however, present challenges even for college students (Piolat, Roussey, Olive, & Amada, 2004).

Part of the focus on surface revision may, however, result from the task schema that writers bring to the revision task. With very brief instruction, Wallace and Hayes (1991; Wallace et al., 1996) were able to reorient college writers to revise for meaning.
The instruction was so brief (eight minutes) that Wallace and colleagues argued they could not have taught students revision processes per se; rather, they argued they simply altered the students’ revision schema by directing students’ attention to meaning over mechanical features of texts (see also Graham, MacArthur, & Schwartz, 1995). Such brief instruction, however, was not effective for struggling college writers (Wallace et al., 1996).

Instruction: A Focus on Revising

Direct instruction, procedural facilitation, and apprenticeship models have been used to improve the revision skills of students at different ages and varying levels of writing competence. Direct instruction attempts to describe, and explicitly model, what revision is about and how to revise. Research on direct instruction in revision appears limited, but at least one study revealed beneficial effects of teaching in this way to sixth graders. In a seminal study by Fitzgerald and Markham (1987), students learned four types of revisions (how to add, delete, rewrite, and move text) in a series of 3-day lesson cycles. When compared to a control group, direct instruction improved students’ knowledge of revision, their efforts to make revisions, and the quality of their stories across drafts. A more recent example of direct instruction contrasted effects of collaborative and individual revision on fourth-, sixth-, and eighth-grade students’ abilities to anticipate lack of clarity in narratives (Boscolo & Ascerti, 2004) and revealed clear advantages for having students work together to identify and resolve ambiguities in text.

Procedural Facilitation

Scardamalia and Bereiter (1983, 1985) developed procedural routines for students in a series of studies to reduce the executive burden involved in revising, by signaling movement from one element of revising to the next and by limiting the number of evaluative and tactical decisions to be made. Their compare, diagnose, and operate (CDO) routines helped students identify problem areas, evaluate and explain the problems, select a revising tactic, and carry it out. These routines generally elicited more revisions in students’ writing, and enabled students to focus on higher-level features of text than typically reported for similar students. Because students with disabilities are more likely to have problems with executive control, Graham (1997) taught fifth and sixth graders with LD how to use a modified version of the CDO routine used by Scardamalia and Bereiter (1983). Revising one sentence at a time, the student selected one of seven possible evaluations (e.g., “This doesn’t sound right”) for each sentence (compare), explained orally how the evaluation applied (diagnose), and selected one of five directives (e.g., “Say more”) to execute (operate). Unfortunately, gains in overall quality were not evident because the global structures of students’ texts were largely unchanged.

De La Paz, Swanson, and Graham (1998) replicated and extended Graham’s (1997) study. They used a CDO procedure to teach a revising strategy to 12 eighth-grade students with LD. A primary difference in the more recent study was the inclusion of additional steps to engage students in applying the directives twice, first at a global level and then at a local level. Results indicated that when revising with the CDO procedure, students were more likely to improve the quality of their essays than under normal conditions. Meaning-preserving revisions tended to improve quality under the CDO
procedure; in contrast, meaning-changing revisions appeared to lower quality. Thus, while students made more changes affecting the meaning of their text, some changes resulted in lower quality ratings, because these students with LD were limited in their ability to carry out evaluative and tactical decisions.

Evidence from a study by Midgette, Haria, and MacArthur (2008) demonstrates that setting content and audience awareness goals can function as procedural facilitators for students during revising. In their study, fifth- and eighth-grade students wrote persuasive essays and then revised them under one of three goal setting conditions: a condition that prompted students to make changes in general, a content condition that encouraged students to include reasons and a conclusion, and an audience awareness plus content condition that suggested students consider a readers’ position, especially one who might have another point of view. Older students were more successful than younger students in responding to the content plus audience awareness goals; however, all students in this condition outperformed other students in addressing and rebutting reasons in their essays. Somewhat surprisingly, the two content goal conditions appeared equivalent in terms of effects on overall quality.

Apprenticeship Models

The strategic instruction model (SIM), described previously in the context of instruction to support students’ planning, has also been used to support revising strategies in several studies on editing and proofreading (Deshler & Schumaker, 1986; McNaughton, Hughes, & Ofiesh, 1997). Other researchers using the SRSD model, which combines strategy instruction with self-regulation support, have focused on changes in meaning (e.g., revising; Stoddard & MacArthur, 1993), or on both revising and editing, with word processors and peer review to facilitate the revising process (e.g., MacArthur, Graham, Schwartz, & Schafer, 1995).

A recent study by De La Paz and Sherman (2013) demonstrated the utility of the SRSD model for teaching 23 elementary students a revising strategy based on Scardamalia and Bereiter’s (1985) CDO procedures. An additional goal of this study was to determine the effects of instruction with students who were identified as English learners, as well as with students with LD, or who were low-, average-, and high-achieving writers. The results were remarkably similar for EL and non-EL students. In this study, the effects were apparent with the students who struggled most with writing as well as with more capable writers. Students with LD and students who were low-achieving writers made two to three times the number of revisions that made the quality of the text better, and they reduced or eliminated the number of revisions that lowered the quality of their text both immediately after instruction and one month later. Thus, relatively young writers achieved independence in revising after learning a meta-cognitive strategy.

It is important to note that some investigators have developed holistic writing programs that focus on both planning and revising instruction (Bui, Schumaker, & Deshler, 2006; De La Paz & Graham, 2002; Englert et al., 1991; Wong et al., 1996). In addition, more recent studies have attempted to determine the effects of direct instruction in both planning and revising (Fidalgo, Torrance, & Garcia, 2007) and the benefits of planning versus revising strategy instruction, relative to a students’ initial writing profile (Kieft, Rijlaarsdam, Galbraith, & van den Bedge, 2007). Thus, our characterization of multi-pronged studies such as these as either planning or revising was done partly for convenience in explaining these cognitive processes.
Knowledge of Genre

General Development

All writers rely on knowledge of shared rhetorical conventions, such as genre. By the term *genre*, we refer to more than the structural features of text and include the illocutionary purposes that texts serve within the contexts of specific disciplines and discourse communities. However, genre knowledge develops, in part, from experience with text structures. As a consequence of their broad early experience with narratives (Duke, 2000; Teale & Sulzby, 1986), even young children show signs of emergent narrative schemata (Stein & Glenn, 1979). Young children’s exposure to informational texts, even in school, is more limited than their exposure to narratives (Duke, 2000), and it is therefore not surprising that children’s knowledge of expository genres generally develops later than knowledge of narrative (Englert, Stewart, & Hiebert, 1988; Langer, 1986). Comparisons typically reveal that children’s written narratives are superior to their expositions (e.g., Cox, Shanahan, & Tinzmann, 1991; see Langer, 1986, and McCutchen, 1987, for qualifications). Students’ control over expository text structures continues to develop across the elementary grades, throughout high school, and beyond (Crammond, 1998; Galloway & Uccelli, 2015). However, for students from non-dominant groups, use of text structures that differ from the Western European structures typically emphasized in US schools may sometimes reflect purposeful genre selections that have more to do with personal identity than with lack of knowledge (Ball, 1992; Matsuda & Cox, 2011).

Instruction: A Focus on Genre and Text Structure

A survey of empirical intervention research revealed more published work on text structure than on genre. One reason for this finding might be the predominant use of qualitative or descriptive approaches by researchers who study the writing process more broadly (including genre), rather than the experimental designs that typify intervention research (Pritchard & Honeycutt, 2006). In considering the needs of students who are learning to compose in English, a specific genre theory, Systematic Functional Linguistics (SFL; Halliday & Matthiessen, 2013; Martin & Rose, 2008; Schleppegrell, 2004) is commonly used as a means of helping students to make connections between model texts and their own writing. Genre theory is seen as part of a functional approach to language learning, because it considers language as texts (genres) that are realized in contexts (registers) through knowledge and use of a functional grammar for making meaning (Schleppegrell, 2004). Moreover, SFL provides an analytical lens to understanding language because it requires students to understand when and how to use language and to make linguistic choices in real (e.g., learning) contexts (Turkan, De Oliveira, Lee, & Phelps, 2014).

With respect to text structure, researchers have focused on teaching students basic elements of narrative, persuasive, or compare-contrast texts, (e.g., Fitzgerald & Teasley, 1986; Gordon & Braun, 1986; Kirkpatrick & Klein, 2009; Scardamalia & Bereiter, 1985), but typically with more emphasis on the writing process than was common in product-focused instruction (e.g., Skwire Chitwood, Ackley, & Fredman, 1975). More generally, it is important to note that researchers who employ expert-novice apprenticeship models typically embed instruction in text structure as a means to communicate information about the genre under consideration to students. Many writing intervention studies involving planning include a focus on text structure (e.g., Bui...
et al., 2006; Danoff et al., 1993; De La Paz, 1999; Wong et al., 2008). To illustrate, teaching students to understand text structures and to use them as ways to organize their writing has featured prominently in Englert’s research, from her early research on generic writing strategies (Englert et al., 1991) to her most recent work on content area writing (Englert, Okolo, & Mariage, 2009).

Englert and her colleagues describe ACCelerating Expository Literacy (ACCEL) as a program designed to integrate reading and writing strategies in learning about science and social studies from expository texts. The ACCEL instruction includes Plan-It, Highlight-It, Read-It, Mark-It, Note-It, Map-It, Respond-to-It, and Write-It. Each strategy becomes a tool to be used in conjunction with knowledge about common text structures in expository text: cause/effect, problem/solution, compare/contrast, time (sequential order), classification, and explanation. Together, both strategies and text structure form the basis of the overall curriculum. In sum, the overall effort was to help students develop writing-to-learn strategies that would help them in the expository curriculum (Englert, 2009). In their most recent program evaluation, organizing information was difficult for students with and without learning difficulties to master. However, students with LD made relatively larger gains than students without learning problems, based on an improved ability to selectively identify main ideas and details in printed texts, take well-organized notes, and generate written retellings that contained related details and ideas.

We were able to locate one intervention study that involved a comparison of text structure and an expert-novice apprenticeship model (Reynolds & Perin, 2009). Middle-school students learned to summarize sources using text structure or a self-regulatory planning strategy. Students in the text structure condition received explicit instruction in composing from textbook sources, relying on summarization rules and text structure (e.g., main idea, details, topic sentences). Students in the strategy condition followed mnemonics and engaged in personal goal setting. Results, while indicating nearly comparable performance, are not truly representative of apprenticeship models, because elements such as teacher modeling self-regulatory statements, collaborative practice, and criterion-based instruction were omitted from instruction. Moreover, independent practice was limited to completing assignments that teachers began for students (either in class or as homework) rather than independent planning and composing, as in true expert-novice apprenticeship models. What is most appealing about this study, however, is the authors’ attempt to separate the effects of text structure from its usual role as an embedded element within most expert-novice apprenticeship models. More work on the differential effects of components in multi-pronged intervention research is needed, both to be parsimonious and to understand which elements contribute most to the effects produced by complex interventions.

**PRACTICAL IMPLICATIONS AND FUTURE DIRECTIONS**

The model of writing proposed by Hayes and Flower in 1980 was intended to be general, not specific to a discipline. However, as writing research has matured, the importance of disciplinary perspectives, including genre, has become apparent. There is increasing interest in knowledge of genre and writers’ broader knowledge of the disciplinary community for whom (or perhaps more appropriately with whom) they write. For example, writers generally learn the discourse forms and honor the rhetorical values of their respective discourse communities, defined in terms of social and/or disciplinary affiliations (MacDonald, 1992; Myers, 1985; essentially Discourse, as discussed by
Gee, 1996). Skilled writers seem to have ready access to, if not explicit awareness of, such discourse and rhetorical knowledge (Langer, 1992; Stockton, 1995). Genre and stylistic knowledge seem to influence many aspects of the writing process, including even lexical and syntactic choices (Barton, 1995; Bazerman, 1984; MacDonald, 1992; Van de Koppel, 1998).

**Argumentation: A Crucial Genre for Academic Discourse**

One genre of central importance in writing is argumentation. Students’ argumentation skills have been studied as milestones of conceptual development (e.g., Kuhn, 2005), as rhetorical conventions (e.g., Toulmin’s 1958 model and Fulkerson’s 1996 explanation of classical claims to teachers), and as grade-related benchmarks. For instance, in the Nation’s Report Card, Salahu-Din, Persky, and Miller (2008, p. 37) indicated that only 24% of twelfth graders were able to compose texts that “persuade[d] the reader” at levels judged as “sufficient” or better. Although the scoring criteria used in the Nation’s Report Card 2007 were not published, most standards for evaluating arguments suggest that good arguments are organized, elaborated, and supported by evidence (Perloff, 2003). In addition, Rieke and Sillars (2001) describe argument structure as presenting a clear position, supporting claims with relevant justification and elaborations, considering counterarguments, and finding ways of refuting those counterarguments.

However, Ferretti, Andrews-Weckerly, and Lewis (2007) contend that argumentative strategies are influenced by the nature of the writing task, the degree to which writers hold shared knowledge about a topic, and the writing purpose. Moreover, Stevens, Wineburg, Herrenkohl, and Bell (2005) argued that the nature of effective argumentation differs across disciplines because the epistemological criteria for causal explanations differ. Thus, argument is a common text structure employed in many disciplines as a means for persuading or convincing others, but the nuances of the argumentation genre can vary across disciplines.

**Disciplinary Perspectives**

Students then must understand how arguments vary across disciplines. In recent years, advocates for disciplinary literacy articulate differences in the ways teachers should guide adolescents to approach reading and writing tasks in secondary content classes based on inherent differences in the ways that experts think in the sciences (e.g., biology, Carter, Ferzli, & Wiebe, 2007; chemistry, McDermott & Hand, 2011), mathematics (Brown, 2007), and history (Moje, 2008; Shanahan & Shanahan, 2008). It follows that in science classrooms, students must identify claims and evidence when constructing and defending scientific explanations (Berland & Reiser, 2009) and in social studies classes, students must learn to use historical evidence to write arguments (Wineburg, 2001). Recent evidence from McNeill (2009) indicates that dialogue is a critical vehicle for helping students learn to justify claims as they write scientific arguments. Thus, more research is needed to explore how expert teachers help students learn to develop interpretations that are supported with evidence (see Monte-Sano, 2008), as well as research on interventions aimed at improving disciplinary argumentation (e.g., De La Paz et al., 2014), if writing is to serve as a powerful tool for learning within disciplines.
CONCLUSION

We have presented an overview of empirical research on how writing develops and how researchers and teachers have endeavored to scaffold students’ learning using theoretical perspectives common to cognitive and process approaches. Although experienced writers describe overlapping and recursive processes during writing (such as revising the beginning of a sentence before returning to generate content that concludes the sentence), the ability to capture the development of such phenomenon in writing research, as well as strategies for systematically teaching youngsters how to think about writing in such sophisticated ways, remains limited.

Interestingly, much of what we know about effective practices in the teaching of writing comes from the study of children and youth who struggle with this form of communication (Graham & Perin, 2007). Researchers who employ an empirical tradition have found benefit in direct instruction, procedural facilitation, and expert-novice apprenticeship models for teaching planning, translating, and reviewing. Knowledge of genre and text structure have an effect on the writer and writing task and as such may be viewed as influences from the task environment (Hayes, 1996); however, writing that is purposeful also has disciplinary meanings, and we note that recent activity, such as research on argumentation, has considered such contexts. We join others in a call for continued exploration of writing development and interventions that have disciplinary connections, especially for adolescents who are expected to connect writing to content area learning. This is an exciting time to engage in writing research, as the examination of writing within disciplines such as history and science provides opportunities for researchers and teachers to explore new avenues to support student writing and thinking.

NOTE

1 Due to length constraints, discussion of this topic is limited to content learning in the treatment of disciplinary writing.

REFERENCES


