27 Learning to Be Literate

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Advanced technological societies are characterized in part by widespread print literacy. Human beings invented writing systems only about 5,500 years ago, well after the human mind had fully evolved, perhaps by as much as 300,000 years (Hutchins, 2008). This relatively late appearance of communicative symbol systems suggests that human cognitive architecture could not have evolved specifically to enable reading and writing (Paas & Sweller, 2014). Instead, the ability to read and write print texts is based on cognitive abilities that evolved to satisfy other purposes, suggesting that studies of literacy learning have general implications for broader studies of cognition and learning. In this chapter, we review the body of learning sciences research that examines the fundamental cognitive and social processes whereby people learn to read and write. We conclude by identifying several general implications for learning scientists.

Societal expectations of literacy have increased over time. Before the effort to promote universal literacy through formal education got underway, *adults* were deemed literate when they could indicate their signature with an "X" (Reay, 1991). In the twenty-first century, in the United States, the Common Core Standards require that *children in kindergarten* "Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book (e.g., *My favorite book is. . .*)" (National Governors Association, 2012). This ratcheting up of literacy expectations demonstrates that definitions of literacy change across time, as do the standards that apply to students at different ages of development and schooling.

27.1 Three Types of Literate Knowledge

Geary (2005, 2012) distinguishes between biologically primary cognitive abilities (those that evolved through natural selection) and biologically secondary cognitive abilities (those that are developed through cultural practice). The primary abilities are part of able-bodied people's genetic architecture; the secondary abilities are learned through engagement with the physical world and with others. Literacy is a secondary cognitive ability. Most cultures teach

literacy through formal educational institutions (Gardner, 1991), although it is also taught at home and in other settings as well; and literacy is a prerequisite to teaching most school subjects. There are a few exceptions to this general pattern: Scribner and Cole (1981) have documented that in some cultures, people learn scripts outside the formal confines of school that embody particular forms of cultural knowledge, with these scripts serving more local than broadly generalizable social purposes.

Smagorinsky and Smith (1992) argue that literacy researchers have focused, broadly speaking, on three types of literacy. First, literacy can be *general*, such as the ability to decode words or engage in drafting and revision. One could conceivably engage in these practices regardless of what is being read or written. Second, literacy can be *task-specific*: learning to read a novel and learning to read a recipe require different declarative and procedural knowledge, the first relying on the ability to recognize a narrative perspective and determine its reliability (among a host of deciphering skills), and the second requiring a reader to follow or adapt specific instructions. Third, literacy can be *community-specific*, in which people who are members of a community of discourse or practice bring specialized forms of knowledge to bear on their literate actions. In this case, people from different communities might approach a given text using different cognitive and interpretive frameworks. For example, a fundamentalist Christian might first learn to read the Holy Bible at home and in church as a text embodying an indisputable truth and then adapt that stance to assigned school readings – approaching them as indisputable truth, even when a more interpretive approach is appropriate to a school context (Heath, 1983). Socialization to literacy practices is thus a complicating factor in how people learn to approach and engage with texts (Gallas & Smagorinsky, 2002).

Literacy researchers have studied all three types of literacy, and we organize the following review into three sections: general literacy, task-specific literacy, and community-specific literacy. Each research approach produces different insights, and together they provide a comprehensive picture of what literacy learning involves.

27.1.1 General Literacy: Learning to Read and Write

Learning scientists have studied how people learn to read a printed word, comprehend a prose passage, write an essay, and engage in other literacy practices. These studies are examples of how researchers have applied the general science of learning to specific educational issues (Mayer, 2008, 2011), particularly to learning of subject matter (Mayer, 2004, 2009). The psychology of subject matter – which investigates how people learn and think in subject matter areas – represents an important advance in the learning sciences away from general theories of learning that dominated in the first half of the twentieth century (Mayer, 2004, 2008, 2009; also see the other chapters in Part V of this handbook). In this section, we summarize exemplary research on the cognitive

Table 27.1 *Three content areas in the cognitive science of literacy learning*

Name	Target task
Reading fluency	Pronouncing a printed word
Reading comprehension	Comprehending a printed passage
Writing	Producing a written essay

Table 27.2 *Basic cognitive processes in reading fluency*

Name	Example task
Recognizing phonemes	Substitution of first phoneme: You hear the word "ball" and are asked to change the /b/ sound into a /t/ sound.
Decoding words	Word identification: Pronounce the printed word, CAT. Word attack: Pronounce the printed word, BLUD.
Decoding words fluently	Read a paragraph aloud fast and without error.

science of general knowledge in literacy learning in reading fluency, reading comprehension, and writing, as summarized in Table 27.1.

Reading Fluency

Consider the cognitive processes involved in reading a printed word, such as "CAT." Helping students develop this seeming simple ability to read printed words is perhaps the single most important task of schooling in the primary grades, and understanding how students learn to read fluently falls squarely within the domain of the learning sciences. Huey (1908) articulated an important challenge for the learning sciences: "[T]o completely analyze what we do when we read would almost be the acme of a psychologist's achievements, for it would be to describe very many of the most intricate workings of the human mind, as well as to unravel the tangled story of the most remarkable specific performance that civilization has learned in all its history" (p. 6). Since Huey's challenge, researchers have made remarkable progress in understanding the cognitive processes that unfold when a person is reading (Rayner, Pollatsek, Ashby, & Clifton, 2011). As shown in Table 27.2, Mayer (2008) has analyzed the process of word reading in alphabetic orthographies into component cognitive skill, including recognizing phonemes, decoding words, and decoding words fluently.

   Recognizing Phonemes: Phonemes are the smallest sound units of a language. In English there are approximately forty-two phonemes, such as the three that combine to form the word CAT: /c/ and /a/ and /t/. Phonological awareness is the ability to recognize and produce each of the sound units of one's language. Reading researchers have produced strong evidence that phonological awareness is a readiness skill for learning to read in alphabetic

languages. Being able to segment a spoken word into phonemes and being able to combine phonemes into a spoken word represent the first step in learning to read in alphabetic languages, even though it does not involve printed words at all. English language readers must form cognitive categories for each of the forty-two sounds of English.

There is substantial empirical evidence for the role of phonological awareness in learning to read (e.g., Bradley & Bryant, 1985; Juel, Griffin, & Gough, 1986). For example, Wagner and Torgesen (1987) found that students who enter school with weak skills in phonological awareness are less successful in learning to read than those who enter school with strong skills in phonological awareness. However, these are correlational studies, and do not allow us to draw causal conclusions. For example, it might be the case that general intellectual ability is responsible for both phonological awareness and reading skill.

Experimental studies, where learners are randomly assigned to different instructional conditions, offer a way of testing causal claims about the role of phonological awareness. Overall, reviews of training studies provide strong and consistent support for the claim that phonological awareness is a first step in causing improvements in learning to read (Bradley & Bryant, 1983; Bus & van Ijzendoorn, 1999; Ehri, Nunes, Stahl, & Willows, 2001; Fuchs et al., 2001; Goswami & Bryant, 1990; Hulme, Bowyer-Crane, Carroll, Duff, & Snowling, 2012; Melby-Lervåg, M., Lyster, S.-A. H., & Hulme, 2012; Spector, 1995).

Decoding words: The cognitive skill of decoding refers to the process of pronouncing a printed word. Decoding skill can be assessed by asking students to read out loud the printed word CAT and then seeing if they say "cat" properly, or by asking students to attempt to pronounce nonwords like BLUD (which usually leads them to say "blood"). A major issue concerns whether people acquire decoding skill mainly by learning to translate whole words into sounds (called the *whole-word approach*) or by learning to translate individual letters into phonemes that are blended together to form a word (called the *phonics approach*). Of course, in ideographic languages, learning to read involves the whole-word approach, because each ideograph corresponds to one word. In cultures with alphabetic writing systems, the whole-word approach has been criticized on the grounds that it is more efficient to learn the pairings between letters (or letter groups) and forty-two individual phonemes than to learn thousands of words.

However, the phonics approach can be criticized on the grounds that phonics rules are somewhat inconsistent, at least in English (Clymer, 1963), so some commonly used words that violate phonics rules are best learned by the whole-word approach. With alphabetic orthographies, the preponderance of evidence shows that phonics instruction is indispensable in learning to read, and yields better decoding performance than all forms of conventional instruction including whole-word on word identification tasks and word attack tasks, according to a review by Ehri et al. (2001). Overall, there is a strong research base showing that phonics instruction greatly improves students' decoding skill in learning alphabetic literacy.

Reading Comprehension

Once a learner has acquired the cognitive skills needed for reading, which can be called *learning to read*, the learner is ready to engage in reading comprehension, which can be called *reading to learn*. This transition to reading comprehension can occur in the third and fourth grades, and is epitomized by being able to make sense of a short text passage (e.g., to be able to answer comprehension questions). Reading comprehension has long been recognized as a creative act of structure building (Bartlett, 1932; Gernsbacher, 1990) in which the reader selects relevant information, mentally organizes it into a coherent structure, and integrates it with relevant prior knowledge activated from long-term memory (Mayer, 2011). As shown in Table 27.3, some of the cognitive processes involved in reading comprehension are using prior knowledge, using prose structure, making inferences, and using metacognitive knowledge.

Using Prior Knowledge: Skilled readers use their prior knowledge to guide how they select, organize, and integrate incoming information. Learners perform better on reading comprehension tests when they have relevant prior knowledge than when they do not (Bransford & Johnson, 1972; Pearson, Hansen, & Gordon, 1979) and they better remember material that fits with their existing knowledge (Lipson, 1983; Pichert & Anderson, 1977). Beck, McKeown, Sinatra, and Loxterman (1991) have shown that students perform much better on comprehension tests when a history text is rewritten to explicitly prime relevant schemas. For example, if the text is about the causes of a war over territory, students comprehend that text better when it is rewritten to evoke a common childhood schema, two children both wanting the same object and fighting over who gets to play with it.

Using Prose Structure: Skilled readers are able to mentally outline a passage and use the outline to help them determine what is most important. Many studies have found that more skilled readers are better at identifying important information (Brown & Smiley, 1977). For example, more skilled readers are more likely to recall important material from a lesson than unimportant material, whereas less skilled readers tend to recall both important and unimportant material at similar rates (Taylor, 1980). In a recent review, Fiorella and Mayer (2015) reported on the effectiveness of generative learning strategies based on prose structure: students who were asked to create summaries as they read

Table 27.3 *Four cognitive processes in reading comprehension*

Name	Example task
Using prior knowledge	Reorganizing the material to fit with an existing schema
Using prose structure	Determining what information is important in a passage
Making inferences	Attributing a motive to justify a character's action
Using metacognitive knowledge	Finding a contradiction in a passage

scored higher on comprehension tests than those who did not create summaries (with a median effect size of d = 0.50), and students who were asked to create graphic organizers as they read scored higher on reading comprehension tests than those who did not (with a median effect size of 1.07).

Making Inferences: Skilled readers make inferences as they read to help make sense of the passage. For example, Paris and Lindaeur (1976) read a list of sentences (such as "Our neighbor unlocked the door") to students, and then gave them a cued recall test with *explicit cues* – words that had appeared in the text (e.g., "door") or *implicit cues* – words that had not appeared in the text but that were implied (e.g., "key"). Kindergarteners performed much better with explicit cues, indicating they did not infer that a key was used to unlock the door, whereas fourth-graders performed just as well with implicit cues as with explicit cues, indicating they did make inferences while listening to the sentences.

Using Metacognitive Knowledge: Skilled readers monitor how well they understand what they are reading, that is, they engage in *comprehension monitoring* (also see Azevedo & Winne, Chapter 5 in this volume). For example, Markman (1979) found that children in grades 3 through 6 generally were not able to recognize implicit inconsistencies in a passage (e.g., seeing a mismatch between saying there is absolutely no light at the bottom of the ocean and saying fish can see the color of plants at the bottom of the ocean) and they could only recognize explicit inconsistencies (e.g., seeing a mismatch between saying fish cannot see anything at the bottom of the ocean and saying fish can see the color of plants at the bottom of the ocean) about 50%–60% of the time. In a recent study, Wassenburg, Bos, de Koning, and van der Schoot (2015) found promising evidence for the effectiveness of training fourth-graders to detect inconsistencies in texts they are reading.

Writing

The majority of literacy research has been about reading, but there has also been a separate strand of research on writing. For example, in an analysis of think-aloud protocols of student writers, Hayes and Flower (1980; Flower & Hayes, 1981; Hayes, 1996) identified three cognitive processes in writing: *planning*, *translating*, and *reviewing*. These three processes, summarized in Table 27.4, occur iteratively throughout the process of writing an essay rather than in precise linear order.

Table 27.4 *Three cognitive processes in writing*

Name	Example task
Planning	Creating an outline before writing
Translating	Using a word-processing program to compose an essay
Reviewing	Detecting and correcting problems in an essay

Planning: Planning includes generating (i.e., retrieving relevant information from long-term memory), organizing (i.e., selecting the most important information and structuring it into a writing plan), and goal setting (i.e., establishing criteria concerning how to communicate with the audience). When students are instructed to create an outline before they write an essay, the quality of the essay is better than when they are not asked to generate an outline (Kellogg, 1994). Planning appears to be a high-level skill that increases through the middle and high school years (Limpo, Alves, & Fidalgo, 2014).

Translating: Translating involves putting words on the page, such as through typing or handwriting. Nystrand (1982) noted that that the process of translating is subject to low-level constraints such as graphic constraints (e.g., the words must be legible) and syntactic constraints (e.g., the sentences must be grammatically correct and the words must be spelled correctly), as well as high-level constraints such as semantic constraints (e.g., the sentences must convey the intended meaning) and contextual constraints (e.g., the tone must be appropriate for the audience). Working memory capacity is limited, so if writers focus too much on low-level constraints, their essays may fail to satisfy high-level constraints, and vice versa.

It seems that handwriting fluency is related to writing quality (Limpo, Alves, & Connelly, 2017). When students are given training in handwriting, not surprisingly, their handwriting becomes more legible. But somewhat surprisingly, the handwriting training also results in an increase in the quality of their essays. This finding has been interpreted as evidence that once they have automated their handwriting skill, they can use their working memory mainly for addressing the high-level semantic and contextual constraints that are essential to well-composed essays (Jones & Christiansen, 1999).

It also seems that improved syntactic and spelling ability is related to writing quality (Glynn, Britton, Muth, & Dogan, 1982). Similarly to the findings regarding handwriting fluency, it seems that when you have automatized the syntactic constraints of writing, you have more working memory capacity to focus on higher-level features of an essay.

Reviewing: Reviewing refers to detecting and correcting problems in the written text, including both syntactic problems and semantic problems. Explicit training in specific strategies for detecting and correcting errors can be successful in improving essay quality (De La Paz, Swanson, & Graham, 1998; Saddler & Graham, 2005). Limpo et al. (2014) reported improvements in revising skill from age nine through fifteen, and revising was related to writing quality for older but not younger writers.

Overall, understanding how people learn to read and write contributes to the science of learning, by extending the learning sciences to authentic learning tasks. In contrast to classic learning theories that focused on general principles of learning, learning in subject areas such as reading and writing requires domain-specific knowledge and skills and is shaped by working-memory limitations.

27.1.2 Task-Specific Knowledge in Reading and Writing

Knowledge about how to read and write particular genres of texts involves specific as well as general knowledge. For instance, in Section 27.1.1, we summarized research on writing the "essay" genre, which found that composing a well-written essay involves the processes of planning, translating, and reviewing. But not all writing involves these processes; many sorts of written texts do not include the features of essays (Hillocks, 1995; Smagorinsky, Johannessen, Kahn, & McCann, 2010; Smagorinsky & Smith, 1992).

A number of researchers have adopted the position that general literacy knowledge is necessary but not sufficient as people's writing skills mature and they begin to differentiate genres of written expression and start to read an increasing variety of texts. These researchers have found that when people engage with various types of reading and writing tasks, they use different literacy knowledge of both form and process.

Hillocks (1986) and his students and colleagues (e.g., Hillocks, Kahn, & Johannessen, 1983; McCann, 1989; Smagorinsky, 1991; Smith, 1989) have been among the strongest proponents of the idea that writing knowledge and reading knowledge are different for different genres or tasks. Hillocks et al. (1983), for instance, describe certain "enabling strategies" (p. 276) for compositions involving the definition of abstract concepts: "1) to circumscribe the problem generally, 2) to compare examples in order to generate criteria that discriminate between the target concept and related but essentially different concepts, and 3) to generate examples which clarify the distinctions" (p. 276). These strategies are unique to the task of defining abstract concepts; one would not employ them in writing a personal narrative, although, quite remarkably, Hillocks (2002) has found that in some high-stakes writing tests, the same rubric is used for very different writing tasks. He found that in some state writing tests, both narrative essays and persuasive essays are graded on a rubric that says they must have an introductory paragraph, three body paragraphs, and a concluding paragraph. These assessment criteria suggest that the test developers implicitly subscribe to the position that the test should assess general literacy knowledge, because the test omits considerations of the composition of a narrative, itself a genre involving many subgenres requiring different sorts of declarative and procedural knowledge from essays (Parla, 2003). In contrast to the idea that general literacy knowledge is sufficient, scholars like Hillocks have argued that because narrative essays and persuasive essays enlist very different cognitive skills and abilities, the two genres call for very different production and evaluative criteria.

In addition to the debate about rubrics and assessment, the task-specific knowledge position has implications for school instruction. This position suggests that a writer cannot approach a poem and a memo in the same way and with the same procedures, as believed by Murray (1980). Even different types of poems – a sonnet, a free verse poem, a limerick, or virtually any other poetic type – would require unique knowledge, with each variation (e.g., different types of sonnets) requiring yet more specialized knowledge. The implication is

that designing an effective learning environment for these different writing tasks requires a task analysis of the particular knowledge required for each type of text, and instruction in the appropriate set of procedures identified by the task analysis.

In parallel with research on cognitive variation in *writing* tasks, researchers have also documented that unique skills are required to *read* particular types of texts. Rabinowitz (1987), for instance, argued that reading literature "is not even a logical consequence of knowledge of the linguistic system and its written signs. It is, rather, a separately learned, conventional activity" (p. 27). Smith (1989) found that giving students direct instruction in the interpretive strategies that readers use to understand irony (Booth, 1974) significantly improved students' ability to understand ironic poetry, as measured by performance on a test requiring the identification of ironic language, and by responses to interview questions. Smith (1991) argued that giving students direct instruction in the conventions of irony may help them become more active interpreters of meaning when irony is employed.

27.1.3 Community-Specific Knowledge in Reading and Writing

In addition to general knowledge used in literate activities and task-specific knowledge used in particular genres, different communities of discourse (Nystrand, 1982), interpretation (Fish, 1980), and practice (Lave & Wenger, 1991) require further specificity in the kinds of knowledge they employ when their members read and write, because of the demands and customs of the particular social and discourse communities in which they participate. The shift toward conceiving literacy practices as differentiated by community comprises the "social turn" taken by many writing researchers since the 1990s (see the contributors to Smagorinsky, 2006).

Researchers working from this position find that the process of argumentation, to give one of many possible examples, is not practiced the same by all professional, discursive, or cultural groups. The basic template for argumentation in US education comes from Toulmin (1958), who identified the features central to constructing an argument that include the *claim*, or the points emphasized; the *grounds*, or data used to support the claim; the *warrant*, or the chain of reasoning from the data that supports the claim (for a more extended treatment, see Andriessen & Baker, Chapter 21 in this volume).

This outline has provided a durable basis for much school instruction in writing arguments (Newell, Bloome, & Hirvela, 2015). Most social groups are likely to employ these features, but in different degrees and with additional requirements to suit their cultural practices. Toulmin acknowledged that different situations bring out nuances in the particular argumentative strategy. These elements do not appear in the same degree in all discourse communities, and various cultural groups often have additional elements and requirements. Professional and disciplinary communities of practice, for instance, foreground different aspects of argumentation. For example, literary criticism seems to be a

unique form of argumentative discourse, distinct from scientific debate, for example (Fahnestock & Secor, 1991). If argumentation were task-specific only, without being adapted to discourse communities' specialized values, literary criticism would not have its own distinct requirements and expectations. However, when read by a scientist, literary criticism might come across as insufficient as argumentation (Fahnestock & Secor, 1991, p. 84).

Professional and academic communities of practice were among the first noneducational sites for research on composition (Odell & Goswami, 1985). Studies of racialized discourse communities were launched at roughly the same time. Kochman (1981), for instance, found that in public settings, Black and White participants foregrounded different aspects of argumentation in their exchanges, and distrusted the argumentative practices employed by the other cultural group. White participants in public discussions of neighborhood issues in Chicago tended to rely on logical arguments founded in appropriately grounded claims, yet did so with muted affect, relying instead on the weight of their logic. Black participants meanwhile relied on passionate expression of needs and ideas. To White participants, the Black contributors lacked analytic grounding for their opinions, and thus were suspect. To the Black participants, the White contributors lacked passion and thus commitment to their ideas, and thus were suspect (also see Nasir et al., Chapter 29 in this volume).

A number of researchers have identified the ways in which a discourse community's speech conventions carry over to their literacy acts. Kochman (1981) noted that Black speech tends to rely far more on emotion and passion than White speech, which tends to be emotionally muted and more reserved in service of meeting the standards of Eurocentric reason. Majors (2015) has detailed the ways in which African American women generate persuasive arguments in hair salons, engaging in speech that often has an emotional, relational character that is expressed through African American discourse norms (call and response, signifying, narrative argumentation). These conventions, Majors argues, might not be recognized as legitimate in either speech or writing in school classrooms in which dominant culture values structure participation (see Nasir et al., Chapter 29 in this volume). Literacy practices grounded in speech conventions learned at home, then, are often found to be deficient according to the standards ossified in the deep structure of schools (Smagorinsky, 2020), which is designed to maintain cultural dominance rather than provide access to learning and achievement arising from a variety of cultural vantage points. Literacy practices in such cultural genres as spoken word poetry, which are often written before being performed (Fisher, 2005), are making inroads in some classrooms as bridges between students' cultures and the school curriculum (e.g., Hill, 2009). Yet they remain marginalized in relation to the power of centralized curriculum scripts and standardized tests in shaping teaching, learning, and assessment in schools. Simply noting that literacy practices vary by community, then, is insufficient. Understanding the greater authority that dominant cultural values have in determining how

students express themselves in writing or how they engage with reading cultural texts is critical to understanding the lack of equity in how schools structure teachers' instructional design and students' educational experiences.

Understanding argumentation solely from Toulmin's (1958) perspective, then, may preclude appreciation of other forms of argumentation and may work to far better advantage for those enculturated to White, Western notions of persuasion than those who learn how to argue points from other perspectives. Literacy thus has important cultural dimensions that make socialization to European Enlightenment norms advantageous, and socialization to other ways of being open to negative judgments in the context of schools that were designed for assimilation, in spite of rhetoric advocating for respect for and celebration of diversity (Smagorinsky, in press).

27.2 Implications for Learning Sciences

Our review of the research on how people learn to be literate suggests the following implications for the learning sciences in general:

(1) Learning a complex cognitive skill, such as reading and writing, requires a multifaceted array of cognitive components, from decoding letters as a fundamental skill to composing and interpreting texts in a variety of genres in accordance with the expectations of particular communities of practice. This complexity is likely to be found in other complex cognitive skills, including those that are presumed by many to lack such demands. Rose (2005), for instance, has documented how waitresses must develop strategies to aid memory of a routinely changing set of customers in a chaotic environment, requiring the recall of the basic sequences and etiquette (greeting the customer, asking for drink orders, recording orders for a revolving door of tables and customers, bringing the salad before the main course, and so on as performance schema) as well as more task-specific knowledge, such as the different conventions for serving wine and serving water, and more community-specific knowledge, such as the expectations for serving wine in a roadside diner and serving wine in a five-star restaurant. The general, task-specific, and community-specific knowledge categories appear to structure performances in diverse areas of endeavor.

(2) It is not possible to learn to produce written versions of the higher-level cognitive skill (understanding a genre like argumentation) without first mastering the lower-level cognitive skills of letter and word decoding; and the automatization of lower-level skills (e.g., learning phonics as part of initial reading experiences; see Stahl, Duffy-Hester, & Stahl, 1998) is necessary before higher-level skills can be learned due to limitations in working memory. Just as a reader or writer could not undertake an argument without knowing how to form words from letters, a soccer player could not attack different types of defenses without first knowing how to kick, pass, and receive a soccer ball at the most basic level.

(3) Communities of practice play a substantial role in defining expert cognitive performance in literate domains. As learners mature within fields of endeavor and belief systems that differentiate schools of thought within fields, they must learn the conventions for acceptable communication and action so that they can adapt to local expectations. In diverse areas of cognition and performance, metacognitive awareness helps to enable the adaptation of one's knowledge to new situations in which local conventions require recognition and adjustment for optimal communication and action.

27.3 Conclusion

In this chapter we have confined our discussion of literacy practices to those concerned with learning to read and write print-based texts. In doing so we do not dismiss the abundant field of multimodal textuality that has become of great scholarly and practical interest following the recent proliferation of digital devices that enable combinations of sign systems for communication. These new forms of textuality are increasingly driving research that extends the above findings in new ways. In this chapter, however, we are confining our attention to print literacy, given the abundance of symbol systems that comprise multimodality and multiliteracies and the complications they would introduce into our review.

Our outline of general, task-specific, and community-specific knowledge provides a useful organizing framework for a large body of research. Roughly speaking, the three types of knowledge follow a developmental curricular path, with general knowledge of how to read and write being the province of younger children and their education, task-specific knowledge available when curricula begin to differentiate in middle and high school into subject areas and their preferred genres, and community-specific knowledge primarily of importance when one enters more intensive concentration on a profession or discipline such that adhering to local conventions is necessary in order to communicate and succeed within genres.

This curricular progression maps well onto the finding from the learning sciences that knowledge proceeds from general understandings to those requiring more specific forms of knowledge. The learning sequence governing reading and writing development, then, appears to share fundamental processes involved in learning across the cognitive spectrum.

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