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The role of knowledge in early literacy

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Several years ago, in collaboration with Kathy Roskos, I was studying the effects of a literacy-related play office setting in a Head Start center (Neuman & Roskos, 1993). Using a task developed by Lomax and McGee (1987), I asked 4-year-old Terrell to identify several objects and to describe their use. Specifically, the purpose of the assessment was to determine whether a child's involvement with objects like a calendar, grocery list, map, or letter in a literacy-related play setting might lead to greater understandings of functional print, defined as knowing the name of the object, and knowing its purpose. Pointing to the business letter inside an envelope, I asked, "What's this?" "A mail," he said. Even though the protocol called for a dichotomous *yes* or *no*, it was hard not to resist writing *sort of*. Following the initial prompt, I asked him what the object could be used for. He did not respond. Continuing down the list to other literacy-related objects (i.e., a grocery list, a coupon), I found that they, too, were "a mail."

At the time, I assumed an instrumentation error—the instrument was obviously insensitive to a child's language and way with words. In addition, it was decontextualized. The objects had been taken out of the setting and had, perhaps, lost their meaning. But it was also true that, although Terrell had been very active in the play office setting, his activities had focused primarily on manipulating objects. He had not necessarily used them in meaningful ways or in dramatic play. Still, I was convinced that due to his interest and activity, Terrell would be ready for kindergarten instruction. I even conveyed this message to his parent, so confident was I that Terrell would succeed in reading.

I am not so optimistic any more. In fact, today I believe it is questionable whether a child demonstrating skills like Terrell's would be ready for kindergarten, even

given his interest and obvious intelligence. What I failed to recognize in constructing this play setting was that Terrell needed more than theme-related objects. He needed to learn the words and some beginning understandings about what people might do in an office and why one might write a letter. He needed knowledge and vocabulary to convey his ideas. And with such instruction, I suspect that Terrell would have begun to develop the narrative routines, the concepts, and the problem-solving strategies that are, in fact, related to reading success.

In this review, I will argue that we have underestimated the role of knowledge in our understandings of early literacy. Knowledge refers to information, rules, and beliefs in specific domains (e.g., knowledge about the natural world) (Ceci, 1990)—the raw materials for operating various cognitive processes. To support my argument, I first briefly examine what we know about differential exposure to print and its potential consequences for knowledge acquisition. Then, I review several technical reports from the Center for the Improvement of Early Reading Achievement (CIERA) that examine the role of informational text on children's understandings. Finally, I will suggest that although recent consensus reports have helped to focus on the necessary accomplishments and outcomes for children in these early years, it may be that the richness of knowledge about a topic or about the concepts embedded in activities has much to do with children's achievement.

This is not a conventional review for several reasons. First, it examines technical reports, instead of books, from CIERA, the national reading center sponsored by the U.S. Office of Educational Research and Improvement. Although all technical reports go through an extensive peer review process including four outside reviews, they often represent work in progress and will involve further research and investigation. Second, I have chosen to focus on four of the more than 25 technical reports (available at www.ciera.org), not only because a full review of all would be unwieldy, but also because of the topic they begin to explore. Third, I focus on the theoretical underpinnings of this research from my perspective, attempting to tie a number of investigations together, rather than look at the research strictly through the authors' theoretical lenses. The findings I chose to emphasize, therefore, are my own, and do not necessarily represent the ways in which the authors might summarize the major contributions of their work. Finally, it would be hard to argue for total objectivity. Although these reports were completed and owe much to those involved under a different administrative structure, I was the Director of the Center prior to accepting my current position (Assistant Secretary for Elementary and Secondary Education in the U.S.).

However, in defense of this strategy, while often representing important new avenues for research, technical reports have limited visibility and accessibility. Although many will become articles, chapters in books, or books, generally the time delay will be significant. Thus, an analysis of these current investigations may begin to generate discussions beyond CIERA among the broader reading research community, as we jointly seek to improve children's early reading achievement.

Why do children fail at beginning reading?

In their compendium of research, Snow, Burns, and Griffin (1998) suggested that although Americans tend to do well in international comparisons of reading, it is the concentration of readers among poor, urban neighborhoods and rural townships that continue to be at risk for failure in reading. The economic gap has widened over the past 20 years (Fischer et al., 1996), leading some to estimate that as many as 25–40% of children in the U.S. are likely to be imperiled because they do not read well enough, quickly enough, or easily enough to ensure comprehension. On average, children at risk grow up with lower incomes, less nutritious diets, unhealthier environments, and poor medical care. They are likely to come from home environments that may value education but have neither the physical nor the social conditions to support it entirely.

What is striking in the description of risk factors is how many are related to the social contexts of learning, and thus are amenable to change, and not to individual or inherent abilities. For example, studies have shown that given conditions such as quality preschools (Barnett, 1995), quality instruction (Ramey & Campbell, 1991), and family literacy targeted to language development (Neuman & Gallagher, 1994), children likely to be at risk are succeeding and continue to succeed throughout their schooling. Furthermore, these studies find that beginning early makes a difference. As Stanovich, in his now classic model of the Matthew Effect posited (1986), differences in cognitive, motivational, and educational experiences in the early years become magnified in the process of reading acquisition.

Focusing specifically on early skill accomplishments, Stanovich's Matthew Effect model (1986) placed phonological processing at the center of reading acquisition. In short, his argument suggested that children who develop efficient decoding processes early on are likely to be able to concentrate on the meaning of the text. They will read more, practice, and get better at it, thus enjoying the further riches of reading. Unfortunately, and in a contrasting trajectory, children who do not become

proficient in these skills begin a negative spiral of cumulative disadvantage. Adams's (1990) thorough synthesis on beginning to read served to substantiate and extend this theory. Consequently, instruction in phonological awareness has received enormous attention in early intervention programs.

Despite the crucial role of phonological processing in early reading, Stanovich reported in his intriguing self-reflection (2000) that it does not appear to account for *all* of the observed variation in reading acquisition. Rather, in the next series of studies, Stanovich and his colleagues (Cunningham & Stanovich, 1991; Stanovich & West, 1989; West, Stanovich, & Mitchell, 1993) reported that print exposure is explicitly linked to a variety of cognitive outcomes, including vocabulary knowledge, domain-specific knowledge, and verbal fluency. Comparing other media and conversational language, Cunningham and Stanovich (1998) reported that print appears to be a more potent source of rare vocabulary words than other sources. Several studies (e.g., Anderson, Wilson, & Fielding, 1988; Elley, 1989) have confirmed these linkages, indicating the impact reading has on vocabulary development and content knowledge.

That books may well *make people smarter*, as Stanovich has claimed (2000) (defining smarter as larger vocabularies, more knowledge, and greater abstract reasoning), however, has largely eluded substantiation in the research literature in early literacy. Studies to date have for the most part examined how children come to understand the symbols of reading (Snow et al., 1998) and concepts of print, with the focus on how children develop knowledge *of* literacy, rather than knowledge *through* literacy. Yaden, Rowe, and MacGillivray (2000), for example, suggested that most of the research has addressed basic questions, such as "Is it good to read to children?" "How do forms of early writing change as children develop?" and "What is the role of the home in preparing children for successful literacy learning?" These questions are reminiscent of the age-old adage that the nuts and bolts of learning to read must occur before reading to learn.

The fact is, however, that the contributions of most early intervention programs (Hiebert, 1994; Jencks & Phillips, 1998; Shanahan & Barr, 1995) have not necessarily shown up in later acquisition of inferential and critical thinking skills required to comprehend text competently. Although early literacy skills are improving, higher level processes are not. It could be argued that early childhood programs have emphasized process to the exclusion of content, placing the utmost importance on how children learn rather than on what they learn, instead of striking a better balance.

How much knowledge are we teaching in early literacy?

Educators may not be teaching enough knowledge in early literacy. Two of the technical reports under review here, *Beating the Odds in Teaching All Children to Read* (Taylor, Pearson, Clark, & Walpole, 1999), and *The Scarcity of Informational Text in First Grade* (Duke, 1999), highlight these concerns. Examining schools that appeared to beat the odds, Taylor, Pearson, Clark, and Walpole (2000) provided a portrait of school and classroom factors related to primary-grade achievement in 14 schools across the U.S. (See Taylor et al., 2000, for a complete analysis.) In the course of their analysis, they identified school factors that appeared to be related to the most effective programs, partnership factors such as strong links to parents and communication among colleagues, and teaching factors such as time spent in small-group instruction and high pupil engagement. They also noted instructional variation among teachers within schools: Accomplished teachers spent more time coaching and engaging in explicit teaching than less accomplished teachers.

In the course of their analysis, Taylor et al. (2000) reported a highly disturbing finding. Across all schools, comprehension instruction was minimal from Grades 1 through 3. Although kindergartens were excluded in this analysis, it is not unreasonable to assume similar results. Primary techniques for teaching comprehension were picture walks, asking text-based questions, asking for aesthetic responses, having children write a response to reading, doing a story map, retelling a story, and completing a workbook page of questions. Text-based questions and written responses to questions dominated the instructional landscape, bearing a striking resemblance to Durkin's (1978–1979) classic study of comprehension.

Taylor et al. (2000), like Durkin (1978–1979), reported that many questions were at the literal level. Only 16% of the teachers in these primary grades were frequently observed asking higher level, aesthetic response questions. Now in fairness, these findings examine the level of question apart from the content of the activity. But the prevailing assumption in these instructional practices appears to be that asking any questions, literal or higher level, will produce higher level critical thinking. The emphasis seems to be that if children develop the general heuristics and problem-solving strategies for reasoning, these behaviors will become transferable to habits of thinking. Rarely, however, has the knowledge of a particular domain been considered, even though we know from research that it takes knowledge to gain knowledge.

This is why informational books might be so critical, particularly for children from disadvantaged communities who have limited access to resources. If we assume that books are a key resource for knowledge and vocabulary, informational texts may provide a central source for developing areas of expertise. Duke, in *The Scarcity of Informational Text in First Grade* (1999), defined informational texts as having many or all of the following features: (a) a function to communicate information about the natural or social world; (b) an expectation of factual content; (c) timeless verb construction; (d) generic noun constructions; (e) technical vocabulary; (f) classificatory and definitional material; (g) compare/contrast, problem/solution, or like text structures; (h) frequent repetition of the topical theme; and (i) graphic elements such as diagrams and maps. As valuable resources, informational books might be used to integrate knowledge and problem-solving strategies, enhancing what children know and how they might go about getting more knowledge.

As the title of her technical report reveals, however, Duke (1999) found limited access to informational text in 20 first-grade classrooms in 10 school districts. Among the aims of her research was a comparison of print environments and experiences offered to students in very low- and very high-socioeconomic status (SES) school districts. Duke reported that although there was a scarcity of informational text throughout the entire sample, it was particularly acute in low-SES classrooms. Overall, low-SES classrooms had fewer displayed texts, averaging 4.3, compared to 14.5 texts for high-SES classrooms, and less than half of the proportion of informational texts (6.9% compared to 12.7%) in classroom libraries.

Of more concern was the extent to which these books were actually used in classroom activities. (See Duke, 2000, for additional detail.) Out of 79 full days of observation, only 3.6 minutes per day were spent with informational texts in all the schools. Low-SES classrooms spent a mean of 1.9% of time on informational texts as a whole class, compared with 3.8% in high-SES classrooms. Previous research (Pappas, Kiefer, & Levstik, 1990) supported these findings, showing that these texts often fall into an instructional abyss, chosen neither for teacher read-alouds nor for independent or reference reading.

Duke suggested in her report (1999) that the scarcity of these resources may limit children's understanding of the genre features of informational text. She raised the legitimate concern that, without greater experiences in the early grades, children's fluency with these texts and motivation for literacy might be compromised, especially as informational texts take on a more prominent role in the intermediate grades. However, in this review I raise an alternative question. How are children to develop broad domain-specific knowledge without these rich resources? How are children expected to gain factual knowledge? To write, think, or solve problems, young learners must have something to write about, something to think about, or some problems to solve. In short, important learning processes require content knowledge.

How might young children develop content knowledge from books?

Young children might develop content knowledge from books read to them by their caregivers and teachers. And, beginning with the mother-child dialogue study by Ninio and Bruner (1978), followed by the work of Snow and Goldfield (1983), much research has focused on the benefits of storybook reading and the conversational contexts that surround it. But rarely has genre been included as a critical factor in what children learn. It is true that Pappas and her colleagues in several elegant studies (Eller, Pappas, & Brown, 1988; Pappas, 1991) demonstrated that children learned linguistic features and text structures as a result of repeated readings of expository genre. However, Smolkin and Donovan in *The Contexts of Comprehension: Information Book Read Alouds and Comprehension Acquisition* (2000) suggested that in addition to genre features, children engage in different comprehension-related conversations with informational texts. Comparing responses from a first-grade class's whole-group discussions with six storybooks and six information books, Smolkin and Donovan found striking differences in comprehension discourse moves across genres. Interactions with the six information books produced 354 discourse moves, or 93% of the total, compared to 42 moves for six storybooks (7% of the total). These discourse moves included connecting within and between sentences of the book, summarizing, examining aspects of text structure, creating mental images, and linking intertextually.

Smolkin and Donovan (2000), like Duke (1999), argued for a better balance in read-aloud books to young children. They suggested that different genres, like storybooks and informational texts, have different purposes. Storybooks entertain and promote aesthetic responses. Informational books, on the other hand, though affording aesthetic experiences, primarily seek to inform. Thus, it makes sense that informational books, and the conversational moves that support them, might serve as essential vehicles for increasing children's content knowledge. With talented teachers, children may confront new challenges or contradictions to their existing knowledge base and, in doing so, increase the breadth and depth of their understanding.

As Palincsar and Magnusson (2000) reported in *The Interplay of Firsthand and Text-Based Investigations in Science Education*, however, integrating informational texts in early primary teaching is not easy. In content areas like science, some teachers who favor inquiry-based learning find that these texts tend to be regarded by children as the authoritative word, inhibiting them from generating their own hypotheses and answers in the course of observing phenomena. Thus, in a fascinating series of studies, Palincsar and Magnusson examined the interplay between text and inquiry, with the goal of helping children in the early elementary years to attain both knowledge and reasoning skills.

Palincsar and Magnusson (2000) described an expert third-grade teacher involved with the interplay of two forms of scientific investigation, one involving direct firsthand experiences with phenomena of interest and another involving text-based secondhand experiences. They found that the teacher used text largely for the purpose of extending children's understanding of the firsthand inquiry, helping them to reflect and consider multiple hypotheses. But the text itself had missing elements. For example, it did little to advance children's opportunities to think like scientists and to reason scientifically.

Because of the text's limitations, the authors designed their own, basing their model on a scientist's notebook. Like a notebook, the text used scientific reasoning to advance the inquiry, and it included facts and multiple ways of representing data (i.e., tables, figures, diagrams) that are typically used to depict information. For example, Lesley, the young scientist in the new text, included in a notebook entry what she had learned from studying Newton's investigations of light and color, and she indicated how she formulated claims from this information to advance her own inquiry. In brief, the text was a hybrid of exposition, narration, description, and argumentation.

Comparing the effects of this new text genre with a traditional one, Palincsar and Magnusson (2000) found significant support for the benefit of the notebook genre in learning scientific concepts over traditional text. Another finding perhaps as interesting involved the quality of children's conversations. The discussions tended to reflect both firsthand and secondhand experiences, suggesting that rather than supplant inquiry, text provided an important value-added component to children's learning. This interplay may demonstrate how children begin to improve their skills through the exercise of conceptual and procedural knowledge in the context of a specific domain. One could argue that the innovative genre provided a model of what good inquiry teachers tend to do: They engage children in learning about facts, concepts, and particular rules or strategies for learning more about the domain and help children think about the new phenomena in terms of what they already understand.

How do we improve early literacy instruction for children at risk?

Communication theorists (e.g., Viswanath & Finnegan, 1996) have long contended that knowledge is power. However, as Delpit (1988) has so poignantly described, such power is seldom spread equitably across income groups. Gaps have been found and reported consistently in access to resources, materials, and educational opportunities between low-income and middle-to-upper income groups (Jencks & Peterson, 1991; Wilson, 1987). For example, Donna Celano and I (Neuman & Celano, 2001) described the differences in access to print in four low- and middle-income neighborhoods in a large city. Whereas children in a middle-income community would likely be inundated with multiple opportunities to observe, use, and purchase books (estimated at about 13 titles per individual child), few such occasions were available for low-income children (estimated at about 1 title for every 300 children).

Although such inequities must be resolved, resources alone probably will not improve achievement. Coleman's classic study of educational opportunity (Coleman et al., 1966), for example, reported no evidence that school resources had much effect on achievement. More recent studies (Jencks & Phillips, 1998; McGill-Franzen, Allington, Yokoi, & Brooks, 1999), as well, have shown that greater resources have only modest to no effects on early literacy improvement or on closing the achievement gap.

Rather than assume a direct *resources equals achievement* relationship, it could be that initial access is tied to a complex set of relationships. Limited access might predict limited exposure to print, with concomitantly limited distribution of knowledge and information. As many social scientists have theorized (Graziano, 1997; McLeod & Perse, 1994; Viswanath & Finnegan, 1996), it may be the inequities in *knowledge* that lead to inequities in social power and status. In formulating the knowledge gap hypothesis, Tichenor, Donahue, and Olien (1970) suggested that increased knowledge disparities among social groups occur as a result of differences in the amount, rate, and speed of gathering information from media. Assuming that knowledge produces more knowledge, they hypothesized that information-haves read more, engage more in higher level conversations, create greater existing pools of knowledge, and use information for fulfilling specific purposes and needs. Greater use enhances speed of information acquisition, which over time

is likely to accelerate a knowledge gap between those who have access and those who do not (Neuman & Celano, 2001).

The 1965 debut of *Sesame Street*, designed specifically to narrow knowledge disparities as part of U.S. President Johnson's War on Poverty, provides an illustrative example of the difficulties of closing the gap. The first- and second-year evaluations (Ball & Bogatz, 1970; Cook et al., 1975) of the program showed evidence of actually increasing differences, helping those children who were already somewhat prepared for formal reading instruction far more than the less ready children, who benefited little. As a result of the program, studies (Cook et al., 1975; Goldsen, 1977) found larger gaps in skills by kindergarten for middle- and lower-income children than before. In fact, since 1983, the most consistent result in 58 studies of the knowledge gap is the presence of knowledge differentials, regardless of topic (Gaziano, 1997).

To date, however, much of the discussion on prevention or early intervention for children at risk has focused on whether special interventions, such as Head Start and Even Start, and remedial instruction like Reading Recovery are likely to raise and sustain children's literacy achievement. But it seems to me that the real leverage may not lie in such episodic events. Instead, it may be the continual, systematic, everyday ways we engage children in learning new knowledge and information, starting in the early years. In an analysis of programs with long-term effectiveness for low-income children, Frede (1998) reported the presence of curriculum content and learning processes that cultivate knowledge and skills, with an emphasis on language development. Children who had a broad base of experience in domain-specific knowledge were likely to move more rapidly in acquiring complex skills.

Untapped potential

Many years ago in establishing curriculum guidelines for what children should learn, Eisner and Vallance (1974) advised against two fallacies. The first fallacy, they suggested, would be to overemphasize learning processes, such as problem-solving or thinking skills, over content, placing ultimate importance on *how* children learn rather than *what* they learn. The second, or opposite error, would be to assume that there is a body of content, canon, or universal curriculum that all children should master and that an emphasis on content is necessary to ensure academic rigor. To these, I would add a third fallacy—that the specter of engaging children in more content learning means that process is less important, or that important processes will be ignored in favor of a rigid academically based curriculum.

The fact is, more often than not, young children at risk have had neither process nor content taught meaningfully. Instead, they have been subjected to intellectually trivial activities, limited in content and only loosely connected between subjects. Too often, there has been an overemphasis on active, cute, and hands-on learning assumed to be developmentally appropriate, without any foundational knowledge base. Seppanen, Godon, and Metzger (1993) found, for example, that early childhood Title I classrooms did not provide any regular experiences in topics of math, language, and science. Minds may atrophy under such conditions.

Rather than succumb to an either/or fallacy (academic vs. social/emotional; content vs. process), more recent work in cognitive psychology considers the interaction of acquired knowledge and processes. Content cannot be learned without learning processes being engaged (Glaser, 1984). Consequently, the technical reports described in this review begin to grapple with a more integrated approach in which attention to process is shared with the structures of knowledge and skills. Duke's (1999) report on the paucity of informational books, and time spent on informational text, is made all the more poignant by Smolkin and Donovan's (2000) analysis of the more complex conversations that are possible in a more content rich form. The new text genre developed by Palincsar and Magnussun (2000) shows how thinking is influenced by new information. The scientist's notebook provides a vivid example of how changes in thinking occur when theories are confronted by specific challenges and contradictions to a young scientist's knowledge base. Further, when knowledge structures of wide application like measurement or science concepts are learned, a variety of related domains are likely to be influenced (Chi & Koeske, 1983). As we begin this new millennium, we must strive to ensure that all children have access to such rich and varied experiences that adhere to current scientifically based understandings of learning.

Today in the United States, economic differences between the haves and have-nots are greater than at any other time in history since 1929 (Fischer et al., 1996). The almost unprecedented sharp increases in inequality in recent years make wealth distribution more unequal than in the societies of northwestern Europe, which have traditionally been perceived as class ridden. Increasing gaps between high- and low-education segments tend to parallel income disparities. If the past is any guide (Gaziano, 1997), such disparities may predict future increases in knowledge differentials due to barriers to communication, access to print, and speed of knowledge acquisition over time.

It is not enough for children in the 21st century, therefore, to be able merely to read or write at basic lev-

els. Such minimal expectations are likely only to increase existing inequalities. To the contrary, education in a democracy must, from the very beginning, help children to make reasoned and thoughtful decisions, requiring both the interaction of acquired knowledge and cognitive processes. To do so, teachers must ensure that children develop factual knowledge that has coherence and depth. They must work on the edge of children's current competency, encouraging them to express ideas through language, and raising questions to help children develop even more complex ideas and concepts. In turn, children must have opportunities to form their own hypotheses, to observe and compare their findings, and to adjust their thinking based on new information.

No time is as important or as fleeting as a child's early years of schooling. Providing high-risk children, in particular, with high-quality instruction may be the deciding factor between success or failure that will follow them all their lives. Research has consistently shown the value of early education in helping to equip children with essential skills. But these skills must be used to develop coherent understandings of knowledge and concepts, the basic foundation for later learning. All of our children, rich and poor and in between, deserve no less.

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