

School Finance Redesign Project

center on reinventing public education

LEARNING SCIENCE MEETS SCHOOL FINANCE:

The How People Learn Framework as a Tool for Resource Decisions

Diana Sharp

Diana Sharp Consulting

John Bransford

University of Washington

Working Paper 6

March 19, 2007



Daniel J. Evans
School of Public Affairs

UNIVERSITY of
WASHINGTON

The School Finance Redesign Project

The School Finance Redesign Project (SFRP) encompasses research, policy analysis, and public engagement activities that examine how K–12 finance can be redesigned to better support student performance. The project addresses the basic question, “How can resources help schools achieve the higher levels of student performance that state and national education standards now demand?”

Check in with us periodically to see what we’re learning and how that information may reshape education finance to make money matter for America's schools. You can find us at www.schoolfinanceredesign.org.

Jacob Adams, Principal Investigator

The SFRP Working Paper Series

The Working Paper Series presents analyses that are complete but have not undergone peer review. The papers are subject to change and should be cited as working papers. Their purpose is to promote discussion and to solicit reactions.

Support from the Bill & Melinda Gates Foundation

This work was supported by the School Finance Redesign Project at the University of Washington’s Center on Reinventing Public Education through funding by the Bill & Melinda Gates Foundation, Grant No. 29252. The views expressed herein are those of the authors and are not intended to represent the project, center, university, or foundation.

Introduction

In 2002, the Council for Excellence in Government and the Committee on Economic Development issued a report called “Linking Resources to Results” (CEG and CED 2002). The report noted that government agencies that are making decisions about domestic programs need more than massive sets of data on program effectiveness; they need help in interpreting the data. They also need help in reconciling conflicts that appear in different sets of data and in claims about the data. In short, policymakers need something to facilitate their conversations with researchers about effectiveness data, in order to better link resources to results.

We argue that with regard to education, there are at least three primary challenges for such conversations. The first is the need for a common language to use in talking about learning. Learning research spans a huge range of ages and disciplines. Each discipline (e.g., math, literacy, science) is rich in its own specialized terminology, and often this terminology varies depending on the age of the learner.

The second primary challenge is the need for a guide we can use to navigate what is already a vast literature across disciplines and ages on how people learn, as we search for implications from this research that are relevant for resource decisions. Learning researchers have been using scientific methods to understand the human mind since the latter part of the nineteenth century. Though there are still many things that we do not know about learning and many things that researchers disagree about, there is also a great deal of consensus about effective learning environments that has yet to be reflected in many of the nation’s classrooms. However, much of the research on learning is aimed primarily at describing effective learning environments for those who are directly doing the educating; it does not often spell out directly what the implications are for decisionmakers in the world of school finance. Navigating the learning literature that represents accepted consensus and then drawing implications for school finance is a major undertaking.

A third challenge, faced by all of us, but particularly by policymakers who are not learning scientists, lies in determining which claims about learning have, in fact, been sufficiently validated to represent consensus in the field, and which financial implications drawn from these claims will be accepted by a majority of experts in the learning science field as accurate and adequately justified.

Can the Learning Sciences provide researchers and policymakers with a coherent framework for conversations about how to link resources and learning? That is the major question we begin to explore in this paper. We will focus mainly on ideas for developing a common language and for navigating the literature on effective learning environments across disciplines, ages, and contexts in search of implications for resource decisions. We will also propose some initial ideas for how policymakers and others can determine whether particular findings and implications from educational research represent a consensus among top researchers in the learning sciences today. And we will suggest some first steps for policymakers who are interested in using the How People Learn (HPL) framework for broader resource-to-learning decisions.

The Learning Sciences

Learning Science is an interdisciplinary field that for more than twenty years has brought together researchers in such areas as psychology, education, neurology, computer science, and anthropology. All of these areas provide different frameworks for what Sawyer (2006) describes as the central focus of learning science inquiry: our improved understanding of “exactly what is going on in a learning environment, and exactly how it is contributing to improved student performance.”

The How People Learn Framework

One such framework is the How People Learn (HPL) framework. In 1997, the National Research Council charged a committee of sixteen leaders in learning sciences to review the nation’s investment in relevant research and provide a high-level overview of what we now know about learning. That project culminated in the publication of the book *How People Learn: Brain, Mind, Experience, School* (Bransford, Brown, and Cocking 2000; first published in 1999 with an expanded edition in 2000).

The HPL framework draws from what researchers have learned about learning, beginning with studies in the latter part of the nineteenth century. The framework provides a set of four lenses for evaluating and designing effective learning environments across ages and subject areas. According to the framework, effective learning environments are:

- **Learner-centered**, so that they recognize and respect differences in what children know, care about, and want to do and offer each learner enticing, meaningful, and customized paths to new understandings;
- **Knowledge-centered**, so that they strike a balance between activities that promote deep understanding (such as knowledge about why we value reading and writing) and activities that promote skill fluency (such as the ability to quickly and automatically recognize a word or to “know the times tables”);
- **Assessment-centered**, so that learners have opportunities to test their abilities, receive feedback, and revise their performance; and
- **Community-centered**, with social elements that allow learners to interact with and learn from each other.

The HPL Framework as a Tool for Resource Decisions

Can the HPL framework provide a useful, common language for conversations between learning scientists and policymakers, to help provide a more coherent framework for conversations on how to better link resources and learning? Can it provide commonality across subject areas and ages so that policymakers aren’t constantly faced with completely unrelated laundry lists of what aids learning in math, science, literacy, and social studies? Can it provide a guide for navigating through the vast literature on effective learning environments in search of implications for resource decisions? And do we have any ideas for ways that policymakers can know whether claims about effective learning environments and implications for resources decisions represent a scientifically-justified consensus among top researchers in learning?

We believe that the best way to answer these questions is to explore the usefulness of HPL in the context of a concrete example, where we use the framework to organize research-based implications for finance. We have chosen for our example the area of early literacy learning (grades K–3).

We chose the area of K–3 literacy for two main reasons: First, there is a growing (and large) consensus from the research community on the settings and practices that promote early literacy learning, as established by scientific research. The most notable of these consensus reports is the report by the National Reading Panel (2000). Even critics of that report do not dispute the instructional elements recommended by the panel; instead they suggest that additional settings and practices are also supported by credible research (e.g., Pressley 2001).

Second, given the weight of evidence that supports particular settings and practices in literacy, there have already been attempts at dialogue between researchers and policymakers about the implications of literacy research for policymaking decisions—including implications for teacher training and other resource use. In 2001 and 2002, for example, Harvard University, in partnership with the National Governor’s Association and the Carnegie Foundation, hosted literacy institutes that brought together research and state teams to focus on improving instruction, teacher preparation programs, and professional development.

During the 2002 Harvard Institute for Statewide Literacy Initiatives, we (with the help of colleagues at the Learning Sciences Institute at Vanderbilt University) digitally captured the entire five days of presentations and discussions. We did this as part of a project aimed at preserving insights from conferences such as this one, so that they are available to a wider audience. Our project did not aim to reproduce the conference, but rather, to repackage the information in ways that efficiently highlighted the primary insights and main points. In response to the needs of the National Working Group on Funding Student Success, we decided to return to the knowledge base captured at that conference. This knowledge base, supplemented by our knowledge of other recent research in literacy, is what we used to explore the usefulness of the HPL framework for further organizing and illuminating the implications of literacy research for school finance. In the remainder of this paper, we will review this knowledge base, asking the following HPL-guided questions:

What does literacy research about effective classroom settings and practices imply for using resources (such as dollars, time, staffing, and professional development) to make our schools more learner-centered? More knowledge centered? More assessment-centered? More community-centered?

If the HPL lenses offer a way to organize and highlight the implications for finance from what learning researchers know (and generally agree) about literacy learning, then this will be the first step in suggesting that the framework could be useful for conversations between researchers and policymakers about how to more closely link resources and learning across disciplines and ages.

Resource Implications: An HPL-Guided Review of Literacy Research

Using Resources to Make Literacy Classrooms More Learner-Centered

A learner-centered approach requires teachers to identify the initial literacy-related knowledge and skills that children bring to the classroom. Teachers then need to tailor instruction to support and propel these skills. Teachers also need to keep in mind differences in children's topical interests when choosing the best texts for each child, since interest and motivation will influence the child's willingness to tackle new words and the amount of effort the child puts into comprehending the text (Snow 2002a).

What does research tell us about how resources can best support more learner-centered classrooms? In the following sections, we provide several implications for resource decisionmakers that arose from our review.

Allocate a portion of resources to help teachers identify differences in what children know about how written language works. Research highlights large differences in what children know about how written language works. For pre-readers, these differences lie in two main areas: phonemic awareness and knowledge of the alphabetic principle (National Reading Panel 2000). If children have phonemic awareness, they can hear that the spoken word “cat” has three sounds: [c] [a] [t]. Children with phonemic awareness can also blend these individually spoken sounds, into the spoken word “cat.” Alphabetic principle skills help children apply phonemic awareness to printed words. With these skills, children can identify the printed letters in a word that they see, remember the sounds that go with those letters, and blend those sounds together into a word.

Research suggests that children need to have a threshold level of these skills before they can benefit from learning to read simple sentences. Without this threshold level, children will find their reading instruction bewildering and difficult. Research also shows that children progress farthest in first grade when the type of reading instruction they receive best fits the level of skills they have in these areas when they begin the school year. For example, children who enter first grade with high levels of these skills do best when instruction maximizes their time reading books right from the start; children who enter first grade with lower levels of these skills do best when instruction focuses early in the year on phonics and later shifts to more book reading (Juel and Minden-Cupp 2002).

To deal with the diversity of children's literacy skills in the early grades—a diversity that becomes even larger when children from other language groups enter the mix—teachers need resources for assessments of their phonemic awareness and phonics skills, they need testing materials, they need time and support for administering, recording, scoring, and interpreting these assessments, and they may need some professional development to best diversify their instruction. There are a variety of assessments and assessment models for these lower-level skills currently in use, many of which have been driven by the Reading First program (see Sharp 2004 for a review). There is not yet consensus to suggest that one assessment model is clearly superior to the others; the important thing is that teachers need the resources to put some assessment model for these skills into place.

Do not limit resources to dealing with diversity in phonics-related skills: Prioritize the need for resources to target differences in vocabulary, starting in preschool and early grades. Research suggests that one of the largest differences between children entering school is in vocabulary, and this difference has large effects on comprehension and learning in later grades. For example, a landmark study by Hart and Risley (1995) revealed a gap between well-developed and poorly developed speaking vocabularies in children that began as early as 24 months. Their results showed that by age three, the vocabulary resources of high-vocabulary children were over 1000 words and were twice the cumulative vocabularies of low-vocabulary children. The differences were related only to income level—not race or another measured factor—and they could be traced to the number of words that children had heard at home. Example findings included the following:

- Some parents said more than 3,000 words to their child in an average hour together, and others said fewer than 500 words.
- With few exceptions, the more parents talked to their children, the faster the children’s vocabularies were growing and the higher the children’s IQ test scores at age 3 and later.
- In the everyday interactions at home, the average (rounded) number of words children heard per hour was 2,150 in the professional families, 1,250 in the working class families.
- By age 3, the children in professional families would have heard more than 30 million words, the children in working class families 20 million, and the children in welfare families 10 million.
- By the time the children were 3 years old, parents in less economically favored circumstances had said fewer different words...than had the children in the most economically advantaged targeted families in the same period of time.

Other research has shown that differences between advantaged and disadvantaged children’s vocabulary knowledge become much more noticeable in grades four and above, when the texts they are reading contain more abstract, technical, and literary words (Chall, Jacobs, and Baldwin 1990; Chall and Jacobs 2003).

Researcher Isabel Beck and her colleagues argue that these profound differences in vocabulary levels demand that a high level of vocabulary instruction begin in kindergarten (Beck, McKeown, and Kucan 2002). Consistent with Hart and Risley’s (1995) work, they cite the following evidence from research:

- First-grade children from higher-SES groups knew about twice as many words as lower-SES children (Graves, Brunetti, and Slater 1982; Graves and Slater 1987).
- High school seniors near the top of their class knew about four times as many words as their lower-performing classmates (Smith 1941).
- High-knowledge third graders had vocabularies about equal to the lowest-performing 12th graders (Smith 1941).

What kinds of resources are needed to tackle this problem? Unfortunately, the current state of assessment models for vocabulary is vastly different from the plethora of tools and models for phonics skills. Gersten and Dimino (2006) note:

Currently, there are no efficient screening measures for language deficits that are analogous to those used to predict student outcomes and consistently monitor

student progress in phonemic awareness, sound-symbol correspondence, and fluency...Recently completed longitudinal research (e.g., Scarborough 2005) suggests that a group of students will learn to read, but be seriously hampered beginning in third and fourth grade by limited vocabulary knowledge and limited strategies for comprehension of either spoken or written discourse.

Aside from the need for better assessments, the most common resource-related recommendations for tackling the vocabulary problem center on the need for instructional time in the school day to focus on vocabulary, and on resources for selecting and preparing teachers to deal with vocabulary issues. For example, Biemeller (2004) advocates that to address vocabulary needs, teachers should plan on “about 30 minutes a day for reading aloud, word explanations, maintaining some focus on comprehension, and on assessment.” Catherine Snow states:

... if we've got current and prospective teachers whose vocabularies are in the 80th percentile, then they're going to do a much better job than if we have teachers and prospective teachers whose vocabularies themselves are in the 35th percentile. They don't know enough words or enough about words to do an optimum job of helping kids, making sure that they are salting their own language with the words that kids will need to know. And that's the efficient way of teaching vocabulary without taking 45 minutes a day to do it, but embedding it in all of the other instruction (Snow and Paez 2002).

Make early investments in addressing the needs of second language learners. A learner-centered literacy environment respects differences in what children know, so it must address differences that second-language learners bring to classrooms. The consensus from research is that early investment in addressing the needs of second language learners will pay off (August and Shanahan 2006). How should resources be targeted to those needs?

First, researchers highlight the need for resources to establish coherence among programs that range from pre-school to primary grades. Mariela Paez notes:

(Part) of the incoherence of the system is the lack of connection between early childhood and primary grades. The kids can easily go to Head Start programs where the stated purpose is these kids have to learn English as fast as possible in school districts where there's a strong commitment to bilingual or even two-way bilingual, and where the Spanish language skills of the children are seen as a resource (Snow and Paez 2002).

Second, teachers need to know how to adapt the teaching of reading components to language-minority students for maximum benefits. For example, when teaching children skills in phonemic awareness and the alphabetic principle, teachers may need to spend more time on particular phonemes and combinations of phonemes that do not appear in the students' native language. Resources should be used to provide this information to teachers as part of professional development and pre-service programs (August and Shanahan 2006).

Third, resources need to be used to ensure that programs for second-language learners do not stop when children have achieved a level of English proficiency that allows only for adequate interpersonal communication. For second-language learners to succeed, they need instruction that will help them develop proficiency in *academic* printed English. Written, academic English has a greater cognitive load than conversational English and does not provide extralinguistic cues

such as gestures and facial expressions. Research suggests that with instruction, language minority children can achieve parity levels of interpersonal communication skills in their non-native language in one to three years; achieving parity levels in academic English takes five to seven years (Carlo 2002).

Use resources to provide classrooms with extensive reading content that includes a wide range of topics and reading levels. In learner-centered classrooms, teachers know what children care about, and teachers tailor their reading suggestions to match those interests as often as possible. In defining comprehension, the RAND report (Snow 2002a) explicitly highlights the need for children to be interested in what they are reading and to understand the purpose for reading it; otherwise, conflicts between the child's motivation and the reading assignment will result in incomplete comprehension. In a review of research on student motivation, focused exclusively on experimental studies with random assignment to experimental and control groups, Guthrie and Humenick (2004) found that giving students in primary grades large amounts of choice in their reading, to match their own interests, resulted in significant impacts on reading motivation and an increase in student's use of important cognitive strategies for comprehension. In addition, Shiefele, Krapp, and Winterler (1992) conducted a meta-analysis showing that a child's reading is likely to improve when a text's topic matches the child's personal interest.

Many children in primary grades prefer informational text (text that provides information on the natural or social world) to stories (e.g., Mohr 2006). Drawing from extensive research, Duke and Bennett-Armistead (2003) recommend that one-third of the texts in classrooms be informational genre, one-third narrative genre, and one-third other texts (e.g., poetry and biography).

Policy mandates and funding can conflict not only with the need for wide-ranging topics in early classroom reading materials but also with the need for wide-ranging levels of reading material in each classroom. In a 2004 interview for a MacArthur Foundation project about the Reading First program (Sharp 2004), Mary Fowler of the University of Virginia noted:

One of the big things about Reading First is that you need to be using assessment to drive instruction. At the same time, [the state] says, "You need to use your basal." Well, if your kids are not reading at a 2nd grade level, the 2nd grade basal isn't going to be appropriate. It's a big contradiction. What I tell people is, if you've adopted this basal, then put it in a bookroom, so that in any classroom you might have five first-grade basals, five second-grade basals, and so on. That way, you can meet the needs of your kids. And that works for some schools. For others they say, "No way, you're in the second grade, you're using the second-grade basal... I used to hear crazy things like, they have all these wonderful little books and trade books in their classroom, and now they have the basal, so they've put all [the other books] in storage, and they're not using them anymore. And [we tell them], "No, no, no, that's one other resource; it's not one or the other.

Indeed, the wide range of reading abilities in early classrooms is hard to understate. Researchers involved in the Development of the TPRI (Texas Primary Reading Inventory) state, "the range of reading ability in a typical classroom is about five years and is more academically diverse than any time in history" (Kameenui and Carmine 1998; Mathes et al. 2003).

To meet the wide-ranging needs of readers in early classrooms, Allington (2001) recommends that elementary classrooms have, as a general, rule, at least 500 different books.

Some grades may need even more wide-ranging levels of books than others: David Kerbow, developer of the STEP literacy assessment for K–3 at the University of Chicago’s Center for Urban School Improvement, notes that reading skill diversity in second grade is extremely high and is even greater than in the earlier grades (Kerbow, Gwynne, and Jacob, forthcoming).

Using Resources to Make Early Literacy Learning More Knowledge-Centered

In previous decades, educational researchers have clashed over whether to emphasize basic skills in reading or focus on comprehension and meaning (e.g., Chall 1967; 1989). More recently, calls for balance have prevailed, in line with a knowledge-centered approach that stresses the need for instruction in skill fluencies, such as decoding and word recognition, *and* deeper understandings, such as why reading and writing are valuable (e.g., Snow, Burns, and Griffin 1998; New Standards Primary Literacy Committee 1999).

In the remainder of this section, we outline three suggestions from research on where resources are needed to make classrooms more knowledge-centered.

Resources need to be allocated so that early grade teachers recognize the importance of balance that extends beyond 3rd grade tests. Researchers warn that if incentives for elementary schools are tied only to third-grade outcomes, then instruction tends to skew towards an emphasis on skill fluency, instead of comprehension and deeper understandings (Snow 2002a). From first through third grade, most tests for comprehension, including those tied to Reading First funds, are highly dependent on children’s decoding ability (Sharp 2004). In contrast, shortcomings in *true* comprehension ability often do not become apparent until fourth grade or later, when children can read texts complex enough to require more than surface understanding (Chall and Jacobs 2003; Chall, Jacobs, and Baldwin 1990).

In preparing teachers and/or designing incentives for knowledge-centered classrooms, we need to stress the importance of preparing for the eighth grade test, even as early as kindergarten and first grade. In addition, when measuring comprehension in the early grades, we need better assessments that will highlight students’ language abilities apart from their decoding and word recognition skills. Research for one such assessment, the Diagnostic Assessment of Reading (DARC), is currently underway. Early reports suggest that the DARC provides teachers with comprehension scores that are less related to word-level skills and more related to narrative language production and memory than the Woodcock-Johnson Passage Comprehension test (Francis et al. 2006).

Resources are needed to provide early grades with texts that are worth comprehending. In a previous section, we noted the need for informational texts in early classrooms; that need is worth repeating here as critical for knowledge-centered classrooms. To prepare children for learning from text, we need to give them more experience with expository texts than are typical for many early grade classrooms (Duke 2000). In addition to providing familiarity with expository genres, informational texts that teachers read aloud to children in early grades build vocabulary and knowledge of the natural and social world that are critical for children’s understanding of subsequent texts that they will read to themselves in older grades (Wilson and Anderson 1986; Duke and Bennett-Armistead 2003).

When allocating resources for professional development, the most dollars will likely be needed for helping teachers to become highly effective with comprehension instruction. Research suggests that several methods of “packaged” comprehension strategy are highly

effective for increasing student learning (Duke and Pearson 2002; Pearson and Duke 2002; Goldenberg 1992/1993; Duke and Bennett-Armistead 2003). Researchers also emphasize the need for large investments in professional development in order for teachers to become proficient with these methods. Duke (2002) estimates that many teachers need three years to become good at comprehension instruction—a long time in the world of professional development. As a result, more dollars will likely be needed for this area of early literacy than for other areas, such as fluency instruction, that teachers can pick up more quickly. (For example, Morrow, Kuhn, and Schwanenflugel (2006), report that second grade teachers needed only two training sessions to implement a highly effective fluency program, Fluency Oriented Reading Instruction, that was still in use two years later.)

Using Resources to Make Early Literacy Learning More Assessment-Centered

As we noted in the section on learner-centered environments, the funding of Reading First and NCLB has been accompanied by an explosion of assessment tools that teachers can use to identify the needs of beginning readers, particularly in the areas of phonics and fluency (Sharp 2004). Calls to make early literacy classrooms more “assessment-centered” would likely be met with groans by many teachers and others who already protest that an “assessment juggernaut” is eating up too many resources of instructional time and money (Kozol 2005).

However, in the HPL framework, the notion of “assessment-centered” learning environments means something different than typical notions of data-driven instruction, where assessments inform only the teacher. Instead, assessment-centered environments are those in which students have opportunities to test their abilities, receive feedback, and revise their performance. In other words, assessments also become tools that students use to motivate their own learning.

At the 2002 Harvard Institute for Statewide Literacy Initiatives, many of the insights around assessments related to more traditional notions of assessments as tools for the teacher or as accountability measures for the state. In reviewing these insights for links to resources, we noted the need for funds to coordinate across assessment stakeholders, pre-service educators, and professional development programs. We include that recommendation in this section, since it relates to both traditional and broader notions of assessment. We also provide an additional recommendation for resources to expand traditional conceptions of assessment-centered environments, so that they include tools for students to use in maximizing their own learning.

Fund efforts to coordinate between pre-service, professional development programs, and state assessment systems. Researchers note that 80 percent of pre-service teachers will teach in the states where they attend college (Snow and Greer 2002). Strengthening pre-service teachers’ knowledge of their state assessment system, including state standards, is critical for achieving coherence in any state plans for reform. Similarly, better relationships between state assessment teams and institutions of higher education have the potential to tailor state assessment systems so that they better reflect the latest knowledge of effective assessment in early literacy. As Catherine Snow (2002b) notes:

Literacy reform for teachers in classrooms depends on reform in institutions of higher education that prepare those teachers, in the institutions, whatever they might be, that provide professional development to the teachers, but also in the organizations in which the teachers work to make professional development possible. And it all needs to be coordinated with the state assessment and state

standards system because otherwise changes can be going in opposite directions and end up conflicting with one another; that, in short, one has to change the whole system in order to change any part of the system.

Fund pre-service and professional development efforts that help teachers think about assessment as tools that students use to drive their own learning. Researchers have recently called for broadening conceptions of early literacy to include more than tools for teachers to use in differentiated, data-driven instruction or for states to use as accountability measures. For example, Johnson (2005) argues that future assessments need to consider more carefully children's developing conceptions of themselves as readers. He notes that successful readers are resilient; that is, they do not believe that their current level of reading ability is permanent, and they can focus on learning even when it is difficult (as reading is for most beginning readers). Moreover, assessments of a child's resilience can predict word recognition in grades 1 and 2 better than assessments of phonological awareness (Niemi and Poskiparta 2002). Johnson also argues that, unfortunately, many normative testing practices inadvertently contribute to the development of learning dispositions that are not resilient, because they imply to children that they are either "good" or "not good" at reading, without also showing children that they have control over their learning and achievement. He advocates that teachers encourage resilience by encouraging children to self-assess with questions such as, "what have you learned most recently, how did you learn that, what would you like to learn next, and how will you go about that?"

Using Resources to Make Early Literacy Learning More Community-Centered

In community-centered environments, children interact with and learn from each other. Research evidence reviewed by Guthrie and Humenick (2004) shows that in general, when students work together in reading, they are more motivated and show greater achievement and comprehension than when working alone. We do not know of any research reviews that specifically examine the benefits of collaboration at the earliest grades; however, research on peer-assisted learning (PALS) at first grade, in which students work together in pairs, has shown achievement benefits over traditional instruction, particularly for low-skilled students (Mathes et al. 1998).

Most work on collaborative literacy instruction for young students in groups of more than two has focused on rich discussion models designed to facilitate comprehension (Duke and Bennett-Armistead 2002; Duke and Pearson 2002). These models provide examples of how the four lenses of the How People Learn framework often overlap. By working to create effective knowledge-centered environments that support comprehension, many researchers have also created community-centered classrooms where students interact and learn from each other. In fact, our view is that the most efficient answer to the question of "How do we use resources to make early literacy learning more community-centered?" is to piggy-back this goal onto the goals for knowledge-centered classrooms, rather than to assign additional resources to this area.

Similarly, considerations for key ways to extend the literacy learning community from the classroom into children's homes bring us back to the research on learner-centered differences related to different levels of talk at home (Hart and Risley 1995). This research strongly suggests that raising levels of talk in low-income homes could have a profound effect on closing gaps in children's vocabulary. Unfortunately, we do not yet know of research that clearly points to ways

that resources can be most effectively used to make this change with families who need it most, though some models of family programs have yielded promising results (e.g., Jordan, Snow, and Porsche 2000).

Summary of Finance/Resource Implications From an HPL-Guided Review of Early Literacy Research

In the previous sections, we used the HPL framework to navigate our way through the early literacy research in search of implications for linking resources to learning. The eleven implications that rose to our attention are listed below.

For Greater Learner-Centered Environments:

1. Allocate a portion of resources to help teachers identify differences in what children know about how written language works.
2. Do not limit resources to dealing with diversity in phonics-related skills: Prioritize the need for resources to target differences in vocabulary, starting in preschool and early grades.
3. Make early investments in addressing the needs of second language learners.
4. Use resources to provide classrooms with extensive reading content that includes a wide range of topics and reading levels.

For Greater Knowledge-Centered Environments:

5. Resources need to be allocated so that early grade teachers recognize the importance of balance that extends beyond 3rd grade tests.
6. Resources are needed to provide early grades with texts that are worth comprehending.
7. When allocating resources for professional development, the most dollars will likely be needed for helping teachers to become highly effective with comprehension instruction.

For Greater Assessment-Centered Environments:

8. Fund efforts to coordinate between pre-service, professional development programs and state assessment systems.
9. Fund pre-service and professional development efforts that help teachers think about assessment as tools that students use to drive their own learning.

For Greater Community-Centered Environments:

10. Look for double payoff in this area from resources used to create knowledge-centered environments where children interact with and learn from each other.
11. Continue to watch for research that will indicate effective ways to help low-income parents raise levels of talk at home.

Conclusions About the Potential Value of the HPL Framework for Guiding Conversations About Resources and Learning

The research literature of the learning sciences is vast. In order to mine this literature for guidance in linking financial resources to learning, we need to have a navigating framework and a common language that will cover the research on learning across ages and disciplines. When we were first asked to explore the use of HPL as the basis for such a framework and language, we were not sure we could distill the research of even one area—beginning literacy—into recommendations for linking resources to learning. However, we found that by using HPL, we uncovered eleven recommendations for resource decisionmakers that appear to be well supported by consensus reports and recent research on literacy learning.

How could policymakers determine whether recommendations like these really represent a well-justified consensus from the field? Our next step in exploring the usefulness of these HPL-guided recommendations would be to ask others in the literacy field to use their own perspectives in judging the validity and comprehensiveness of these eleven recommendations. Enlisting this kind of feedback in an attempt to establish majority consensus would once have been impossible; however, today we believe that the Internet offers such opportunities, which have yet to be fully tapped. We can identify three major organizations of researchers that together cover the range of views on literacy instruction:

- International Reading Association (<http://www.reading.org>)
- National Reading Conference (<http://www.nrconline.org/>)
- Society for Research on Educational Effectiveness (<http://www.sree-net.org>)

Each of these organizations has a web site, through which members of the school finance community could ask for input on our initial list, following in the footsteps of Open Source models of group problem solving, decision making, and consensus building. It's not yet clear exactly how policymakers could best evaluate and resolve any conflicting feedback from these groups—but models from the creation of Open Source products are out there.

With Linux, for example, there is a single benevolent dictator with final responsibility for making decisions that are not resolved by discussion at lower levels. With Apache, there is a system of email voting based on minimal quorum consensus rule (Weber 2004). With some exploration of how members in the above research groups would respond to requests for feedback on these HPL-guided recommendations, it should be possible to determine whether such Internet-based Open Source problem-solving models could be used to determine majority consensus for finance implications from the field of educational research. Moreover, such exploration would provide highly valuable feedback about whether HPL is useful as a common language for discussing resource implications of educational research. Armed with this knowledge, we could then begin to explore how HPL might uncover resource recommendations from learning science research aimed at other disciplines (e.g., math, science) and at different ages.

What about larger school finance issues that cut across disciplines? We recognize that policymakers are often faced with resource-linked decisions about such issues as class size, general professional development structures, and technology configurations, without any specific

links to subject areas. To date, we are unaware of research on these larger issues that clearly shows whether or how HPL could help match these resources to specific contexts.

However, we believe the HPL framework signals policymakers to look for answers to these larger issues through understanding as much as possible about the particular learners and teachers affected by decisions. Traditional methods of viewing schools and students in broad categories such as “rural,” “suburban,” “inner-city” or “at-risk” are not likely to be enough. A recent LIFE center report (Banks et al. 2007) uses the term “broad and nuanced vision” to emphasize that decisions in educational policy need both an understanding of the target population as a whole and consideration of the local needs of particular communities and students.

A Two-Step Process for HPL Resource-to-Learning Decisions

We suggest that one way to achieve “broad and nuanced vision” with the HPL framework is to start with a two-step process. In the tables below, we provide one possible way to organize the information in this two-step process. We have listed here general features and concepts from the HPL framework that stood out most prominently as we engaged in the literacy case study for this report. As shown in Table 1, the first step in the process uses “students” and “teachers” as the productive levels of analysis. Ask yourself, “What do we know about the particular communities of students and teachers affected by these decisions?”

Table 1. First Step: “What Do We Know For This Community?”

HPL Framework	Students	Teachers
Learner-Centeredness	Major differences in skill levels and interests	Level of knowledge about students’ different skill levels and interests
Knowledge-Centeredness	Fundamental deep understandings that these students need to learn	Level of knowledge about the deep understandings that students need to learn
Assessment-centeredness	Available tools or structures that help these students test their skills and knowledge and receive feedback	Use of assessments to help students test their skills and knowledge and receive feedback
Community-centeredness	Available and preferred ways that these students socialize, interact, contribute, and share	Use of instruction that allows students to socialize, interact, contribute, and share

Second, as shown in Table 2, use this knowledge to evaluate your different options, taking into consideration each of the four pillars of the HPL framework. Given what we know about these students and teachers, determine what impact the different options for this decision will

have on helping teachers to implement HPL features (i.e. ask yourself, “What impact will the different options have in helping us to create learner-centered environments? Knowledge-centered environments? Assessment-centered environments? Community-centered environments?”). To jump-start dialogue among the decisionmakers, it may be helpful for each person to provide an initial rating for each option, selecting from the following: N=No effect; SI=May slightly improve; MI=May moderately improve; GI=May greatly improve; SR=May slightly reduce; MR=May moderately reduce; GR=May greatly reduce. Differences among the decisionmakers’ ratings could then lead to further discussion.

Table 2. Second Step: “What is the Likely Impact on These HPL Features?”

HPL Framework	HPL Features	Options		
		1	2	3
Learner-Centered Environments	Identify students’ different interests			
	Tailor lessons to students’ different skill levels			
	Use their knowledge of students’ interests to motivate learning up front and to motivate students to persist when learning becomes difficult			
Knowledge-Centered Environments	Teach toward deep understandings			
Assessment-Centered Environments	Provide students with motivating opportunities to test their skills			
	Provide students with feedback that encourages them to keep trying to improve			
Community-Centered Environments	Build on the fact that students are social beings with inherent motivation to interact, contribute, and share?			

Future research is needed to support, extend, and refine this process for matching general resources to specific contexts. We welcome interested partners in pursuing this path. Additional insights about how the HPL framework can assist in resource-to-learning decisions will likely come to light through new work we have just begun with the Bellevue school district in Washington State. In partnership with the district, we are working toward a district-wide HPL-based curriculum. One thing is already clear: what’s needed is a dynamic system for curriculum that stays abreast of change. The world is constantly changing and so, therefore, is whom we are teaching and what should be taught. Rather than a typical “fix it once” tacit model for schools, we need models that allow for constant innovation. We also need models for making resource-to-learning decisions that are similarly dynamic, so that resources can continually adapt to changing needs.

References

- Allington, R. 2001. *What really matters for struggling readers*. New York: Longman.
- August, D., and T. Shanahan. 2006. *Developing literacy in second-language learners: Report of the National Literacy Panel on language-minority youth*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Banks, J.A., K.H. Au, A.F. Ball, P. Bell, E.W. Gordon, K. Gutierrez, S.B. Heath, C.D. Lee, Y. Lee, J. Mahiri, N.S. Nasir, G. Valdes, and M. Zhou. 2007. *Learning in and out of school diverse environments: Life-long, life-wide, life-deep*. Report from the LIFE Center (The Learning in Informal and Formal Learning Environments Center) and the Center for Multicultural Education, University of Washington, Seattle.
- Beck, I., M.G. McKeown, and L. Kucan. 2002. *Bringing words to life: Robust vocabulary instruction*. New York: Guilford.
- Biemiller, A. 2004. Teaching vocabulary in the primary grades: Vocabulary instruction needed. In Baufman, J. F., and Kame'enui, K. (Eds.), *Vocabulary instruction: Research to practice*. New York: Guilford.
- Bransford, J., A. Brown, and R.R. Cocking. 2000. *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academy Press.
- Carlo, M. 2002. *Second language reading*. Presentation at the 2002 Harvard Institute for Statewide Literacy Initiatives.
- Chall, J. S. 1967. *Learning to read: The great debate*. New York: McGraw-Hill.
- Chall, J. S. 1989. Learning to Read: The Great Debate 20 Years Later—A Response to "Debunking the Great Phonics Myth." *Phi Delta Kappan*, 70: 521–538.
- Chall, J. S., and V.A. Jacobs. 2003. *Poor children's fourth-grade slump*. American Educator: Research Round-Up. Retrieved from http://www.aft.org/pubs-reports/american_educator/spring2003/chall.html.
- Chall, J. S., V.A. Jacobs, and L.E. Baldwin. 1990. *The reading crisis: Why poor children fall behind*. Cambridge, MA: Harvard University Press.
- Council for Excellence in Government (CEG) and The Committee on Economic Development (CED) (2002). *Linking Resources to Results: A Discussion Paper*. Downloaded December 4, 2006 from <http://www.excelgov.org/index.php?keyword=a432fbadc917c3&PHPSESSID=3ba904cb564c8e9325a7bb28ab985b86>. See also <http://www2.excelgov.org/index.php?keyword=a433c980394925>
- Duke, N. K. 2000. 3.6 minutes per day: The scarcity of informational texts in first grade. *Reading Research Quarterly*, 35: 202–224.
- Duke, N. 2002. *Comprehension*. Presentation at the 2002 Harvard Institute for Statewide Literacy Initiatives.

- Duke, N. K. and V.S. Bennett-Armistead. 2003. *Reading and writing informational text in the primary grades: Research-based practices*. New York: Scholastic.
- Duke, N. K., and P.D. Pearson. 2002. Effective practices for developing reading comprehension. In A. E. Farstrup and S. J. Samuels (Eds.), *What research has to say about reading instruction* (3rd ed). Newark, DE: International Reading Association.
- Francis, D. J., C.E. Snow, D. August, C.D. Carlson, J. Miller, and A. Iglesias. 2006. Measures of reading comprehension: A latent variable analysis of the diagnostic assessment of reading comprehension. *Scientific Studies of Reading*. 10: 301–322.
- Gersten, R., and J.A. Dimino. 2006. New directions in research: RTI (Response To Intervention): Rethinking special education for students with reading difficulties (yet again). *Reading Research Quarterly*. 41: 99–108.
- Goldenberg, C. (1992/1993). Instructional conversations: Promoting reading comprehension through discussion. *The Reading Teacher*, 46:316–326.
- Graves, M. F., G.J. Brunetti, and W.H Slater. 1982. The reading vocabularies of primary-grade children of varying geographic and social backgrounds. In J. A. Harris, and L. A. Harris (Eds.), *New inquiries in reading research and instruction*. Rochester, NY: National Reading Conference.
- Graves, M. F., and W.H. Slater. 1987. The development of reading vocabularies in rural disadvantaged students, inner-city disadvantaged students, and middle-class suburban students. Paper presented at the meeting of the American Educational Research Association, Washington, DC.
- Guthrie, J. T., and N.M. Humenick. 2004. Motivating students to read: Evidence for classroom practices that increase reading motivation and achievement. . In P. McCardle and Chhabra, V. (Eds.), *The voice of evidence in reading research*. Baltimore, MD: Paul H. Brookes Publishing Co.
- Hart, B., and T.R. Risley. 1995. *Meaningful differences in the everyday experience of young American children*. Baltimore, MD: Paul H. Brookes.
- Juel, C., and C. Minden-Cupp. 2000. Learning to read words: Linguistic units and instructional strategies. *Reading Research Quarterly*. 35: 458–492.
- Johnson, P. 2005. Literacy assessment and the future. *The Reading Teacher*. 58: 684–686.
- Jordan, G. E., C.E. Snow, and M.V. Porche. 2000. Project EASE: The effect of a family literacy project on kindergarten students' early literacy skills. *Reading Research Quarterly*. 35: 524–546.
- Kameenui, E.J. and D.W. Carmine. 1998. *Effective teaching strategies that accommodate diverse learners*. New Jersey: Prentice-Hall, Inc.
- Kerbow, D., J. Gwynne, and B. Jacob. in progress. Implementation of a Balanced Literacy Framework and Student Learning: Implications For Program Development. Center for School Improvement, Chicago. Available at: <http://usi.uchicago.edu/research.html>
- Kozol, J. 2005. *The shame of the nation: The restoration of apartheid schooling in America*. New York: Crown.

- Mathes, P.G., J.K. Howard, S.H. Allen, and D. Fuchs. 1998. Peer-Assisted Learning Strategies for first-grade readers: Responding to the needs of diverse learners. *Reading Research Quarterly*. 33(1): 62–94.
- Mathes, P. G., J.K. Torgesen, J.C. Menchetti, K. Santi, K. Nicholas, and C.A. Robinson. 2003. Comparison of teacher-directed versus peer-assisted instruction to struggling first-grade readers. *Elementary School Journal*. 103: 459–479.
- Mohr, K. A. J. 2006. Children’s choices for recreational reading: A three-part investigation of selection preferences, rationales, and processes. *Journal of Literacy Research* 38: 81–104.
- Morrow, L. M., M.R. Kuhn, and P.J. Schwanenflugel. 2006. The family fluency program. *The Reading Teacher*. 60 (4): 322–333.
- National Reading Panel. 2000. *Report of the National Reading Panel: Teaching children to read: An evidence-based assessment of the scientific research literature in reading and its implications for reading instruction: Reports of the sub-groups*. (NIH Publication No. 00-4754). Washington DC: National Institute of Child Health and Human Development.
- New Standards Primary Literacy Committee. 1999. *Reading and writing grade by grade*. Pittsburgh, PA: National Center on Education and the Economy and the University of Pittsburgh.
- Niemi, P. and E. Poskiparta. 2002. Shadows over phonological awareness training: Resistant learners and dissipating gains. In E. Hjelmquist and C. V. Euler (Eds.), *Dyslexia and literacy*. London: Whurr.
- Pearson, P. D. and N.K. Duke. 2002. Comprehension instruction in the primary grades. In C.C. Block and M. Pressley (Eds.) *Comprehension instruction: Research-based best practices*. Guilford.
- Pressley, M. 2001. *Effective beginning reading instruction*. Executive Summary and Paper Commissioned by the National Reading Conference. Chicago, IL: National Reading Conference.
- Sawyer, R. K. 2006. The new science of learning. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences*. New York: Cambridge University Press.
- Scarborough, H. 2005. Developmental relationships between language and reading: Reconciling a beautiful hypothesis with some ugly facts. In H.W. Catts and A.G. Kamhi (Eds.), *The connections between language and reading disabilities*. Mahwah, NJ: Erlbaum.
- Schiefele, U., A. Krapp, and A. Winteler. 1992. Interest as a predictor of academic achievement: A meta-analysis of research. In K. A. Renninger, S. Hidi, and A. Krapp (Eds.), *The role of interest in learning and development*. Hillsdale, NJ: Lawrence Erlbaum.
- Sharp, D. 2004. *Supporting teachers’ data-driven instructional conversations: An environmental scan of Reading First and STEP literacy assessments, data visualizations, and assumptions about conversations that matter*. Report to the Information Infrastructure project, Network on Teaching and Learning, John D. and Catherine T. MacArthur Foundation.
- Smith, M. K. 1941. Measurement of the size of general English vocabulary through the elementary grades and high school. *Genetic Psychological Monographs*. 24: 311–345.

- Snow, C. (2002a). *Reading for understanding: Toward an R&D program in reading comprehension*. Santa Monica, CA: RAND.
- Snow, C. (2002b). Interview with Tim Altman (Learning Sciences Institute, Vanderbilt University) following the 2002 Harvard Institute for Statewide Literacy Initiatives.
- Snow, C. E., M.S. Burns, and P. Griffin. (Eds.) 1998. *Preventing reading difficulties in young children*. Washington DC: National Academy Press.
- Snow, C., and E. Greer. 2002. Standards and assessment. *Presentation at the 2002 Harvard Institute for Statewide Literacy Initiatives*.
- Snow, C. and M. Paez. 2002. *Oral Language Development and Demographic Change*. Presentation at the 2002 Harvard Institute for Statewide Literacy Initiatives.
- Weber, S. 2004. *The success of open source*. Cambridge, MA: Harvard University Press.
- Wilson, P. T., and R.C. Anderson. 1986. What they don't know will hurt them: The role of prior knowledge in comprehension. In J. Oransano (Ed.), *Reading comprehension from research to practice*. Hillsdale, NJ: Erlbaum.