

Adolescents and
Literacy
Reading for the 21st Century



ALLIANCE FOR
EXCELLENT EDUCATION

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Michael L. Kamil

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About the Alliance for Excellent Education

The Alliance for Excellent Education is a national policy, advocacy, and research organization created to help middle and high school students receive an excellent education.

The Alliance focuses on America's six million most at-risk secondary school students—those in the lowest achievement quartile—who are likely to leave school without a diploma or to graduate unprepared for a productive future. Based in Washington, D.C., we work to make it possible for these students to achieve high standards and graduate prepared for college and success in life.

Our audience includes parents, teachers, and students, as well as the federal, state, and local policy communities, education organizations, the media, and a concerned public.

To inform the national debate about education policies and options, we produce reports and other materials, make presentations at meetings and conferences, brief policymakers and the press, and provide timely information to a wide audience via our biweekly newsletter and regularly updated Web site, www.all4ed.org.

About the Author

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He is currently Chair of the Framework Planning Committee for the National Assessment of Educational Progress. In addition, he is a member of the National Literacy Panel for Language Minority Youth. He was a member of the National Reading Panel and the RAND Reading Study Group.

His most recent publications include a co-edited volume (with Dorothy Strickland) on professional development, *Professional Development for Teaching Reading*, as well as many other chapters and articles in professional journals.

He has been editor of *Reading Research Quarterly*, *Journal of Reading Behavior*, and *The Yearbook of The National Reading Conference*. He co-edited the *Handbook of Reading Research*, Vols. I and II, and is lead editor for Vol. III.

His research explores the effects of computer technologies on literacy and learning and the acquisition of literacy in first and second languages.

Foreword

In 2002, the Alliance for Excellent Education released its flagship report, *Every Child a Graduate: A Framework for an Excellent Education for all Middle and High School Students*. That report contained a call to Congress and the administration to adopt, nationally, four research-based initiatives to dramatically improve the culture and conditions of America's secondary schools. When implemented, we believe that these initiatives will create an academically rich, supportive environment that will help assure that *every* student—regardless of socioeconomic status or race—graduates from high school with the skills necessary to succeed in college.

Nationally, 25 percent of our secondary students are reading at “below basic” levels. Therefore, they are unable to understand or comprehend the advanced material that is an integral part of the high school educational experience. Is it really surprising, then, that only 70 percent of the children who enter the eighth grade actually graduate from high school; that in many urban areas, only 50 percent of students will receive a high school diploma; and that every school day, three thousand students drop out of school, rarely to return?

The first of the Alliance's recommended initiatives focuses on these problems, addressing the urgent need to improve the reading, writing, and comprehension skills of our middle and high school students. *The Adolescent Literacy Initiative*, described in the box that follows, recognizes that the approximately six million secondary school children who read well below grade level have little chance of academic success without effective, targeted interventions that are incorporated into all of their core curricula classes. As *Every Child a Graduate* notes:

Research shows . . . that students who receive intensive, focused literacy instruction and tutoring will graduate from high school and attend college in significantly greater numbers than those not receiving such attention. Despite these findings, few middle or high schools have a comprehensive approach to teaching literacy across the curriculum.

In *Adolescents and Literacy: Reading for the 21st Century*, Michael Kamil documents, through his thorough review and analysis of existing research, what is currently known about effective literacy instruction and the impact of successful literacy programs. Although more study will enhance our understanding and benefit program development, this report demonstrates that we already know a great deal about what works for older students. Indeed, the country is well positioned, *now*, to move forward with the national implementation of literacy programs for children in grades 4–12 that—properly designed and funded—will help our country's older students develop the reading, writing, and comprehension skills that are critical to their ability to succeed academically.

We must not waste another moment. Our children, our communities, and our country's economic and social future depend upon our determination to put effective literacy programs for students in the fourth through twelfth grades into place in schools across America.

Susan Frost
President
Alliance for Excellent Education

Alliance for Excellent Education's Adolescent Literacy Initiative

The Adolescent Literacy Initiative builds on the Reading First program in the No Child Left Behind Act, which will distribute \$5 billion over five years to states to establish high-quality, scientifically based, comprehensive reading instruction for students in kindergarten through third grade, but which will not help middle or high school students.

The Alliance calls for Congress and the president to strengthen and expand the Reading First program by adding an Adolescent Literacy Initiative to its mission. Under the initiative, every high-needs middle and high school will have additional federal funding to pay for diagnostic assessments, research-based curricula, release time for teachers to participate in professional development, and a literacy coach to train teachers in every high-needs middle and high school.

With a comprehensive literacy program targeted at improving the skills of all adolescents reading below grade level, all teachers will be expected and empowered to ensure that every student has the literacy skills to succeed in challenging courses, meet high standards, and graduate from high school prepared for college.

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EXECUTIVE SUMMARY

National and international tests incontrovertibly prove that far too many of America’s children are reading at levels that are unacceptably low. The most recent National Assessment of Educational Progress (NAEP) exams showed that 25 percent of eighth graders and 26 percent of twelfth graders were reading at “below basic” levels in 2002; international comparisons of reading performance placed American eleventh graders very close to the bottom, behind students from the Philippines, Indonesia, Brazil, and other developing nations.

This report examines the reliable, empirical research that exists on how to improve the literacy of children in grades 4–12. Although few would argue that more research on this subject is needed, the report demonstrates that we already know a great deal about reading comprehension and effective methods for helping students of all ages become better readers.

There are only a few narrowly targeted reviews of research on intermediate and adolescent literacy. In this report, four of the most distinguished of those studies (by Alvermann and Moore; Snow, Burns, and Griffin; the National Reading Panel; and RAND) are examined, along with materials from other published and unpublished investigations. Examining information related to teaching and learning strategies, the prevention of reading difficulties, the components of effective reading instruction, and reading comprehension, the report considers the importance and impact of factors including motivation, alphabetic principle, fluency, vocabulary, and comprehension (including prior knowledge and strategy instruction) on literacy instruction.

Other issues considered in the report include:

- the developmental nature of reading and content learning, considering the notion that the ability to learn from text changes over the course of one’s education and as the result of life experience;
- the differing needs of English-language learners (students whose first language is something other than English), and the special instructional challenges related to helping these students to become more literate in English;
- the role that technology can play in helping students to better read and comprehend text, and the computer-assisted instruction that offers an alternative or adjunct to traditional reading instruction;
- the importance of education and professional development for teachers to improve the reading ability of their students;
- the infrastructure that exists in middle and high schools that encourages or discourages reading instruction, and the resistance that some content teachers have toward incorporating reading instruction into their curricula.

There are approximately 8.7 million fourth through twelfth graders in America whose chances for academic success are dismal because they are unable to read and comprehend the material in their textbooks. This report, which brings together in one place the key findings of the best available research on issues related to adolescent literacy, offers policymakers and the public a better understanding of the challenges and opportunities that confront us as we work to improve the literacy levels of older children.

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THE ADOLESCENT LITERACY CRISIS

The reading scores of high school students have not improved over the last thirty years.

In international comparisons of performance on reading assessments, U.S. eleventh graders have placed very close to the bottom.

The most recent data from the National Assessment of Educational Progress (NAEP), which tests the reading ability of America's fourth, eighth, and twelfth graders, show that students in eighth and twelfth grade are not improving over previous years. There is good news in the report on the 2002 exams: the reading achievement of fourth graders had improved significantly since the tests were previously administered (in 1998). But the average performance of eighth graders remained flat, and the reading achievement of twelfth graders had declined at all performance levels.

In fact, the reading scores of high school students have not improved over the last thirty years. Although mathematics scores have improved, reading scores stubbornly remain flat, and in recent years, twelfth graders' scores have decreased significantly. With few exceptions, indicators of achievement in states and school districts have shown no, or only slow, growth across grades in the past ten years.

Further, in international comparisons of performance on reading assessments,

U.S. eleventh graders have placed very close to the bottom, behind students from the Philippines, Indonesia, Brazil, and other developing nations. This poor performance contrasts with rankings in grade four, when U.S. students have placed close to the top in international comparisons. These findings confirm teachers' impressions that many students who read well enough in the primary grades confront difficulties with reading thereafter.

In 1999, the Office of Educational Research and Improvement of the U.S. Department of Education charged the RAND Reading Study Group (RRSG) with developing a research agenda to address the most pressing issues in literacy. More information about the study itself is provided later in this report, but it is interesting to look here at the decisions made by the group about their proposal's major focus area, in relation to the problems confronting adolescents around literacy. Members of the RRSG chose to concentrate their attention on reading comprehension, motivated by a number of factors:

- All high school graduates are facing an increased need for a high

degree of literacy, including the capacity to comprehend complex texts, but comprehension outcomes are not improving.

- Students in the United States are performing increasingly poorly in comparison with students in other countries as they enter the later years of schooling, when discipline-specific content and subject matter learning are central to the curriculum.
- Unacceptable gaps in reading performance persist between children in different demographic groups despite the efforts over recent decades to close those gaps; the growing diversity of the U.S. population will likely widen those gaps even further.
- Little direct attention has been devoted to helping teachers develop the skills they need to promote reading comprehension, ensure content learning through reading, and deal with the differences in comprehension skills that their students display.
- Policies and programs (e.g., high-stakes testing, subject-related teacher credentialing, literacy interventions) intended to improve reading comprehension are regularly adopted, but their effects are uncertain because the programs are neither based on empirical evidence nor adequately evaluated.

Additionally, the RAND Reading Study Group was concerned that:

- reading comprehension instruction is often minimal or ineffective;
- the achievement gap between children of different demographic groups persists;
- high-stakes tests are affecting reading comprehension instruction in unknown ways; and
- the preparation of teachers does not

adequately address children’s needs for reading comprehension instruction.

Despite the problems related to adolescents and literacy—and their urgency—the RAND report and others cited below stress that we indeed know a great deal about reading comprehension. We know that there are prerequisites to reading comprehension, that good decoders and fluent readers can become good comprehenders, that oral language is important to comprehension. And we know that there are social and cultural components to success in becoming a good reader.

Snow and Biancarosa (2003) have documented many of the calls for attention to the issues surrounding adolescent literacy. They note that the International Reading Association (IRA) issued two position statements on adolescent and young adolescent literacy (IRA and NMSA, 2001; Moore, Bean, Birdyshaw, and Rycik, 1999). They also point out that in 2002, the journal of the College Reading Association, *Reading Research and Instruction*, published a special issue on adolescent literacy, and in 2003, the American Federation of Teachers’ journal, the *American Educator*, followed suit.

On the frontlines, in our classrooms, secondary school educators too often find that their students do not have the necessary literacy skills to use reading and writing effectively to learn subject matter. Educators know that something needs to be done but are daunted, understandably, by the considerable task of identifying and applying research-based literacy strategies (Meltzer, 2002). Meltzer writes:

When I began reviewing the research

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on adolescent literacy support and development, I expected to find much more conflict about what we know. I expected to find hesitant recommendations and contradictory advice. Instead, I found resounding agreement across research communities about what is effective and what needs to be done. The fact remains, however, that not much has changed in the past decade in terms of typical classroom practice. One problem has been a lack of awareness about what the research says.

It has often been taken as an axiom that there are two major areas of concern in literacy development: “learning to read” and “reading to learn.” For much of the history of reading in this country, the attitude of middle and high school teachers has been that their job was not to teach reading. They view themselves as content specialists and believe that the job of teaching reading belongs to elementary school teachers. And they feel that, if only those elementary school teachers would do a better job of teaching these students to read, the problems at the secondary level would be solved. But for decades, reading education experts have disagreed with that analysis. In 1944, for instance, A. Sterl Artley issued the following injunction to content area teachers:

Every classroom teacher has the direct responsibility for developing those reading skills and abilities essential for adequate comprehension with his particular area of instruction, as well as for applying to his content field and making functional those skills and abilities being developed by teachers in other areas of instruction.

This report examines what is known, from research, about adolescent literacy.

The goal is to increase awareness of research-based knowledge, particularly among policymakers. The literature on research in reading is examined to determine what sort of guidance it can offer to educational practice in middle and high school. This report focuses primarily on reading; however, other literacy skills—writing, listening, speaking—are also critical to the development and success of adolescent learners. While these other skills are not reviewed in this document in depth, policymakers should be cognizant of the importance of all literacy skills when making important policy decisions.

Before turning to the research, it is necessary to delineate the population. Neither “middle school” nor “high school” is a precise term. Middle schools can include grades 4–9 and high schools can include grades 9–12. For the purposes of this report, research that examines reading for students in grades 4–12 is considered relevant.

REVIEW OF KEY LITERATURE

There are few narrowly targeted reviews of research on adolescent literacy; four distinguish themselves prominently on the research landscape. These studies—by Alvermann and Moore, Snow, Burns, and Griffin, the National Reading Panel, and RAND—examine research that presents evidence in support of programs and interventions that could effectively prevent reading problems in children or solve reading challenges in adolescents.

Teaching and Learning Strategies

In 1991, Alvermann and Moore reviewed the research on literacy conducted with students in grades 7–12. In their analysis, they divided studies into those that dealt with teaching strategies (forty-nine) and those that dealt with learning strategies (sixty).

Teaching strategies are those that are content focused and teacher initiated. Examples of teaching strategies include guided reading and writing, Directed Reading Activity, questioning, reciprocal teaching, advanced organizers, and using graphic organizers. Alvermann and

Moore write, in the aggregate, that 62 percent of the studies reported significant facilitative effects of students who were in a teaching strategy group, compared to a control group. In 12 percent of the studies, there were mixed results, where the results differed by the teacher's ability level.

Learning strategies are student directed and intended to build independence in reading. Examples of learning strategies included summarizing, note taking, imagery, outlining, and metacognitive training. The results were very similar to the teaching strategy analysis. Significant effects were reported in 61 percent of the studies, and mixed results were reported in 12 percent. Alvermann and Moore conclude their review by stating that “researchers are beginning to form a picture of secondary school reading. . . . [I]f researchers are to form a more complete picture of secondary reading, they will need to tap a variety of sources.”

Preventing Reading Difficulties

Snow, Burns, and Griffin (1999), in a book entitled *Preventing Reading Difficulties* (PRD), identified three areas that, if dealt with appropriately, would prevent reading problems: knowledge of the alphabetic principle, fluency, and comprehension. Snow, Burns, and Griffin suggest that these areas represent opportunities for appropriate instruction. If students do not acquire the knowledge and skills in each of these areas at the appropriate time, they will be at risk for developing reading difficulties. While the review is primarily important for elementary students, it becomes relevant for students of any age who do not attain proficiency in these areas and are passed through the grades until they are unable to read as adolescents.

Components of Effective Reading Instruction

A third review was conducted by the National Reading Panel (NRP) (NICHD, 2000). The NRP systematically synthesized the research on reading instruction relevant to the three areas in PRD, as well as some new areas. The report examined effective reading instruction and conducted meta-analyses where appropriate. The three areas were elaborated on so that knowledge of the alphabetic principle became phonemic awareness (the ability to manipulate sounds in oral language) and phonics (knowledge of the correspondence between letters and sounds). Fluency was divided into reading practice and guided reading (reading accompanied by feedback to correct errors). Comprehension was divided into vocabulary (knowledge of words) and comprehension strategies (procedures that guide students as they read). The

NRP also examined two other areas to determine effects on reading instruction: teacher education (including professional development) and computer technology.

A Focus on Reading Comprehension

A fourth review of the research (RAND, 2002) specifically targeted reading comprehension with the intent of generating a research agenda to add to existing knowledge about comprehension. In order to develop such an agenda, the RAND report synthesized what is known about comprehension. This paper focuses on the RAND report's synthesis of what is known about reading comprehension, rather than the research agenda.

RESEARCH SYNTHESIS

The following sections provide a synthesis of some of the material from these various reports and add material that was not included in them. This analysis is not entirely bound by some of the restrictions of the other reports. For example, the NRP only reviewed published reports of experimental and quasi-experimental research. What follows reviews many of those studies, but goes beyond those criteria, where appropriate, and includes other genres of research. Specifically, the issues of motivation, alphabetic principle, fluency, and comprehension (including vocabulary and comprehension strategies) are examined.

Motivation

Motivation is one concept that continually surfaces as an important focus in reading and learning to read, particularly for adolescents. It is often viewed as one of the determiners of adolescent literacy. Motivation (in reading) can be defined as the cluster of personal goals, values, and beliefs with regard to the topics, processes, and outcomes of reading that an individual

possesses (Guthrie and Wigfield, 2000, p. 404).

This is not the same thing as interest, attitude, or beliefs (Guthrie and Wigfield, 2000). One could have an interest in reading, but nevertheless choose not to read. Motivation is the underlying factor that disposes one to read or not. Engagement is yet another variable in this affective cluster of concepts. Engagement in reading is the extent to which an individual reads to the exclusion of other activities, particularly when faced with the other choices.

Students often exhibit far more sophisticated reading when they are in situations away from the classroom (Alvermann et al., 2002). For example, students engaged in complex reading and writing activities around computer games, when they did not exhibit such behavior in classrooms.

Strategy instruction, in which students are taught how to apply specific strategies, may be critical to increasing students' motivation. Guthrie et al. (1996) found that all students who increased their intrinsic motivation across a school year also increased their usage of strategies.

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Guthrie and Wigfield (2000) listed several strategies that were likely to increase self-efficacy in both elementary and middle-level students: activating prior knowledge, looking for information, comprehending informational texts, interpreting literature, and self monitoring.

Motivation and engagement are critical for adolescent readers. If students are not motivated to read, research shows that they will simply not benefit from reading instruction. As much of the work in motivation and engagement shows, these are critical issues that must be addressed for successful interventions. In fact, motivation assumes an important role in any attempt to improve literacy for students of all ages, not just adolescents.

Skills Related to the Alphabetic Principle

“Alphabetsics” is the term applied to the skills needed to decode print to speech or oral language. It includes the skills of phonemic awareness, the ability to manipulate the sounds of oral language and phonics, the relationship of letters to sounds. Phonemic awareness is a skill that is typically useful in increasing literacy only in relatively young children. The National Reading Panel (NICHD, 2000) found that phonemic awareness instruction was only effective for kindergarten and first-grade students, and only if delivered for a total of about twenty hours of instruction.

Phonics is often thought of as a skill that is learned early in the reading process. In PRD, it is considered one of the three skill areas that need to be acquired in order to prevent future reading difficulties in children. However, not all students acquire expert skills in

phonics in the early grades. NRP reviewed the research on phonics and concluded that

phonics instruction contributed to growth in reading in all groups except students in the 2nd through 6th grade low achiever group. Among the at-risk and grade level readers in kindergarten and 1st grades, phonics instruction had moderate to high positive effects on their reading development. While the effect was smaller for the next group, phonics instruction still had a positive effect on the reading development of students in grades 2 through 6 who were either reading on grade level or learning disabled. There was one group for whom phonics instruction failed to exert a statistically significant impact on the students’ growth in reading: low achievers in grades 2 through 6. Findings indicate that the strongest impact of phonics instruction was evident in normally developing 1st graders as well as at-risk kindergartners and 1st graders, while the least impact was felt by struggling second through sixth grade students.

(See Appendix, number 1.)

Most of the work represented in NRP focuses on younger, elementary students. Curtis (in press) has reviewed a great deal of the research surrounding the issues of learning phonics for older readers. She concludes that as many as one out of every ten adolescents has serious difficulties in identifying words (Curtis and Longo, 1999). These difficulties usually stem from problems associated with the phonological aspects of word analysis, and are compounded by the tendency in adolescents to abandon the process of trying to read a word and (instead) to guess at it based on context.

It is important to note that, despite the

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typical belief that the problems of adolescent literacy are all about comprehension, there remains a group of middle and high school students who have reading problems that result from not having mastered the alphabetic principle. The research suggests that instruction can help remediate this problem, while also acknowledging that it is better to prevent these sorts of problems *before* they occur.

Curtis offers a number of suggestions for helping adolescents who struggle with word identification. Among these are:

- systematic, explicit, and direct instruction produce the best results (e.g., see Curtis and Chmelka, 1994; Curtis and McCart, 1992);
- high-frequency sound-spelling relationships and words should be the focus of instruction (Graham, Harris, and Loynachan, 1993; Blevins, 2001);
- instruction should be reflective;
- opportunities to practice identification of words in context should be frequent; and
- connections among word analysis, word recognition, and semantic access should be emphasized (e.g., see Henry, 1990).

Fluency

Going beyond the alphabetic principle, Curtis also notes that fluency has been found to differ significantly between skilled and less-skilled readers through adolescence (Shaywitz et al., 1999).

Fluency is defined as the ability to read quickly, accurately, and with appropriate expression. Good comprehenders are fluent readers (RAND, 2002). In a review of the instructional research on fluency, the National Reading Panel reported findings on fluency of two different

instructional interventions. The first intervention was repeated reading; the second was guided reading practice.

In repeated reading, students are taught to read and reread a relatively easy passage. When they can read the same passage fluently, they are given progressively more difficult passages to practice. The results of this intervention are fairly straightforward and powerful. The use of repeated reading resulted in positive gains in reading ability. Many of these studies apply largely to primary- and elementary-age students.

However, the populations analyzed can be divided into younger and older groups. The younger students were developing in “normal” patterns. The older students, who were part of the middle and high school populations, often had been classified as disabled readers or at least had experienced some difficulties in learning to read. There were few studies of good readers who were older.

Overall, the NRP found that fluency could be improved through appropriate instruction. For the studies of older students receiving guided oral reading instruction, the NRP reports that students showed the most significant improvements in reading accuracy. Oral reading instruction also resulted in improvements in reading fluency and reading comprehension. (See Appendix, number 2.)

Analysis also indicated that repeated reading procedures—instructional techniques that have students read and reread the same passage until they can read it fluently—had positive effects on fluency. These techniques have a clear impact on the reading ability of nonimpaired readers through at least

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Thus, fluency instruction appears to be an effective instructional intervention, producing at least moderate effects for particular portions of the middle and high school students who suffer from reading problems.

The importance of a strong oral-language vocabulary is thus critical to learning to read.

grade four, as well as on students with various kinds of reading problems throughout high school. NRP reports that all approaches were associated with positive impacts. These data provide strong support for the supposition that instruction in guided oral reading is effective in improving reading. (See Appendix, number 2.)

The National Assessment of Educational Progress conducted a large study of the status of fluency achievement in American education (Pinnell et al., 1995). That study examined the reading fluency of a nationally representative sample of fourth graders and found 44 percent of students to be non-fluent, even with grade-level stories that the students had read under supportive testing conditions. Moreover, the study found a close relationship between fluency and reading comprehension. Students who are low in fluency may have difficulty getting the meaning of what they read.

It is evident from studies included in the NRP analysis that repeated reading procedures have a clear impact on the reading ability of nonimpaired readers at least through grade four, as well as on students with various kinds of reading problems throughout high school.

Thus, fluency instruction appears to be an effective instructional intervention, producing at least moderate effects for particular portions of the middle and high school students who suffer from reading problems.

However, even this conclusion is far from unequivocal. Underwood and Pearson (in press) write:

It seems clear that while an intense instructional focus on fluency may pay short-term dividends, the cost-benefit analysis of such an emphasis for adoles-

cent learners looks less attractive. We are not the first to point out that too many learners move from elementary into secondary school with serviceable levels of skill in decoding and fluency yet unable to comprehend what is read. (Brown, 2002; Greenleaf et al., 2001; Greenleaf, Jimenez, and Roller, 2002; Wilhelm, 1996)

Vocabulary

Davis (1942) presented evidence that reading comprehension comprised two “skills”: word knowledge (vocabulary) and reasoning. The finding that vocabulary is strongly related to general reading achievement has remained unchallenged. But the question that needs to be addressed is, *Why* is vocabulary so important?

One way to understand the importance of vocabulary is to look at beginning readers. Beginning reading involves teaching students to decode text to speech. When a reader accomplishes that objective, the assumption is that the reader can comprehend the speech. This can only happen if the words that are decoded are in the reader’s oral vocabulary. The importance of a strong oral-language vocabulary is thus critical to learning to read.

Anderson, Wilson, and Fielding (1988) showed large differences in amounts of daily reading among children. The number of words encountered in leisure reading per year varied from eight to 4.7 million. These enormous variations in reading, of course, lead to large differences in children’s vocabularies and comprehension abilities. Hart and Risely (1995) report similar findings, but identified these deficits in at-risk students with low socioeconomic status (SES),

finding that low SES students were exposed to one-third to one-half the words that high SES students encountered.

Research (e.g., Anderson and Freebody, 1983; Stanovich, Cunningham, and Freeman, 1984) has shown that reading ability and vocabulary size are related, but the *causal* link between increasing vocabulary and an increase in reading ability has been difficult to demonstrate (Stanovich, 2000, p. 162).

Nagy and Anderson (1984) examined printed texts for grades 3–9. They estimate that good readers read approximately one million words per year. Clearly not all of these words are unique, but the sheer numbers lead to the conclusion that students could never be taught that many words. Instructionally, there seems to be no choice but to rely on students’ learning vocabulary from context. Consequently, more reliance was placed on students’ own learning from context. However, the NRP review showed that while learning from context is important, direct instruction of vocabulary is effective in improving both vocabulary and comprehension. The implication is that *both* direct, explicit instruction *and* learning from context are important. A further implication is that explicit instruction *may* be useful in closing the gap between the students with the highest levels of vocabulary knowledge and those with the lowest.

The NRP analysis is relevant to the issues of adolescent literacy because most of the studies that were reviewed were conducted with students at third grade and above. While there were fewer studies at high school, the results are directly relevant for older elementary and middle school students.

The NRP reached the following conclusions about vocabulary:

- *Repetition and rich support are essential for increasing vocabulary.*

The context in which a word is learned is critical. Lists of words are, generally, less effective than vocabulary words imbedded in text for learning most vocabulary. However, if vocabulary is organized by categories, it will be learned more easily than a list that has no such context (e.g., Meyerson, Ford, and Jones, 1991). Students will learn words better if they are actively engaged in the task of inferring vocabulary meanings from context, rather than simply being given the definition (e.g., Jenkins, Matlock, and Slocum, 1989).

- *Vocabulary tasks and instruction should be restructured when necessary.*

Research has shown, however, that students often simply do not understand the task involved in vocabulary learning. For example, simply asking students for the definition of a word might be confusing. Revising learning materials or designing instruction to meet the needs of learners often facilitates vocabulary learning (Gordon, Schumm, Coffland, and Doucette, 1992). Restructuring tasks seems to be particularly effective for low-achieving or at-risk students (e.g., Schwartz and Raphael, 1985).

- *Vocabulary learning should entail active engagement in learning tasks.*

Findings consistently show that having students actively participate in learning vocabulary words is best (e.g., Dole, Sloan, and Trathen, 1995). Successful examples of active engagement in tasks included a variety of methods, such as having students make mental pictures of the definitions, acting out the definitions with sign language, using the word in writing tasks, and actively attending to context clues to infer word meanings.

Explicit instruction *may* be useful in closing the gap between the students with the highest levels of vocabulary knowledge and those with the lowest.

The most recent National Assessment of Educational Progress (NAEP, 2002) shows that many eighth- and twelfth-grade students do not have the capacity to perform the higher-order cognitive work required for deep learning of content through reading.

- *Computer technology can be used to help teach vocabulary.*
The NRP finding that the use of computers was successful in improving vocabulary learning applied mostly to younger children. However, the effects of computers on various aspects of literacy can also be demonstrated for adolescent populations. See “Computers and Adolescent Literacy” section.
- *Vocabulary should be taught both directly and indirectly.*
Direct instruction of vocabulary should be included in reading lessons. There is a need for instruction of those vocabulary words that are required for a specific text to be read as part of the lesson. Such instruction can help to make the translation of print to speech meaningful by introducing the items orally (Brett, Rothlein, and Hurley, 1996). All of the studies reviewed by the NRP that examined direct instruction of vocabulary found that both comprehension and vocabulary improved as a result of the direct instruction. While the research provides no empirical data on the best words to teach directly, some researchers have begun to develop methods to address this issue. One promising approach has been developed by Beck, McKeown, and Kucan (2002), who suggest that vocabulary words fall into tiers, based on frequency of use. They recommend that teaching words that fall in between the two extremes (words that students already know and those that are so rare as to be of little utility) should be the content of explicit vocabulary instruction. While this approach needs to be validated by research, it is sufficiently promising to justify its recommendation.
- *Vocabulary can be acquired through incidental learning.*
As noted above, the vocabularies that

students acquire are too large to be the result of instruction only. Students must learn words in other ways. Incidental learning of vocabulary through listening, other reading instruction, and storybook readings was found to improve comprehension. Not all vocabulary can be, or has to be, taught explicitly.

The effect of explicit instruction of vocabulary is one of the more interesting findings of the NRP. While it is clear that vocabulary learning *must* include more than explicit instruction, it is also clear that explicit instruction is one way to improve comprehension. This explicit instruction likely extends to content area learning, although again, the research is not informative on this topic.

Comprehension

The most recent National Assessment of Educational Progress (NAEP, 2002) shows that many eighth- and twelfth-grade students do not have the capacity to perform the higher-order cognitive work required for deep learning of content through reading. Eighth-grade students showed no improvement since 1998, although they exceeded scores for 1992 and 1994; twelfth-grade students showed a decline and had lower scores than in 1992.

According to the NAEP rubric, a “basic” level at eighth grade means that readers can:

- demonstrate a literal understanding of what they read;
- make some interpretations;
- identify specific aspects of the text that reflect overall meaning;
- extend the ideas in the text by making simple inferences; and
- recognize and relate interpretations

and connections.

In contrast, eighth-grade students performing at the “advanced” level can:

- describe the more abstract themes and ideas of the overall text;
- analyze both meaning and form and support their analyses explicitly with examples from the text; and
- extend text information by relating it to their experiences and world events.

Advanced performance is characterized by student responses that are “thorough, thoughtful, and extensive.” Similar distinctions between “basic” and “advanced” reading performance apply to the reading achievement descriptors at the twelfth-grade level, in that basic performance indexes an incapacity to be successful at higher-order reading tasks (Underwood and Pearson, in press). This is a significant indicator of both the importance of comprehension and the problems that older students face in reading and understanding complex materials in content areas.

Prior Knowledge

One of the assumptions that is often made is that at-risk students have prior knowledge deficits. If that is so, then there is reason to assume that work that increases general world knowledge might be beneficial. But we have very little evidence that this type of intervention will solve the problem. If it did, the solution would be to provide students with rich background and prereading activities. While there is not a great deal of research on the instruction of prior knowledge, the importance of having sufficient prior knowledge is clearly important (Dole, Valencia, Greer, and Wardrop, 1991).

Strategy Instruction

The NRP analyzed 203 studies of comprehension strategy instruction. The bulk of these studies were conducted with students in fourth grade and above. In the analysis, NRP found that there was research evidence for the efficacy of eight strategies, which included the following:

- *Comprehension monitoring* is the process by which readers decide whether or not they are understanding the text. If they are not understanding it, they need to learn to apply “fix-up” strategies to correct whatever problems are occurring. Some of these fix-up strategies are restating, looking back, and even looking ahead for clues that might help (Bereiter and Bird, 1985).
- *Cooperative learning* allows students to learn while being engaged in the learning process with other students. Research shows that students often learn better when they are engaged in cooperative learning. While cooperative learning is often thought of as a social organization for the classroom, it is also a specific learning strategy whereby students can work together on clearly defined tasks to arrive at a solution. Klingner, Vaughn, and Schumm (1998) had small groups of students translate content material from “teacher talk” to “kid talk” and showed gains in reading.
- *Graphic organizers* are alternative representations of text, visual or spatial. Graphic organizers include semantic networks, concept maps, or text maps. They have been extensively researched and have even been thought of as a general teaching tool. Graphic organizers can be used before, during, or after reading. Most of the uses have involved effects on reading, but an interesting use of graphic organizers after reading has shown improvement in written summaries (Bean and Steenwyk, 1984).

- *Story structure* refers to the common components in story (or narrative) text. These components are often described as: setting, initiating events, internal reactions, goals, attempts, and outcomes. While many students arrive at school with a complete knowledge of stories, others do not. The research showed that knowledge of these components helps the reader comprehend stories better than without such knowledge (e.g., Singer and Donlan, 1982).
 - *Question answering* is one of the most prevalent forms of comprehension assessment. It is also an effective comprehension strategy. One interesting example is the QAR technique (Raphael and Pearson, 1985), in which students are taught that questions can be answered by referring to the text, as well as the information one already knows. A critical variable in this strategy is the process of identifying where the information to answer the question was found.
 - *Question generating* is another powerful technique. Students are taught to create (and then answer) their own questions about a text. A meta-analysis of the research on question generation (Rosenshine, Meister, and Chapman, 1996) concluded that there were large impacts for multiple-choice, short-answer, and summarization assessments. (See Appendix, number 3.) Question generation can be used independently or as part of multiple strategy instruction, as in reciprocal teaching (see below) (Palincsar and Brown, 1984).
 - *Summarization* is the result of reading the text and extracting the most important information from it. As a strategy, it forces the reader to extract the main ideas and eliminate redundant and unnecessary details. To do this requires reading and rereading of the text, accounting for greater comprehension. The classic studies of summarization can be found in Brown and Day (1983) and Brown, Day, and Jones (1983).
 - *Multiple strategies*. The final category of research-supported strategies is not really a “strategy,” but rather the application of multiple strategies. Instructionally, students are taught to use combinations of strategies to assist in comprehending the text. The important question that arises about strategy instruction is whether or not strategies should be taught to students singly or in combinations, as multiple strategies. “Reciprocal teaching” (Palincsar and Brown, 1984), for example, is an instructional intervention that utilizes multiple strategies (e.g., question generation, summarization, vocabulary, etc.). There are substantial results reported from use of these strategies in the best cases (Rosenshine and Meister, 1994). (See Appendix, number 4.)
- Ray Reutzel (personal communication) has recently completed an experimental study in which he varied the instruction of strategies—either teaching a single strategy at a time *or* teaching multiple strategies. The multiple strategy approach had a clear superiority over single strategy instructions. Although it is rarely wise to depend on prepublication results, this does seem promising as a “meta” strategy for instruction that will leverage students’ abilities to comprehend.
- In general, there seems to be relatively strong evidence that suggests that teaching strategies in multiple combinations is superior to teaching strategies one at a time.

DEVELOPMENTAL NATURE OF READING AND CONTENT LEARNING

Alexander and Jetton (2000) proposed a developmental view of learning from text. They emphasized the notion that the ability to learn from text changes over the course of one's education (and, presumably, over the remainder of one's life experiences).

In this perspective, readers progress from an *acclimated* stage, in which the emphasis is on orientation and adaptation. Learners are attempting to understand the structure of an unfamiliar domain of information. An important characteristic of this stage is that students often apply strategies inefficiently because they have limited subject matter knowledge.

At the next, more advanced stage, learners are termed *competent*. To reach this stage (and not all learners do), readers have to develop a sufficient level of knowledge, strategic capability, and motivational interest and goals. This competence entails both quantitative and qualitative transformations in knowledge of the domain and strategic processing. As students reach this level, their deeper level of subject matter knowledge facilitates the acquisition of new knowledge. Important among the factors

that account for the transition to competence from acclimation is the use of strategies (Alexander and Murphy, 1999). However, in the end, motivation was the clearest determiner of successful students.

The highest stage in this perspective is labeled *proficiency* or *expertise*. At this stage, readers have a great deal of knowledge of specific domains, deep interest in the topic, and a desire to explore or learn more about the domain. Alexander and Jetton suggest that few students ever reach this final stage.

On the basis of the research that supports this developmental perspective, they offer instructional implications that include the need for differential instructional support for learning, depending on the stages students have attained. Quality of text is differentially related to students' abilities to learn. Students at the acclimated stage are most affected by poor texts, while students who have reached more advanced stages can compensate for flaws in the textbooks. Finally, Alexander and Jetton suggest that instruction encourage learner autonomy and intrinsic motivation.

The ability to learn from text changes over the course of one's education.

ENGLISH-LANGUAGE LEARNERS AND LITERACY

An important and growing group of students who have unique literacy challenges are English-language learners (ELLs), students whose first language is something other than English.

An important and growing group of students who have unique literacy challenges are English-language learners (ELLs), students whose first language is something other than English. For the adolescent populations under consideration, these students may or may not have acquired some literacy in their first language. While the research does not always distinguish between them, it is important to understand what literacy skills a nonnative speaker brings to the learning task.

For students who are literate in their first language (L1), instructional strategies may be different from those needed for students who are not literate in their first language and are attempting to learn English as a second language (L2). The majority of studies of L2 transfer for adolescent populations focus on Latino, Hispanic, or Mexican American students. In twenty-one of twenty-six studies, Spanish was the native language.

Impact of First-Language Literacy on Second-Language Acquisition

One focus of studies of ELL adolescent readers was to assess how L1 language

proficiency impacted L2 performance. Overall, these studies showed encouraging outcomes, finding either positive or neutral effects of L1 proficiency on L2 performance. Royer and Carlo (1991) found a positive correlation between L1 reading comprehension scores on later L2 reading comprehension scores in bilingual Spanish/English sixth graders, suggesting a positive transfer of reading skills. In a study with white and Hispanic bilingual and monolingual high school sophomores, Fernandez and Nielsen (1986) found a positive correlation between scholastic achievement and proficiency in both English and Spanish among the bilingual students. Finally, in a study with Vietnamese students in grades 1–8, students' self-reports of Vietnamese competency showed no correlation with English proficiency (Nguyen, Shin, and Krashen, 2001).

Impact of Vocabulary Development

A second theme in the studies examined the role of vocabulary with respect to L2 instruction, achievement, and L1/L2 transfer. In the area of vocabulary development, Nagy et al. (1993) found that the knowledge of

Spanish vocabulary and the ability to recognize Spanish/English cognate relationships among fourth through sixth graders was associated with increased reading comprehension of an expository text. Nagy, McClure, and Mir (1997) investigated the transfer of L1 to L2 errors of guessing words in context among seventh and eighth graders, and found that L1 syntax knowledge influenced students' guesses of unknown words in the L2 context. Garcia (1991) looked at how poor vocabulary knowledge, among several other factors, could negatively impact the test performance of Hispanic fifth and sixth graders. One study by Avila and Sadoski (1996) revealed potential implications for L2 vocabulary instruction, finding positive results using the keyword method with fifth-grade Hispanic students.

Impacts of Oral Reading and Verbal Fluency

A third theme focused on oral reading and verbal fluency and its impact on various reading measures. Goldstein et al. (1993) investigated how oral story-telling ability was related to reading comprehension among Latino junior high school students with learning disabilities, and Peregoy (1989) found a link between oral proficiency and reading comprehension among Mexican American fifth-grade students. Miramontes (1987) looked at oral reading miscues among successful and disabled Hispanic fourth through sixth graders and found significant differences in measures such as comprehension and grammatical relationships. Vida and Vargas (1985) investigated the effects of cognitive skills training on verbal fluency in Mexican American fifth graders and found no benefits on measures of general verbal fluency, but

did note an increase in speed of word recognition.

Impacts of Culture and Community on Achievement

A few studies explored the role of various contextual factors on L2 achievement. Hansen (1989) assessed the impact of family, peer, and cultural influences on reading comprehension and auditory vocabulary gains in Mexican American fifth-grade students. In the study, smaller gains were found for reading comprehension during the summer months, but no difference for auditory vocabulary gains between the summer and school months. In another study of contextual influences, Kennedy and Park (1994) examined the role of the language spoken at home and achievement among eighth-grade Mexican American and Asian American students; they found differential effects mediated by language, socioeconomic, and social-psychological factors. Buriel and Cardoza (1988) also evaluated the impact of contextual factors such as home language, socioeconomic background, mother's aspirations, and parental educational levels on academic achievement in Spanish-speaking high school seniors. One notable finding from this study was that Spanish-language effects on English achievement were found to be minimal.

Impact of Native Language Use on Academic Achievement

Finally, two studies investigated the association between the extent of L1 use and academic performance. Tentative findings from these two studies suggested that the frequent or heavy use of the L1 language had a negative association with L2 test performance. Ahern et al. (1980) found an inverse relationship between the

use of the Hawaiian dialect and standardized test scores among fourth graders. However, students who were aware of their dialect use and corrected for it had higher standardized test scores, and demonstrated fewer errors in their ability to distinguish the meaning of the written word and match it to a picture. In a study of Hispanic and white monolingual and bilingual high school sophomores, Fernandez and Nielsen (1986) found a negative correlation between the frequent use of non-English and standardized test scores in reading, vocabulary, and math among the bilingual students. As reviewed earlier, the same study also found a positive correlation between academic performance and proficiency in English and the native language for the bilingual students.

One important implication of these two studies is that the association between L1 language use and academic performance is complex, and can be mediated by factors such as L1/L2 proficiency and students' awareness of L1/L2 language differences. Other variables might also help to explain the negative association found between the frequency of L1 usage and test performance. For example, the measure of frequent L1 use may be more indicative of oral language proficiency than proficiency in actual L1 reading and writing skills. In addition, because the studies were based on correlational data, the relationship between L1 language use and poor test performance may have been influenced by secondary variables such as socioeconomic status. Further research that looks more closely at the impact of these various factors is necessary to extend these exploratory findings.

The first theme in the studies of transfer examined L1/L2 transfer in the

context of reading skills and strategies, resulting in some encouraging findings. In a study that assessed reading comprehension scores among sixth-grade Spanish-speaking students enrolled in a transitional bilingual program, Royer and Carlo (1991) found support for the assumption that native language skills would transfer to the second-language context. Jimenez et al. (1996) explored the effects of bilingualism on metacognition among sixth- and seventh-grade Latino readers and concluded that successful students engaged in strategies such as actively transferring information across languages and translating information from Spanish to English. Investigating a similar topic, Langer et al. (1990) examined the implications of English and Spanish reading strategies on recall and text comprehension among Mexican American fifth-grade students. Finally, in a study with Spanish-proficient students entering the seventh grade, Hernandez (1991) found that teaching English reading comprehension strategies in the primary language was an important component of improving reading comprehension and effective strategy instruction.

A second theme explored transfer effects with respect to vocabulary and syntactic knowledge, and underscored the importance of these variables for facilitating reading comprehension. In a study with fourth- through sixth-grade Hispanic students, Nagy et al. (1993) found that the ability to recognize cognate relationships was related to students' reading comprehension of an English expository text. Nagy, McClure, and Mir (1997) found that syntactic knowledge of Spanish influenced seventh- and eighth-grade bilingual students' guesses about the definitions of unknown

words in English. Comparing Hispanic and Anglo fifth- and sixth-grade students' performance on English reading tests, Garcia (1991) identified several factors that negatively impacted test performance, including unknown vocabulary words in the test questions and answers.

Instructional Approaches Taken with English-Language Learners

There is a sizable body of research investigating the pedagogical effects of bilingual instruction—instruction in which students are taught subject matter using their first language. For the most part, these studies cited positive findings in support of bilingual instruction. In a study with eighth-grade Cherokee Indians, Bacon, Kidd, and Seaberg (1982) found that students who received bilingual instruction in grades 1–5 scored significantly higher on the SRA achievement test than students who had not. Interestingly, no significant differences were found in the scores between children who had received four versus five years of bilingual instruction. Burnham-Massey and Pina (1990) investigated the efficacy of bilingual education in a school with a 40 percent limited-English-proficient, Spanish-dominant population. Comparing standardized test (CTBS) scores of fifth graders who were initially instructed in Spanish with native English speakers who were exclusively taught in English, the authors concluded that high-quality bilingual instruction helped the limited-English-proficient students to catch up to their peers.

In a more focused study of L2 instructional approaches, Fulton-Scott and Calvin (1983) compared the efficacy of three elementary school language programs (bilingual multicultural, integrated ESL, and nonintegrated ESL) in a study that included sixth-grade Hispanic students with

low English proficiency. Evaluating student grade point averages in math, reading, and language achievement among the three programs, the authors determined that the bilingual multicultural students scored the highest on most of the measures. Alanis (2000) found that fifth-grade Mexican students (including both native Spanish-speaking and native English-speaking students) who enrolled in a two-way bilingual program for a minimum of three years were developing strong English literacy skills, and achieving either better or the same academically as their control group counterparts. However, the author concedes that the encouraging rate of progress that was evident in the early years of the bilingual program was difficult to maintain at the upper grade levels.

Perhaps related to this issue of sustaining progress through the grades, one particularly notable finding from the review involved two studies that found differential effects of bilingual instruction on the basis of grade level. In a study that compared standardized language and reading test scores among language minority students in grades 4–7, Gersten and Woodward (1995) found significant positive effects of bilingual immersion approaches for students in grades 4–6, but not for students in grade seven. Curiel, Stenning, and Cooper-Stenning (1980) concluded that Mexican American students in grades 1–6 who had received more than a year of elementary school bilingual education had significantly higher GPAs compared to students who had received English-only instruction. However, no significant differences were observed in GPAs between the two groups in grade seven. In addition, differential amounts of time spent in bilingual education were not found to affect seventh-grade school performance. With respect to achievement on standard-

There is a sizable body of research investigating the pedagogical effects of bilingual instruction— instruction in which students are taught subject matter using their first language. For the most part, these studies cited positive findings in support of bilingual instruction.

While there are still a substantial number of unanswered questions about English-language learners, there is an emerging picture of what can be done to improve the literacy of these students.

ized reading test scores in grades six and seven, the authors found that students who had received English-only instruction demonstrated higher scores on comprehension, language skills, and vocabulary in grade six, and higher English-language skills in grade seven.

Another group of studies focuses on the effects of various instructional or curricular variables on L2 achievement. Padron (1992) found benefits of providing instruction in cognitive reading strategies to Hispanic bilingual students in grades 3–5, and noted a reduction in the use of weak reading strategies. Saunders et al. (1997) suggested that the quality of classroom talk after fourth-grade students (who were transitioning from Spanish to English instruction) read a short story in English ultimately revealed an important link to students' learning of the material. Syvanen (1997) assessed the effects of cross-age tutoring among fourth- and fifth-grade ESL students who tutored kindergarten and first-grade students in reading. While some improvements were seen in areas such as the tutors' attitudes toward reading, no significant improvements were found in the tutors' reading achievement relative to their ESL peers. Due to the small number of studies that explored specific instructional manipulations, additional research is necessary to develop these findings and assess their practical implications for the classroom.

With respect to curricular variables, two studies examined the impact of offering various types of reading materials to bilingual students. Schon, Hopkins, and Vojir (1984) assessed the effects of offering high-interest Spanish reading materials that ranged in readability to Hispanic high school students in remedial reading classes. While recent Hispanic immigrants demonstrated high interest in reading and

using these materials, the materials did not provide much appeal for the U.S.-born Hispanics and were not used frequently. A second study by Schon, Hopkins, and Vojir (1985) devised an instructional treatment condition that provided a diverse selection of Spanish reading materials and allocated reading time to Hispanic junior high school students. Students showed little significant differences on measures such as reading attitude compared to students who had not received the treatment. However, the authors note that larger gains in English and Spanish reading achievement were found among students whose teachers were more conscientious about putting the treatment into practice. One implication of these studies is that successfully matching reading materials with ESL students requires the careful consideration of variables beyond text readability, and is likely to include factors such as the cultural saliency of the materials and the appeal of the materials to students with varying levels of acculturation to the United States.

García (1991) conducted a study that compared the English reading test performance of Spanish-speaking, Latino fifth and sixth graders and their native English-speaking, Anglo classmates. She reported that the Latino students, regardless of English reading level, were less familiar with the range of topics on the standardized test passages and knew much less of the vocabulary in the passages and test items compared to their Anglo classmates. This clearly affected the validity of the assessment for the Spanish-speaking students.

While there are still a substantial number of unanswered questions about English-language learners, there is an emerging picture of what can be done to improve the literacy of these students.

COMPUTERS AND ADOLESCENT LITERACY

As an alternative or adjunct to traditional reading instruction, computer-assisted instruction can offer students the opportunity to receive customized support, learn at a comfortable pace, and encourage the active processing of text. Prior research with adolescents suggests that computer-assisted reading instruction can facilitate reading comprehension. Reinking (1988) found that fifth and sixth graders reading expository texts benefited from reading computer-mediated texts that included options for additional information about the text, such as vocabulary definitions, simplified text, and background information.

Computer-Assisted Instruction and Reading

In a study with low-achieving fifth-grade students receiving traditional versus computer-assisted instruction, Weller, Carpenter, and Holmes (1998) found significant increases in standardized reading comprehension scores with the computer-assisted group. Weller et al. credited the augmented learning outcomes to the daily interaction that the students had with computer-assisted instruction.

Similarly, Boyd (2000) found that a self-paced, computer-based reading instruction helped to increase seventh- and eighth-grade students' independent reading levels.

In a study with fifth-grade students reading expository science texts, Kinzer and Loofbourow (1989) found that the noncomputer group scored significantly higher than the computer group on post-test measures. In the study, students in the computer group viewed computerized simulations, while the noncomputer group read a similar expository text. Kinzer and Loofbourow speculate that there could have been novelty effects with the computer group, difficulties with reading from the computer, as well as the potential for the computer animations to distract from the efficient processing of the material. One important instructional variable to note is that the computer group learned in a whole-class environment, while the noncomputer group read the texts individually. As a result, the implementation of the computer-assisted instruction in this study was significantly different from some of the previous studies reviewed that assessed the benefits

Computer-assisted instruction can offer students the opportunity to receive customized support, learn at a comfortable pace, and encourage the active processing of text.

The ability to synthesize visual and text information is a process that is influenced by many variables.

of providing individualized reading instruction.

These studies suggest that computerized literacy instruction can have the potential to augment reading comprehension, but they also underscore the importance of considering many other factors that can affect its successful implementation.

Effectively Processing Computer or Multimedia Text

Prior research on the developmental differences in the ability to comprehend the presentation of combined visual and verbal information reveals that even adolescents may need assistance to process various types of multimedia effectively. In a study of fifth-, seventh-, and ninth-grade students reading science texts with visual adjuncts, Moore and Scevack (1997) found that the ninth graders displayed a greater ability to link text and visual aid information explicitly than did the fifth and seventh graders. The authors conclude that the explicit linking of text and diagrams and the ability to think about ways a diagram can enhance text comprehension is rare among fifth- and seventh-grade students. Even for the ninth graders, only about half in the study were found to engage in such thinking. Small, Lovett, and Scher (1993) discovered that even many adults do not attend to information in visuals unless explicitly instructed to do so. They cite research finding that children often need directions to pay attention to visuals. In a study of high school students, Moore (1993) discovered that subjects were largely ineffective in processing the adjunct visuals such as maps and graphs that accompany text, and took a passive role in interacting with the visual aids. In

a study with fifth- and sixth-grade students, and with college students, Kirby (1993) emphasized that all students may need to be taught strategies and methods for complex and deep processing of visuals.

These findings suggest that the ability to form referential connections between visual elements and text may reveal developmental trends, and that even adolescents and adults have difficulties in effectively processing visuals within text. Proficiency is not necessarily acquired as children progress through school, probably because they are offered little in the way of instruction. Many adolescents will need instruction and guided practice with applying strategies for processing nontextual information in meaningful contexts.

The ability to synthesize visual and text information is a process that is influenced by many variables. One cluster of variables is related to conventional strategic reading skills that develop with age and practice. Another cluster is related to specific skills that must be instructed, such as prompts to encourage readers to process various sources of information actively. Merely presenting the texts and visual aids together is not sufficient for most readers, including adolescents, to process efficiently. Young children are not the only learners who will require additional assistance with these tasks, and these studies suggest that older readers are also likely to benefit from specific instruction to process texts and visuals actively.

These findings suggest that specific reading guidance may be necessary for adolescents to utilize a multimedia environment for learning successfully. Simply providing access to various options

for reading support is not sufficient when readers do not know how to select and apply the relevant assistance accurately at the appropriate times. Adolescents are likely to benefit from the provision of specific reading prompts while reading on the computer, and the addition of guidance that helps them to attend to salient information in the text, such as target vocabulary words. In addition, these studies suggest that adolescents may benefit from computerized reading instruction that includes an element of predetermined assistance, where the assistance is highly structured and where restrictions are placed on the amount of learner control students are given. These findings with adolescent readers are consistent with studies of younger children that have found that children tend to do better in more structured computer learning environments (e.g., Shin, Schallert, and Savenye, 1991).

Collaborative Opportunities Fuel Motivation and Social Interaction

Computers enable opportunities for adolescents to develop literacy skills through collaborative work and social interactions with each other. Computer-based communication, such as e-mail or chat rooms, places expectations on participants to respond in written formats to convey meaning accurately and effectively. Without the benefit of intonation, gestures, and facial expressions that help to communicate a speaker's intent and emotion in spoken language, written communication relies solely on the use of words and symbols, such as punctuation, smiley faces, and familiar computer jargon. The following research studies underscore some of the

social components that are involved with computer-based communication, and describe some of the new literacy skills that can develop from adolescents' participation in these activities.

Reporting on studies of seventh-grade students working on computers, Beach and Lundell (1998) observed that students engaged in computer-mediated communication (CMC), such as e-mail, posting messages, and online chats, learned literacy skills through social exchanges. Computer technology can also provide a context for collaborative work, such as group writing projects in which students work together to share and revise drafts. Beach and Lundell found that the computerized format can encourage participation from students who tend to shy away from participating in face-to-face discussions, and can facilitate the free expression of alternate views. Collectively, the authors note how these social contexts require adolescents to participate in ways that call on them to infer social meanings, respond in ways that are socially appropriate, and accurately communicate their ideas to an audience.

Since students must communicate through reading and writing in computer-mediated environments, strong demands are placed on proficient literacy skills for participation. In a study with fifth graders, Moore and Karabenick (1992) assessed the effects of computer communications on reading and writing performance. Through the evaluation of written transcripts of the communication, increases were found in the quality of the students' written communication on measures such as clarity, and the inclusion of more examples and support for their ideas. The authors hypothesize that

More school-age children
in the nation use
computers at school than
at home.

providing students with an audience and a clear purpose for their writing helped to motivate students to write longer passages and communicate their ideas more effectively. An additional finding from this research was that the students' attitudes toward computer use became more positive through increased interactions with the computer. However, the study did not find changes in the students' attitudes toward reading and writing because of their computer interactions. The authors suggest that these findings might have been different if students had longer interactions with the computer, as well as a more explicit linking of the computer activities with the reading and writing curriculum.

In a study with six teenage girls (aged fourteen to sixteen), Merchant (2001) investigated the types of online activities in which students were involved. Merchant found that the adolescents developed skills from basic familiarity with mouse/keyboard use to complex skills such as online navigation and the sharing of pictures and exchange of Web site links. Through their participation, adolescents increased their proficiency with the conventions of "written conversation," the term Merchant uses to describe the written communication of exchanges that are typically spoken. These conventions include common abbreviations and symbols used to convey emotions, and shorthand as students quickly learn the popular computer jargon terms and symbols and develop new ones. In addition, students have the opportunity to integrate various forms of media on the computer seamlessly, such as incorporating media files and links to Web sites into their written text. Merchant concludes that adolescents'

participation in these online activities develops communication skills and literacy skills that may not always be recognized in more formal educational settings.

Technology—Equalizing the Playing Field?

Schools may have an ameliorating effect on the attitudinal differences among students from various socioeconomic levels. More school-age children in the nation use computers at school than at home (Newburger, 2001). Because the majority of the instructional computers in schools are connected to the Internet, a wide variety of applications are likely to be found with those computers. Access may even extend beyond regular school hours. A total of 78 percent of secondary schools made computers available outside of regular hours (U.S. Department of Education, 2002).

The availability of and access to school computers during and after school hours may have the effect of compensating for effects that may be attributable to socioeconomic levels, and perhaps gender effects as well. Ultimately, it could be possible that these differences will simply disappear.

TEACHER EDUCATION AND PROFESSIONAL DEVELOPMENT

The National Reading Panel examined the relationship of professional development to reading achievement. The research on teacher education and professional development in reading is fairly extensive, amounting to more than three hundred studies published between 1961 and 2001 (Pang and Kamil, 2003). However, these studies are unevenly divided between thirty-nine experimental studies and 267 descriptive or qualitative ones. Consequently, the NRP reported on only a small number of studies in its analysis. The important framework that drove the NRP analysis was that the research had to be experimental and it had to report both teacher data (i.e., Did teachers learn what was taught?) and student data (i.e., Did students' reading improve?).

There were no studies of preservice teachers that fulfilled both criteria. Primarily, there were no student measures, in all likelihood because of the difficulty of tracking teachers after they graduate. However, there were studies that did examine teacher change. The NRP conclusion was that teachers did learn what was taught in teacher education programs; the behaviors changed in line with the content of

instruction.

For the professional development research, there were studies that reported both teacher and student data. While there were only twenty-one such studies, the results were consistent in their effects on student achievement.

In that sample, seventeen of twenty-one measured teacher outcomes, and fifteen of those seventeen showed at least moderate improvement. That is, the teachers learned and adopted the content of the professional development programs. A total of fifteen of twenty-one of the studies measured student outcomes. Of those fifteen studies, thirteen reported improvements in student achievement. *Most important, if there were no gains for teachers, there were no gains for the students. Thus, if teachers did not learn what was taught, students did not experience gains in reading performance.*

In short, this confirms, albeit with only a limited set of studies, the positive effects of professional development on student achievement. It also can be argued by analogy that teacher education will have an effect, since the precondition for improving student achievement existed. Teachers did learn the content of the

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preservice programs. There is reason to expect that they would do a better job of teaching their students, much as the in-service teachers did. This still awaits experimental confirmation, however.

The research leads to a relatively simple conclusion: If professional development around literacy at the high school level could be conducted in a manner consistent with that described in the NRP, the reading ability of students could be improved.

We know a great deal about how to teach adolescent literacy and how to improve reading for middle and high school students. Nevertheless, several problems seem to represent barriers to the implementation of successful professional development programs around literacy at the secondary school level. First, who is responsible for teaching reading? Second, how will programs be implemented without detracting from other forms of professional development? Third, will teaching reading detract from learning about content?

INFRASTRUCTURE FOR READING INSTRUCTION IN SECONDARY SCHOOLS

We know that having well-trained teachers in early care and education programs makes an important difference to low-income and minority elementary children (Peisner-Feinberg et al., 1999). While 54 percent of teachers taught students who had limited English proficiency, or were from ethnic backgrounds different from their own, only 17 percent of these teachers felt well prepared to meet the needs of their students (National Center for Education Statistics, 1998). How does this knowledge play out in middle and high schools? There has been a traditional resistance to reading instruction, dating back over sixty years (Artley, 1944). More recently, others have documented the problems of delivering reading instruction in high schools.

Schoenbach, Greenleaf, Cziko, and Hurwitz (1999) documented practices in which teachers circumvent the need for students to read texts through adjustments to their assignments or through alternative methods of presentation of content.

Barry (1997) surveyed high school reading programs, and 67 percent of 737 respondents from forty-eight states indicated that they had a program in

place to help struggling readers. This is encouraging, but half of these programs were housed in the special education program area. There does not seem to be a consistent way of delivering knowledge about reading and the teaching of reading in high schools.

Kingery (2000) and O'Brien, Moje, and Stewart (2001) have implicated the demands of broad content coverage as a barrier to implementing content area reading instruction. Efforts to create situations favoring certain literacy practices must attend to the broad cultural aspects common to the secondary school institution; they cannot simply be imposed on schools without regard to the existing structure. Darwin (2002) also reports finding resistance from content teachers to the work of the high school reading specialists.

One vehicle for remedying the infrastructure problem in middle and secondary schools would be to provide high-quality, ongoing professional development in literacy. The most popular and promising solution to this problem seems to be coaching—literacy specialists who work with content teachers to assist them in infusing literacy

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instruction in their teaching.

There is no systematic body of research on coaching as a way of producing improvements in literacy for middle and high school students. However, there are many studies of such implementations, and they do seem to offer positive results. The most promising programs in coaching are reviewed in Sturtevant (2003). The logic is compelling. We know that professional development leads to improved reading ability for students. It is only a small jump to assume that coaching as a form of professional development will be a potent force in the improvement of reading for middle and high school students.

Given that we know a great deal about what to do about adolescent literacy problems, it is imperative that we find a way to put that knowledge to work by getting into the repertoires of middle and high school teachers, administrators, and other relevant stakeholders.

CONCLUSION

There is a crisis in American middle and high schools: one in four adolescents cannot read well enough to identify the main idea in a passage or understand informational text. This keeps them from succeeding in challenging high school coursework and from graduating from high school prepared for the option of postsecondary education.

But there is a strong body of research-based knowledge that is available about adolescent literacy. This research demonstrates that we do know enough about adolescent literacy to make positive changes today. We know a great deal about the literacy needs of adolescents and the teaching practices that are effective with them. We know that skills such as decoding and fluency lead to better reading comprehension. We know that motivation and engagement are critical elements for adolescents. We know that English-language learners face additional challenges when learning to read and write well in English. And we know that professional development for teachers has positive effects on student reading achievement.

Yet the crisis persists. Reading test

scores for high school students have not improved in thirty years, and twelfth-grade students' achievement scores have declined in the last ten years.

Policymakers should use the strong body of research about adolescent literacy as a foundation for change in secondary schools. Policies should be created to embody existing research while remaining flexible enough to incorporate future findings.

- Methods of maximizing motivation and engagement in adolescents should be a major focus when designing adolescent literacy programs. One such focus should include the integration of computer technologies into literacy instruction.
- While the focus of much concern in adolescent literacy is on comprehension, at least 10 percent of adolescents still have difficulties with word analysis and related skills. Therefore, policies should encourage the careful assessment of reading skills to be certain that individualized instruction is provided to each student.
- English-language learners face additional, unique challenges. Policies that guide instruction need to reflect the research that examines the transfer

We do know enough about adolescent literacy to make positive changes today.

In today's knowledge-based society, our students need to be expert readers, writers, and thinkers to compete and succeed in the global economy.

from first language to second language and ESL teaching strategies.

- Research shows that a teacher's professional development can positively affect student achievement, which is sufficiently suggestive to warrant policies that encourage sustained, imbedded professional development for teachers in secondary schools.

In today's knowledge-based society, our students need to be expert readers, writers, and thinkers to compete and succeed in the global economy.

Furthermore, our high fourth-grade and low eleventh-grade international rankings for reading achievement show that an investment in the education of fourth-through twelfth-grade students is not just important—it is a national imperative.

APPENDIX: EFFECT SIZES

Effect sizes are used to measure the “effect” an experimental treatment has over control conditions. The statistic “d” is a standard measure that allows comparisons across different studies and conditions. Small effects are represented by values in the range of 0.2, representing about an 8 percent improvement. Moderate effects are in the range of about 0.5, or a 19 percent improvement. Large effects are in the range of 0.8 or above, translating into a 29 percent improvement of an experimental group over a control group.

1. Effect sizes were moderate to high for at-risk and grade-level readers in kindergarten and first grade, ranging from $d = 0.48$ to $d = 0.74$. Effect sizes were smaller for second- through sixth-grade normal readers ($d = 0.27$) and disabled readers ($d = 0.32$). In the eight comparisons involving low achievers in second through sixth grade, the effect size was very small ($d = 0.15$), but the effect size for low achievers did not differ significantly from the effect size of disabled readers ($d = 0.32$).
2. The use of repeated reading resulted in gains in reading ability with an effect size of 0.48. For the studies of older students receiving guided oral reading instruction, the NRP reports an effect size of $d = 0.41$. The highest impact was on reading accuracy, with a mean effect size of 0.55; the next was on reading fluency, with a mean effect size of 0.44; and the least, but still impressive, impact was on reading comprehension, where the effect size was 0.35. In studies where these reading outcome measures were aggregated, the mean effect size was 0.50.
3. A meta-analysis of the research on question generation (Rosenshine, Meister, and Chapman, 1996) concluded that there were large impacts for multiple-choice (0.95), short-answer (0.85), and summarization assessments (0.85).
4. Reciprocal teaching (Palincsar and Brown, 1984) is an instructional intervention that utilizes multiple strategies (e.g., question generation, summarization, vocabulary, etc.). The effect sizes for this strategy are fairly substantial, about 0.88, in the best cases.

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