# We Acquire Vocabulary and Spelling by Reading: Additional Evidence for the Input Hypothesis

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EXCELLENT REASONS EXIST FOR DEVOTING attention to vocabulary and spelling.[1] First, there are practical reasons. A large vocabulary is, of course, essential for mastery of a language. Second language acquirers know this; they carry dictionaries with them, not grammar books, and regularly report that lack of vocabulary is a major problem. Spelling, especially for treacherous languages such as English, is also a problem. Our standards in spelling are 100%; a single spelling error in public can mean humiliation.

On the theoretical level, the study of the acquisition of vocabulary and spelling ability can help us understand language acquisition in general. In my view, the most promising hypothesis is that vocabulary and spelling are acquired in fundamentally the same way the rest of language is acquired. If this supposition is true, these areas can be useful laboratories for the study of language acquisition.

In this paper, I review some research in vocabulary and spelling and suggest that the results of this research are, so far, consistent with a central hypothesis that has been proposed for language acquisition in general, the Input Hypothesis, and inconsistent with two alternative hypotheses.

The Input Hypothesis (IH) assumes that we acquire language by understanding messages (73, 75). More precisely, comprehensible input is the essential environmental ingredient—a richly specified internal language acquisition device (16) also makes a significant contribution to language acquisition. I argue that the best hypothesis is that competence in spelling and vocabulary is most efficiently attained by

comprehensible input in the form of reading, a position argued by several others (e.g., 19, 122, 123).[2]

According to IH, when the Language Acquisition Device is involved, language is subconsciously acquired—while you are acquiring, you don't know you are acquiring; your conscious focus is on the message, not form. Thus, the acquisition process is identical to what has been termed "incidental learning." Also, acquired knowledge is represented subconsciously in the brain—it is what Chomsky has termed "tacit knowledge."

IH allows that the development of some linguistic knowledge may occur in other ways, outside the language acquisition device, using other mental faculties (16, 17, 42, 75, 120). This knowledge is deliberately and consciously learned, and is represented consciously in the brain. Linguistic competence developed this way is highly limited, since it utilizes mental faculties that are not specialized for language. Severe limits exist on how much can be learned, as well as how this knowledge is used (the Monitor Hypothesis, 73, 75).

IH has several competitors. Two of the most popular are the Skill-Building Hypothesis (SBH) and the Output Hypothesis (OH).

*The Skill-Building Hypothesis.* According to SBH, we learn language by first consciously learning individual rules or items, and gradually, through drills and exercises, make these rules "automatic." In terms of the theoretical framework developed in Krashen (72, 75), SBH is the hypothesis that "learning becomes acquisition," also known (121) as the Interface Hypothesis.[3]

In vocabulary learning, the skill-building view involves learning words one at a time, by deliberate study, and may include analyzing their parts, their prefixes, suffixes, and roots, and exercises (e.g., draw a line from the word

to the definition, fill in the blank). The skill-building approach to spelling is through word lists, spelling rules, and exercises.

To be precise, two versions of SBH or Interface Hypothesis exist. The strong version insists that all our competence in language comes from skill-building, that the only route to acquired competence is through conscious learning made automatic by some kind of "practice." A weaker version of SBH is that skill-building is a possible route. Other routes exist, such as comprehensible input.

*The Output Hypothesis.* According to OH, we learn language by producing it. I consider only one version of OH here, one I believe to be false: we learn rules and items by trying them out in production. If we experience communicative success, our (conscious) hypothesis about the rule or item is confirmed. If we experience communicative failure, or correction, our hypothesis is disconfirmed and we alter it. OH can exist alone (the strong version), or in combination with other hypotheses.[4]

Skill-building and output with feedback, it is hypothesized, may produce some competence, but the competence is learned, not acquired, and thus is very limited. When skill-building or output/feedback based classes "work," when they produce language development, it can be due either to conscious learning or to the presence of comprehensible input (sometimes considered to be "practice"). When the latter is responsible for student improvement, skill-building usually gets the credit.

Both SBH and OH are, in this view, closely related. In skill-building, the student is given an explicit rule, then "practices" it. In output plus feedback, the student "discovers" the correct explicit rule. Skill-building is thus similar to what is known as "deductive learning," while output plus feedback is similar to "inductive learning." Despite this relationship, and despite the fact that many programs do both, in this paper I consider skill-building and output plus feedback to represent independent hypotheses.

A substantial amount of first language research on vocabulary and spelling bears on these hypotheses, but only scraps of second language research address them. Both first and second language acquisition results, in my opinion, support the view that comprehensible input is the major source of vocabulary and spelling competence. This evidence is quite similar to that supporting IH for other aspects of language.

## EVIDENCE FOR THE INPUT HYPOTHESIS

If a hypothesis is correct, it will make only correct predictions. I attempt to show here that the Input Hypothesis makes correct predictions concerning vocabulary and spelling development. This step is necessary to demonstrate the correctness of a hypothesis, but it is not sufficient. It must also be shown that alternative explanations for the phenomena predicted by the hypothesis are not correct. I attempt to show here as well that strong versions of SBH and OH are not able to explain phenomena predicted by IH, or do so awkwardly. Skill-building and output plus feedback also have difficulty with phenomena that IH does not predict directly, but that it handles easily.

## MORE COMPREHENSIBLE INPUT, MORE LANGUAGE ACQUISITION

If IH is correct, it predicts, first, that more comprehensible input, aural and written, results in more language acquisition.[5] This prediction has been confirmed for other aspects of linguistic competence. Chomsky (13) reported that children who grew up in richer print environments displayed more grammatical competence. Several studies show that better writers read more outside of school (74). Better second language acquisition, as measured by a variety of tests, is associated with more comprehensible input in the second language outside of school (studies reviewed in Krashen, 73, 75; see also Hafiz and Tudor).

Good evidence exists that this assertion is also true for vocabulary and spelling: more comprehensible input, in the form of reading, is associated with greater competence in vocabulary and spelling.

*Vocabulary.* Children who perform better on vocabulary tests report more free voluntary reading. Anderson, Wilson, and Fielding asked fifth graders to record their activities outside of school, and reported that "among all the ways children spend their time, reading books was the best predictor of several measures of reading achievement" (2: p. 285), including vocabulary. Greaney (52) and Greaney and Hegarty (54) found modest but significant positive correlations between the amount of leisure reading reported by fifth graders and performance on tests that included a vocabulary measure. In addition, Rice (111) reported that adults who said they spent more time doing leisure reading scored higher on a vocabulary test.

The results of in-school free reading pro-

grams also demonstrate that more comprehensible input results in more vocabulary acquisition. In Sustained Silent Reading (SSR), a certain amount of time, usually five to fifteen minutes, is set aside for free voluntary reading, with no book reports or tests on the reading. When SSR supplements regular language arts instruction, it typically results in superior vocabulary development (Table I).[6]

More comprehensible input in the form of listening to stories is also associated with better vocabulary development. Wells (143) reported that children who heard more stories during their preschool years were judged by their teachers to have better vocabularies at age ten.[7]

Children who grow up in print-rich environments also have better vocabularies. Wells (142) found that children who owned more books at age five, before starting school, did significantly better on tests of vocabulary (as well as reading comprehension and math) two years later.[8]

*Spelling.* The relationship between reported leisure reading and spelling has not been investigated extensively. To my knowledge, only one study exists: Polak and Krashen found that college ESL students who reported more leisure reading did better on a spelling test.

Supplementary free reading in school should also result in better spelling. In Pfau's study, SSR was done in addition to the regular language arts program. Pfau found, however, no difference between experimental and comparison subjects after two years of SSR. While the readers were no worse off, the hypothesis that more comprehensible input results in more acquisition was not supported. As we shall see, such apparent counterevidence is rare.

*Alternative Hypotheses.* A strong version of SBH, one that claims that skill-building is the only route to competence, can account for these studies by hypothesizing that deliberate study of vocabulary and spelling (either in school or self-study) leads to better reading comprehension, which in turn leads to more free voluntary reading. While this explanation can apply to the studies showing a relationship between vocabulary and spelling proficiency and reported free voluntary reading, it is hard to see how it applies to Wells' two findings: a relationship between vocabulary knowledge and preschool listening to stories and preschool book ownership; it is unlikely that preschool children engaged in much vocabulary study. One could hypothesize that these preschool experiences inspired more study in school or more self-study later on (far-fetched, but possible). To account for the effects of in-school free voluntary reading on vocabulary development, skill-building needs to hypothesize that these programs inspired more study, or contained extra skill-building. While these scenarios are possible, they seem to me to be extremely unlikely. They are, however, unexplored possibilities.

A strong version of OH can account for the spelling–reported free voluntary reading relationship by positing that those who read more outside of school also wrote more, and received appropriate feedback on their efforts. To account for the vocabulary data, OH can posit that those who read more outside of school, who grew up in print-rich environments, who participated in supplementary free reading programs, and who heard more stories also wrote more, or used new words more in conversation and received appropriate feedback. These scenarios might be partly true; it would be no surprise to learn that more output did take place in these cases. It is doubtful, however, that enough output occurred, or that feedback was frequent enough or precise enough to account for the tremendous amount of vocabulary and spelling development that takes place (see "Complexity/Size of Language" below).[9]

## ACQUISITION WITHOUT LEARNING

A second prediction that IH makes is that acquisition can occur without learning. Research strongly suggests that this is so. Two kinds of evidence for acquisition without learning are presented here: 1) studies that show that competence can develop without instruction (defined here as a program based on skill-building); 2) "Read and Test" studies that show that acquisition occurs after a small amount of comprehensible input.

## COMPETENCE WITHOUT INSTRUCTION

Competence without instruction exists in other areas of linguistic competence. It has been shown that first and second language acquirers acquire rules of grammar that have never been taught (22). Many documented cases exist of adult immigrants acquiring second languages without instruction, some attaining high levels of competence (e.g., 29, 75). The success of language teaching methods that rely nearly completely on comprehensible input, such as Total Physical Response (4) and The Natural Approach (59, 78) suggest that acquisition without learning exists. Kramer and Palmer recently described a college German class that relied exclusively on comprehensible input, and reported that a significant amount of language acquisition took place. The success of "sheltered subject matter teaching," the finding that substantial amounts of language acquisition can take place when students learn subject matter through another language is an additional example of acquisition without learning (31, 60, 80).

Evidence exists for competence without instruction in first language literacy development as well. As noted earlier, those who report more pleasure reading outside of school write better (74), and students who participate in free reading programs in school do better on tests of writing, reading, and grammar (76, 77).

*Vocabulary.* Miller (92) informally observed vocabulary acquisition without instruction in junior high school students who completed a month's study on conservation of natural resources, which included a great deal of reading, including reading in a phase of conservation selected by the student. At the end of the unit, students wrote an editorial essay. Miller remarks:

> Only near completion of the unit, after hearing the specific discussions in the science and social science classes, after reading the effective editorials on conservation, did we realize some of the concomitant values of the plan (of study). For one thing, in the study of and writing on these subjects, our junior high school pupils were using a technical vocabulary away and above that ordinarily employed by pupils at this level. Our pupils talked and wrote easily of "demolition," "spillways," "replenishing," "fauna," "utilization," "agrarian," "reclamation," "depletion," and other such terms not common to junior high school vocabularies.
>
> The faculty was impressed. At no time in the study of the unit had we so much as mentioned vocabulary. We had been concerned with content. Yet now we were sure that in the extensive reading done on the subject, our pupils had incidentally accumulated an unusual store of conservation terms. . . .
>
> Our conclusion is this: extensive reading by pupils having definite information goals ahead is most conducive to vocabulary growth. We believe that this method of vocabulary enlargement, motivated by a special interest and immediate need, is probably less painful and more challenging than the direct methods of feeding required, selected lists of words. The latter method suggests drill, requirements, uniformity, memory work; while the former allows choice, individuality, selection, association, self-activity, experimentation, which procedures in the secondary school we find more effective in the main than compulsion (92: pp. 665–66).

Miller estimated, on the basis of a vocabulary test administered after the unit, that about a year's growth in vocabulary had taken place. There was, however, no pre-testing and no control group.

Many of those with large vocabularies do not claim to have developed them through vocabulary programs. Smith and Supanich (127) tested 456 company presidents and reported that they had significantly larger vocabulary scores than a comparison group of adults did. When asked if they had made an effort to increase their vocabulary since leaving school, only 54.5% of the sample said they had. Of those 54.5%, when asked what they did to increase their vocabulary, about half mentioned reading. About a third of this group mentioned use of only a dictionary; fourteen (six percent of those who tried to increase their vocabulary and three percent of the entire sample) mentioned vocabulary books.

It has also been shown that children know enormous numbers of words and acquire vocabulary at an incredible rate, and that vocabulary teaching programs cannot be a source of this knowledge. Miller (91) has estimated that children between the ages of six and eight pick up an average of fourteen basic words a day. Nagy, Herman, and Anderson (97; see also 96) have estimated that school-age children acquire several thousand words per year. Nagy argues that direct teaching of vocabulary cannot be the source of these gains, since even the most am-

TABLE I

Impact of Sustained Silent Reading on Vocabulary Acquisition (SSR as Supplement to Regular Program)

| Study | Grades | Duration | Results |
| --- | --- | --- | --- |
| Sperzel, 1948 | 5 | 6 weeks | Equivalent to comparisons |
| Pfau, D., 1967 | 1–2 | 2 years | SSR superior |
| Minton, 1980 | 9 | One semester | SSR superior |
| Schon et al., 1982[a] | 2 | One year | SSR superior |
| | 3,4 | One year | SSR superior |

[a]SSR done in students' primary language.

bitious vocabulary teaching programs typically do not cover more than a few hundred words per year.[10]

The fact that those who report more free reading outside of school have better vocabularies (see above, "More Comprehensible Input, More Language Acquisition") and the fact that those who participated in in-school free reading programs show significant vocabulary gains (see previous section and the next section), are also evidence for acquisition without learning.

*Spelling.* Abundant evidence exists that children can learn to spell without instruction. One interesting case history was provided by Goodman and Goodman, who reported that their daughter Kay, at six-and-a-half years of age, could independently read materials written at the fifth grade level, even though she had had no formal instruction in reading. Kay's spelling ability was impressive. On a spelling test based on words taken from a third-grade reader, Kay was able to spell fifty-eight percent of the words correctly; on a multiple-choice test, she recognized ninety-one percent of the correct spellings of the words. They concluded, quite correctly in my view, that "spelling can be learned naturally without instruction. At least one child has learned to spell without studying lists of words in isolation and without learning rules or generalizations" (49: p. 226).

Not only can preschoolers learn to spell without instruction, but older children can as well. Curtiss and Dolch provide one of the most interesting studies showing this. In a simple experiment, they administered a test of 500 spelling words taught in grades two through eight (fifty words at a time) to children in these grades, in order to see how well the children could spell words they had not yet studied, as well as how well they could spell words they had already studied. Table II gives their results.

What this table tells us is that children can spell words that they have not yet been taught; for example, fourth graders could spell 56.8% of the fifth grade words, and sixth graders could spell 71.2% of the seventh grade words. In addition, the children continued to improve on words on spelling lists taught in previous years. For example, the fifth graders scored 83.7% on the grade three list, compared to 79.6% for fourth graders and 71.8% for third graders. Unless all spelling words are regularly reviewed, this is additional evidence for the acquisition of spelling competence without instruction.

The last column in the table ("not taught") are words that none of the students had studied, since they were assigned in the last half of grade eight (testing took place in the middle of the year). Curtiss and Dolch found that each grade was able to spell some of these words, and eighth graders scored 82.3%.

Nine years before Curtiss and Dolch's study, Thompson had reached a similar conclusion: most words explicitly taught in grades two through eight "are correctly spelled by upwards of fifty percent of the pupils before they are given particular attention in the spelling period. Many words are spelled correctly by ninety percent or more of the pupils before special study" (135, p. 39). Twenty-seven years after Curtiss and Dolch's paper appeared, Hughes reported similar results: two-thirds of the fourth grade children he studied could "already spell correctly seventy-five per cent of the words suggested for study for the year" (65: p. 54). See also Guiles (55).

The results of several other studies suggest that spelling competence can develop without formal instruction. Tyler's report is similar to Miller's observation on vocabulary growth. Tyler reported that sixth grade students improved significantly in their ability to spell

TABLE II
Average Scores of Each Grade on Words Taught to Each of Grades II-VIII

| Grade Tested | Percentage of Correct Spellings of Words Taught in Grade | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | II | III | IV | V | VI | VII | VIII | Not Taught |
| II | 58.6 | 22.9 | 11.8 | 9.5 | 7.0 | 4.8 | 3.5 | 2.6 |
| III | 79.9 | 71.8 | 41.4 | 36.9 | 24.0 | 18.4 | 14.4 | 10.5 |
| IV | 86.1 | 79.6 | 77.4 | 56.8 | 43.8 | 32.3 | 28.3 | 23.1 |
| V | 86.8 | 83.7 | 75.5 | 75.8 | 58.4 | 47.9 | 37.8 | 39.9 |
| VI | 96.5 | 95.1 | 90.5 | 89.1 | 90.0 | 71.2 | 63.1 | 65.5 |
| VII | 94.6 | 93.6 | 85.6 | 84.5 | 83.9 | 80.2 | 64.2 | 67.1 |
| VIII | 98.1 | 97.4 | 93.2 | 91.9 | 90.6 | 87.1 | 85.2 | 82.3 |

From Curtiss & Dolch.

specialized words frequently used in social studies after a fifteen-week unit on history and geography "involving wide reading and a great variety of learning activities" (140: p. 110). Typical pretest scores were around eighty out of 260; after the unit, average scores rose to about 107 correct. Tyler interpreted his data as suggesting that "individual spelling vocabularies are acquired from pursuit of various activities relating to specialized fields" (p. 110).

Kyte studied students who were excellent spellers and who were excused from spelling instruction. He found that these excellent spellers, all of whom were good or excellent readers, continued to improve their spelling without instruction.

Cornman studied the effect of dropping all spelling instruction in two elementary schools for three years (spelling errors in compositions were still corrected by teachers, however). Cornman concluded that the effects of spelling instruction were "negligible," that uninstructed students continued to improve in spelling and did just as well as previous years' classes and just as well as students in other schools. Cornman's results were replicated by Richards, who studied seventy-eight children in grades six, seven, and eight who went without spelling instruction for one year. Richards reported that 67.5% of the children improved more than one year in spelling during this time, while 20.4% made no change, and only twelve percent got worse.

*Alternative Hypotheses.* To account for these results, a strong version of SBH must assume that self-study of vocabulary and spelling took place, that those who improved without instruction studied self-help vocabulary-building books, listened to vocabulary tapes, and diligently looked words up in the dictionary on their own. This is denied by most of the company presidents in Smith and Supanich, is simply impossible for the Goodmans' Kay (who developed spelling competence before starting school), and is unlikely in the other studies discussed here.

A strong version of OH must make the assumption that acquirers, in each case, had ample opportunities to try out new words in writing, and received feedback on their efforts, and/or tried out new vocabulary in conversation. Increased production opportunities may have occurred in cases of increased vocabulary and spelling competence accompanying subject matter instruction (91, 140) and with in-school

free reading programs. Conceivably, company presidents write and engage in conversation more, and good readers excused from spelling instruction (79) wrote more. But all this remains to be demonstrated. Also, it is not likely that exact feedback was provided in any of these situations.

Skill-builders and output advocates could also dismiss Miller's junior high school results by pointing out that no scientifically valid testing took place, and that her observations could simply have been due to the students' greater use of words they already knew.

It could be argued that students consciously learn rules and generalizations in class, either deductively or inductively, and that they apply these rules to untaught words. This could account for some of the results presented here (e.g., 23, 24, 79). Rule-learning could account for some improvement, but not much, due to the complexity of the rules (see "Complexity/ Size of Language").

Similarly, one could argue that students subconsciously acquire rules for word-formation and spelling from lists and exercises and apply these acquired rules to untaught words. While possible, it is doubtful that much acquisition occurs under these conditions, due to the impoverished nature of the input.

## INCIDENTAL READ AND TEST STUDIES

A number of studies using a similar paradigm confirm that both vocabulary and spelling can be acquired by reading for meaning. In each case, subjects are asked to read something, usually a short passage, but occasionally something longer (in one study, an entire novel was used). The text to be read contains words subjects are unfamiliar with or words they cannot spell. After reading the passage, subjects are tested on these words. In the studies I report here, subjects were not focused on vocabulary or spelling, that is, they were unaware that spelling or vocabulary would be tested. Rather, they were focused on the meaning of the passage.

*Incidental Read and Test: Vocabulary.* The most careful Read and Test studies probing vocabulary acquisition were done by Nagy, Herman, and Anderson (98), using elementary school students as subjects and passages from school textbooks as texts. Nagy's team concluded from its data that when an unfamiliar word was seen in print, "a small but statistically reliable increase in word knowledge" typically occurred

(96: p. 26). They found that the chance of a subject's acquiring a word from one exposure was between five to twenty percent, depending on the testing method used. This percentage may not seem high, but when we consider the amount of reading children do, even this small effect results in considerable vocabulary acquisition. Nagy (97) calculated that if children read about a million words per year, given only a five percent chance of acquiring a word from context with each exposure will result in vocabulary growth of about 1,000 words per year, "well enough to pass fairly discriminating multiple-choice tests" (97: p. 262).[11]

This research suggests that words are not learned all at once when they are seen in context; rather, word knowledge grows in "small increments." At any given time, there are words we know well, words we do not know, and words in-between. To increase our vocabulary we need to follow Twadell's advice and learn to tolerate some vagueness, vagueness that is reduced bit by bit as we read more and encounter unfamiliar words more. At any given moment, Twadell notes, "we may 'know' a very large number of words with various degrees of vagueness — words which are in a twilight zone between the darkness of entire unfamiliarity and the brightness of complete familiarity" (139: p. 73).

*The* Clockwork Orange *Study.* Saragi, Nation, and Meister asked adults to read Burgess' novel *A Clockwork Orange.* As readers who have read this novel know, it contains a number of words from a Russian-based slang called *nadsat.* It can be assumed that few readers know these words before reading the book. There are 241 *nadsat* words in *A Clockwork Orange,* and they are repeated an average of fifteen times each. The version of *A Clockwork Orange* sold in bookstores has a dictionary in the back, so readers can look up the meanings of the *nadsat* words. In Saragi, Nation, and Meister's study, subjects were simply asked to read the book, and were told that after they finished it they would be given a test of comprehension and literary criticism. They were not told to try to learn or remember the *nadsat* words. What is crucial is that they were given copies of the book without the dictionary. The subjects read the book on their own time, and reported finishing the book in three days or less. Within a few days of their finishing the book, subjects were given a multiple choice test covering ninety *nadsat* words.

Results showed that considerable vocabulary acquisition had taken place. Scores ranged from fifty to ninety-six percent correct, with an average of seventy-six percent. Subjects had picked up at least forty-five words simply by reading a novel! Saragi also observed some relationship between frequency of occurrence and acquisition, noting that words that appeared less than ten times were typically not consistently acquired, a conclusion that matches Nagy, Herman, and Anderson's results closely.

*Second Language Studies.* A series of recently completed projects done at the University of Southern California has confirmed that second language acquirers can also increase their vocabulary by reading. In Dana Ferris' study, university level students of English as a second language (international students) read George Orwell's novel *Animal Farm.* They were given a multiple-choice test of seventy-five words, including fifty words used in *Animal Farm,* before and after reading the book, words that students at their level typically do not know. The students made significantly better gains on the test than control students who did not read the book (Table III).

TABLE III
Vocabulary Gains After Reading *Animal Farm*

| Group | Pretest Score | Posttest Score | Gain |
|---|---|---|---|
| Experimental (read *Animal Farm*) n = 30 | 16.13 | 27.63 | 11.50 |
| Control (did not read *Animal Farm*) n = 21 | 12.10 | 16.14 | 4.14 |

From Ferris.

Emiko Kiyochi asked nine advanced acquirers of Japanese as a second language to read a science fiction story in Japanese containing twelve invented words representing concepts assumed to be familiar to the readers. (Subjects were told they were participating in market research and were evaluating the text for its entertainment value and comprehensibility.) After reading the story, the subjects were given a multiple-choice test on the meanings of the invented words; the average number acquired was about seven, significantly better than chance.

Pitts, White, and Krashen performed a successful partial replication of Saragi's *A Clockwork Orange* experiment with adult students of English as a second language. The students read only the first two chapters of the novel, and, like Saragi's subjects, were deliberately not told to try to learn the *nadsat* words, but were asked simply to read the chapters for meaning. After reading the chapters, students averaged about two words right on a multiple-choice test of thirty *nadsat* words, after correcting for guessing, nearly a seven percent gain.

These three studies confirm that second language acquirers can acquire vocabulary by reading, and that they can do so with "authentic" texts (*A Clockwork Orange, Animal Farm*) and with different second languages (English, Japanese).

*Reading Aloud.* Using a variation of the Read and Test procedure, Eller, Pappas, and Brown demonstrated that kindergarteners acquire word meanings from stories read to them; children were read two stories containing words judged to be unknown to the children. Each story was read three times, usually on consecutive days. After each reading, the pupils were asked to "read it in their own way" (35: p. 9). Analysis of the children's readings showed that with each reading, there was evidence of increased and more accurate use of the target words, providing evidence of acquisition without instruction. Elley has reported similar results for seventh and eighth graders using multiple-choice tests.

*Incidental Read and Test: Spelling.* Read and Test studies in spelling come to very similar conclusions. In a series of reports, Gilbert demonstrated that high school (45, 46) and university students (47) can improve their spelling by reading. Gilbert presented his subjects with a spelling pretest, a reading passage containing some of the words on the pretest, and a posttest. Subjects did much better on the posttest on those words that appeared in the reading passage.

In Gilbert's studies, the pretest was usually given immediately before the reading. Nevertheless, Gilbert argued that his subjects were focused on the meaning of the passages and not spelling, since they were told they would be tested on the content of the passage. In two of Gilbert's studies, one experimental group took the pretest well before doing the reading — three weeks for one of three groups in Gilbert (47), four weeks in Gilbert (45). Gains were smaller, but were still evident — about 14.5% in one (47) and four percent in the other (45).

In Nisbet's study, children ages eleven to fourteen read passages containing words they could not spell correctly on a pretest. (The reading took place "a few days" after the pretest.) After reading the passage, they could spell an average of about one of these words out of twenty-five. Nisbet found this figure unimpressive and concluded that "intensive reading and study of a passage . . . does lead to some learning of spelling, but this gain is not sufficient . . . to justify the neglect of specific spelling instruction" (99: p. 11). As we just saw, however, Nagy, Herman, and Anderson found that vocabulary acquisition from reading occurred with similar efficiency. Thus, one out of twenty-five may be enough, if readers do enough reading.

In Ormrod (101) college students who read for meaning learned to spell an average of 2.8 "pseudo-words" out of a possible eight (an example of a pseudo-word is *Aerodern,* used as a person's name in the passage; each pseudo-word appeared six times). Like Nisbet, Ormrod was not pleased with these results and concluded that "college students clearly have trouble learning to spell the words they see within the context of a reading passage . . ." (pp. 653–54). I think that her data show just the opposite: after a brief exposure, subjects made progress in learning to spell unfamiliar words, even when not asked to do so.

Neither SBH nor OH, in their strong forms, has any way to deal with incidental Read and Test studies. In these studies, there was no chance to do any deliberate study nor any kind of output. OH supporters could argue that the kindergarten children in Eller (35) searched out meanings for the words used in the stories they heard between readings (e.g., asked their parents), and tried out these words at home and got feedback. (The children apparently got no feedback on their uses of the words in their retellings.) One might also insist that Ferris' subjects looked up unknown words in *Animal Farm* on their own, and that subjects in Saragi (114) somehow found copies of *A Clockwork Orange* with dictionaries of *nadsat* words. These explanations seem to me to be implausible, but are possible.

*Intentional Read and Test Studies.* In "intentional" Read and Test studies, subjects are deliberately focused on new vocabulary and spelling words (5, 32, 67, 70, 101) and in some cases do additional skill-building exercises using the target words (32, 70). Intentional Read and Test subjects do consistently better in vocabulary and spelling than incidental subjects; this shows that focusing on form will result in addi-

(96: p. 26). They found that the chance of a subject's acquiring a word from one exposure was between five to twenty percent, depending on the testing method used. This percentage may not seem high, but when we consider the amount of reading children do, even this small effect results in considerable vocabulary acquisition. Nagy (97) calculated that if children read about a million words per year, given only a five percent chance of acquiring a word from context with each exposure will result in vocabulary growth of about 1,000 words per year, "well enough to pass fairly discriminating multiple-choice tests" (97: p. 262).[11]

This research suggests that words are not learned all at once when they are seen in context; rather, word knowledge grows in "small increments." At any given time, there are words we know well, words we do not know, and words in-between. To increase our vocabulary we need to follow Twadell's advice and learn to tolerate some vagueness, vagueness that is reduced bit by bit as we read more and encounter unfamiliar words more. At any given moment, Twadell notes, "we may 'know' a very large number of words with various degrees of vagueness—words which are in a twilight zone between the darkness of entire unfamiliarity and the brightness of complete familiarity" (139: p. 73).

*The* Clockwork Orange *Study.* Saragi, Nation, and Meister asked adults to read Burgess' novel *A Clockwork Orange.* As readers who have read this novel know, it contains a number of words from a Russian-based slang called *nadsat.* It can be assumed that few readers know these words before reading the book. There are 241 *nadsat* words in *A Clockwork Orange,* and they are repeated an average of fifteen times each. The version of *A Clockwork Orange* sold in bookstores has a dictionary in the back, so readers can look up the meanings of the *nadsat* words. In Saragi, Nation, and Meister's study, subjects were simply asked to read the book, and were told that after they finished it they would be given a test of comprehension and literary criticism. They were not told to try to learn or remember the *nadsat* words. What is crucial is that they were given copies of the book without the dictionary. The subjects read the book on their own time, and reported finishing the book in three days or less. Within a few days of their finishing the book, subjects were given a multiple choice test covering ninety *nadsat* words.

Results showed that considerable vocabulary acquisition had taken place. Scores ranged from fifty to ninety-six percent correct, with an average of seventy-six percent. Subjects had picked up at least forty-five words simply by reading a novel! Saragi also observed some relationship between frequency of occurrence and acquisition, noting that words that appeared less than ten times were typically not consistently acquired, a conclusion that matches Nagy, Herman, and Anderson's results closely.

*Second Language Studies.* A series of recently completed projects done at the University of Southern California has confirmed that second language acquirers can also increase their vocabulary by reading. In Dana Ferris' study, university level students of English as a second language (international students) read George Orwell's novel *Animal Farm.* They were given a multiple-choice test of seventy-five words, including fifty words used in *Animal Farm,* before and after reading the book, words that students at their level typically do not know. The students made significantly better gains on the test than control students who did not read the book (Table III).

TABLE III

Vocabulary Gains After Reading *Animal Farm*

| Group | Pretest Score | Posttest Score | Gain |
|---|---|---|---|
| Experimental (read *Animal Farm*) n = 30 | 16.13 | 27.63 | 11.50 |
| Control (did not read *Animal Farm*) n = 21 | 12.10 | 16.14 | 4.14 |

From Ferris.

Emiko Kiyochi asked nine advanced acquirers of Japanese as a second language to read a science fiction story in Japanese containing twelve invented words representing concepts assumed to be familiar to the readers. (Subjects were told they were participating in market research and were evaluating the text for its entertainment value and comprehensibility.) After reading the story, the subjects were given a multiple-choice test on the meanings of the invented words; the average number acquired was about seven, significantly better than chance.

Pitts, White, and Krashen performed a successful partial replication of Saragi's *A Clockwork Orange* experiment with adult students of English as a second language. The students

read only the first two chapters of the novel, and, like Saragi's subjects, were deliberately not told to try to learn the *nadsat* words, but were asked simply to read the chapters for meaning. After reading the chapters, students averaged about two words right on a multiple-choice test of thirty *nadsat* words, after correcting for guessing, nearly a seven percent gain.

These three studies confirm that second language acquirers can acquire vocabulary by reading, and that they can do so with "authentic" texts (*A Clockwork Orange, Animal Farm*) and with different second languages (English, Japanese).

*Reading Aloud.* Using a variation of the Read and Test procedure, Eller, Pappas, and Brown demonstrated that kindergarteners acquire word meanings from stories read to them; children were read two stories containing words judged to be unknown to the children. Each story was read three times, usually on consecutive days. After each reading, the pupils were asked to "read it in their own way" (35: p. 9). Analysis of the children's readings showed that with each reading, there was evidence of increased and more accurate use of the target words, providing evidence of acquisition without instruction. Elley has reported similar results for seventh and eighth graders using multiple-choice tests.

*Incidental Read and Test: Spelling.* Read and Test studies in spelling come to very similar conclusions. In a series of reports, Gilbert demonstrated that high school (45, 46) and university students (47) can improve their spelling by reading. Gilbert presented his subjects with a spelling pretest, a reading passage containing some of the words on the pretest, and a posttest. Subjects did much better on the posttest on those words that appeared in the reading passage.

In Gilbert's studies, the pretest was usually given immediately before the reading. Nevertheless, Gilbert argued that his subjects were focused on the meaning of the passages and not spelling, since they were told they would be tested on the content of the passage. In two of Gilbert's studies, one experimental group took the pretest well before doing the reading—three weeks for one of three groups in Gilbert (47), four weeks in Gilbert (45). Gains were smaller, but were still evident—about 14.5% in one (47) and four percent in the other (45).

In Nisbet's study, children ages eleven to fourteen read passages containing words they could not spell correctly on a pretest. (The

reading took place "a few days" after the pretest.) After reading the passage, they could spell an average of about one of these words out of twenty-five. Nisbet found this figure unimpressive and concluded that "intensive reading and study of a passage . . . does lead to some learning of spelling, but this gain is not sufficient . . . to justify the neglect of specific spelling instruction" (99: p. 11). As we just saw, however, Nagy, Herman, and Anderson found that vocabulary acquisition from reading occurred with similar efficiency. Thus, one out of twenty-five may be enough, if readers do enough reading.

In Ormrod (101) college students who read for meaning learned to spell an average of 2.8 "pseudo-words" out of a possible eight (an example of a pseudo-word is *Aerodern,* used as a person's name in the passage; each pseudoword appeared six times). Like Nisbet, Ormrod was not pleased with these results and concluded that "college students clearly have trouble learning to spell the words they see within the context of a reading passage . . ." (pp. 653–54). I think that her data show just the opposite: after a brief exposure, subjects made progress in learning to spell unfamiliar words, even when not asked to do so.

Neither SBH nor OH, in their strong forms, has any way to deal with incidental Read and Test studies. In these studies, there was no chance to do any deliberate study nor any kind of output. OH supporters could argue that the kindergarten children in Eller (35) searched out meanings for the words used in the stories they heard between readings (e.g., asked their parents), and tried out these words at home and got feedback. (The children apparently got no feedback on their uses of the words in their retellings.) One might also insist that Ferris' subjects looked up unknown words in *Animal Farm* on their own, and that subjects in Saragi (114) somehow found copies of *A Clockwork Orange* with dictionaries of *nadsat* words. These explanations seem to me to be implausible, but are possible.

*Intentional Read and Test Studies.* In "intentional" Read and Test studies, subjects are deliberately focused on new vocabulary and spelling words (5, 32, 67, 70, 101) and in some cases do additional skill-building exercises using the target words (32, 70). Intentional Read and Test subjects do consistently better in vocabulary and spelling than incidental subjects; this shows that focusing on form will result in addi-

tional development, and supports the view that some language development can take place outside of the Language Acquisition Device (LAD).

We cannot, however, from intentional Read and Test studies alone, ascertain just how strong the effect of learning is, since we are not informed how much extra time and effort went into skill-building and focusing on form. We do not know, in other words, whether the extra time would have been better spent reading. (For an attempt to compare time efficiency of reading and direct vocabulary instruction across studies, see the next section.) The results of incidental studies suggest that comprehensible input alone can do the entire job for vocabulary and nearly the entire job for spelling (see Appendix I). This is, I think, good news for readers. Many people, I am sure, would not read at all if they were compelled to work on their spelling and vocabulary while trying to enjoy a good book.[12]

### THE EFFECTS OF INSTRUCTION

IH insists that the only way of stimulating the operation of the language acquisition device is comprehensible input. Other means of attempting to internalize language, such as skill-building, rely on other mental faculties outside the language acquisition device. These attempts may result in language-like behavior, but not real language. If this is so, we would expect that competence produced outside the LAD makes little contribution to language performance.

This view leads to the prediction that the effect of traditional, conscious, learning-based instruction will be small, compared to the effect of comprehensible input (reading).

Comprehensible input has done very well in method comparisons in the past: beginning second language students in comprehensible input-based methods consistently outperform students in "traditional," usually skill-building-based methods (studies reviewed in Krashen, 73; see also 37 and 59). At the intermediate level, "sheltered" subject matter teaching has been shown to be very effective (31, 60, 80).

Previously published research allows several ways of evaluating the effect of instruction on vocabulary and spelling development: 1) comparing the progress of students in in-school free reading programs with the progress of comparison groups participating in traditional programs; 2) comparing the time efficiency of free reading and formal instruction (possible only

for vocabulary); 3) comparing the effects of formal instruction to normal growth without instruction (spelling only); 4) determining whether more formal instruction results in more acquisition (spelling only).

### VOCABULARY

*In-School Free Reading Compared to Traditional Instruction.* Previously, I discussed in-school free reading programs that supplement regular language arts programs. Some in-school free reading programs replace some or all of regular language arts instruction, and can thus be considered competing methods.

Table IV covers Sustained Silent Reading programs that replace part of regular language arts instruction. Table V covers Self-Selected Reading. As in Sustained Silent Reading, children in Self-Selected Reading choose their own reading material. They also have regular, brief conferences with teachers to discuss their reading and deal with problems.

In Table Va, Self-Selected readers are compared to students who follow the regular program. The design in Table Vb is weaker because no control group is used; instead, students' progress is compared with expected growth.

Tables IV and V show that when free voluntary reading, in the form of either Sustained Silent Reading or Self-Selected Reading, substitutes for all or part of the regular language arts program, free readers do at least as well, and often better, than students in the regular program on vocabulary tests, suggesting that free reading is at least as effective as traditional instruction. As noted earlier, free reading programs look even better when they are allowed to run for seven months or longer (see Table VI; the difference between long- and short-term programs is not, however, statistically significant).

The results of two studies suggest that vocabulary development is better served when at least some language arts time is devoted to reading aloud. Cohen (19) reported that second graders who were read to every day in school made better gains in vocabulary than second graders who were not read to regularly. Feitelson, Kita, and Goldstein found that first graders who were read to daily outscored comparison students on every language test given to them, including vocabulary diversity on a story-telling task.[13]

*Time Efficiency.* Nagy's calculations (97) allow

### TABLE IV
Impact of Sustained Silent Reading on Vocabulary Growth (SSR Replaces Part of Regular Program)

| Study | Grades | Duration | Results |
|---|---|---|---|
| Oliver, 1976 | 4–6 | 3 months | Equivalent to comparisons |
| Collins, 1980 | 2–6 | 15 weeks | Equivalent to comparisons |
| Lawson, 1968 | 6 | 3 months | SSR superior |
| Wolf & Mikulecky, 1978 | 7 | 9 weeks | Equivalent to comparisons |
| Schon et al., 1984 (Chandler) | High school | 7 months | Equivalent to comparisons |
| Schon et al., 1985 | 7 | 8.5 months | Equivalent to comparisons |
| | 8 | 8.5 months | Equivalent to comparisons |

### TABLE Va
Self-Selected Reading and Vocabulary Growth Compared to Regular (Basal) Programs

| Study | Grades | Duration | Results |
|---|---|---|---|
| Jenkins, 1957 | 2 | One year | Self-sel superior |
| Cyrog, 1962 | 3–6 | 2–5 years | Self-sel superior |
| Lawson, 1968 | 6 | 3 months | Regular superior |
| Greaney, 1970 | 6 | 8.5 months | Self-sel superior |
| Davis & Lucas, 1971 | 7, 8 | 10 months | Equivalent to comparisons |
| Meyer & Cohen, 1975[a] | 5 | 3.5 months | Self-sel slightly better (p < .10, 1-tail) |

[a]Control group = "heavy vocabulary training"; experimental group = "wide, free choice reading" and reading comprehension instruction, but no vocabulary instruction.

### TABLE Vb
Self-Selected Reading and Vocabulary Growth (Without Control Group)

| Study | Grades | Duration | Results |
|---|---|---|---|
| Carson, 1957 | 2 | One year | Positive |
| Largent, 1959 | 3 | 7 months | Positive |
| Dickinson, 1959 | 4 | One year | Positive |
| Arkley, 1961 | 3 | 8 months | Positive |
| | 3 | One year | Positive |
| Roettger, 1964 | 4–5 | 13 weeks | Positive |
| Kingsley, 1958 | 6 | One year | Negative |

Positive = students exceeded published norms.

### TABLE VI
Duration of Treatment and Effectiveness of In-School Free Reading Programs

| Duration | Results (Tests of Vocabulary) | | |
|---|---|---|---|
| | Positive | No Difference | Negative |
| Less than 7 months | 2 | 4 | 1 |
| 7 months or longer | 7 | 4 | 1 |

Sustained Silent Reading and Self-Selected Reading combined; Meyer and Cohen categorized as "no difference" (see Table Va).

us to compare the effect of free voluntary reading and vocabulary instructional programs in another way. Nagy estimated that in their Read and Test study, children gained about .25 words per minute. In Appendix II below, I present estimates of efficiency for a number of vocabulary instruction methods. Most of the

methods included utilize some form of skill-building. Inspection of this data reveals that some methods, including several using children as subjects, appear to be more efficient than Nagy's .25 words per minute for reading, while others appear to be less efficient.

Those methods that are more efficient are not, in my view, preferable to reading. First, they do not provide a "deep" knowledge of words, with their full semantic and syntactic properties (see discussion of vocabulary complexity in the next section). Typically, they only ask students to learn synonyms or short definitions. In contrast, methods that take more time aim to give students a more thorough knowledge of words. Beck (7) presented evidence showing that for vocabulary knowledge to have an impact on reading comprehension, such deeper knowledge is necessary. Nagy (97,

98) noted, however, that methods that provide this thorough knowledge (e.g., the "rich instruction" studies in Appendix II: 6, 89) are not nearly as time efficient as reading is. As Nagy (94) points out, reading also results in a deep knowledge of words; words in natural texts are encountered in a variety of contexts, which help readers acquire their full semantic and syntactic properties.

In addition, many vocabulary teaching methods are at best boring, and are at worst painful. Even those that seem to be fairly interesting are nowhere near as interesting as reading a good book. As Sternberg points out, how many people will continue to use methods such as the keyword method on their own?

It thus appears to be the case that vocabulary teaching methods that attempt to do what reading does—give the student a complete knowledge of the word—are not efficient, and those that are efficient result in superficial knowledge. In addition, neither kind is as pleasant as reading.

Another problem, also pointed out by Sternberg, is that many vocabulary teaching methods "require one to know in advance the meaning of the unknown word(s) one wishes to learn . . . but during the course of most vocabulary learning, one does not have definitions readily available . . ." (131: p. 95).

## SPELLING

*In-School Free Reading Compared to Traditional Instruction.* To my knowledge, Greaney's study of Self-Selected Reading (51, 53) is the only one that measured spelling growth; and, in this study no difference was found between those who took part in Self-Selected Reading and comparison subjects in spelling. Since Self-Selected Reading replaced the regular program,

this means that it was just as effective as traditional instruction in improving spelling. (Another in-school free reading study done by Pfau was discussed earlier; see "More Comprehensible Input, More Language Acquisition.")

*Instruction Compared to Normal Growth without Instruction.* Some studies show that instruction in spelling produces no advantage over incidental acquisition from the informal environment. Of those that show that instruction produces gains over no instruction, in one case gains are modest, in another they "wash out," and in a third extraordinary efforts appear to have been made. Results of a fourth study suggest that while instruction can produce some extra gain, incidental growth is impressive.

*No Effect.* As noted earlier ("Acquisition without Learning"), the results of some studies suggest that instruction produces no gain over incidental acquisition of spelling; students who receive no spelling instruction continue to improve in spelling just as much as instructed students do (23, 112).

*Positive Effect.* Guiles tested children in grades five through seven on words they had studied and on words of equal difficulty they had not studied. The children did only slightly better (4%) on the "studied" word lists. Guiles concluded that formal spelling instruction makes only a limited contribution to spelling ability.

Hammill, Larsen, and McNutt produced some evidence for the effectiveness of instruction in their study, which was intended to compare the effectiveness of commercial spelling programs. As indicated in Table VII, the goal of the study was to see which of three commercial series was best, *Word Book, Basic Goals,* or *Spell Correctly.*

Children were tested at grades three and four, five and six, and seven and eight on a spelling test that included words appearing in

TABLE VII

Mean Scores on the "Test of Written Spelling" at Different Grade Levels

| Grades: | 3 & 4 | | 5 & 6 | | 7 & 8 | |
|---|---|---|---|---|---|---|
| Spelling Approach | n | Mean Score | n | Mean Score | n | Mean Score |
| Word book | 145 | 28.0 | 232 | 42.5 | 116 | 51.9 |
| Basic goals | 137 | 30.0 | 234 | 37.7 | 49 | 48.1 |
| Spell correctly | 428 | 25.4 | 242 | 40.8 | 100 | 51.7 |
| Others | 287 | 29.6 | 415 | 41.4 | 174 | 47.9 |
| None | 52 | 16.4 | 48 | 42.8 | 297 | 48.1 |

n = number of children tested.
From Hammill, Larsen, and McNutt.
Perfect score = 60.

the most widely used series in grades three and four. Table VII shows only small differences among the three series (the first three rows); other commercial series (row four) produced similar results.

Of more interest to us, Hammill (58) also tested the spelling of a group of children who had had no spelling instruction at all. These uninstructed children were behind at grades three and four, which seems to indicate that spelling instruction in the other groups was effective. By grade five, however, there was no difference among the groups; the uninstructed children had caught up.

What has happened here, I suggest, is that the spelling test used covered many words that children eventually learn to spell from reading. Spelling instruction, for these words, was a wasted effort; it only succeeded in helping children learn to spell words that they would have learned to spell anyway on their own! The tragedy is that time devoted to spelling could have been used for activities we know are good for language development, activities that are more pleasant for both children and teachers.

Thompson studied the effect of spelling instruction on 1,528 students in grades two through eight, and concluded that formal instruction resulted in a "permanent improvement equivalent to one-half year's gain in excess of that to be expected as a function of general maturity and incidental learning" (135: p. 71). This effect is large. The reason may be the fact that the children Thompson studied spent considerable time on spelling instruction: in the schools Thompson studied, spelling was covered every day, with a pretest on Mondays that was followed by student correction and listing of misspelled words, intensive individual study on Tuesdays, a second test on Wednesday, more intensive study on Thursday, and still another test on Friday. Since twenty new words were covered each week, it is likely that Thompson's students devoted quite a bit of time to spelling.

*Curtiss and Dolch Revisited.* One could argue that the Curtiss and Dolch data (presented in Table II), support the effectiveness of instruction. While their data clearly show that spelling development can occur without instruction, the best progress appears to be in the year the target words were taught (in italics in Table VIII). Note, however, that overall, most of the progress for any list occurs outside of instruction, in years in which the list is not taught.

TABLE VIII

Yearly Gains on Spelling Lists (from Table II)

| | Spelling List | | | | | |
|---|---|---|---|---|---|---|
| Grade Tested | 3 | 4 | 5 | 6 | 7 | 8 |
| 3 | *48.9* | 29.6 | 27.4 | 17.0 | 13.6 | 10.9 |
| 4 | 7.8 | *36.0* | 19.9 | 19.8 | 13.9 | 13.9 |
| 5 | 4.1 | -1.9 | *19.0* | 14.6 | 15.6 | 9.5 |
| 6 | 11.4 | 15.0 | 13.3 | *31.6* | 23.9 | 25.3 |
| 7 | -1.5 | -4.9 | -4.6 | -6.1 | *9.0* | 1.1 |
| 8 | 3.8 | 7.6 | 7.4 | 6.7 | 6.9 | *2.1* |

Original data from Curtiss & Dolch.

Also, the gains during the year of instruction are not simply due to instruction; they include the effect of incidental acquisition as well. Finally, students' steady progress on word lists during "off years" and their progress in words that were never instructed (Table II) strongly suggest that incidental acquisition will eventually take care of nearly all of their spelling needs. Just as Hammill, Larsen, and McNutt's data indicate, instruction may simply teach the spelling of words that children will soon acquire on their own anyway.

*Does More Instruction Result in More Acquisition?* While, in Thompson's study, considerable instruction apparently resulted in significant growth in spelling, according to other studies more instruction does not consistently lead to better spelling.

Rice (110) administered a variety of spelling tests in different school districts "in various sections of the United States" (110: p. 460). He tested well over 10,000 students, and concluded that there was no relationship between time devoted to spelling and spelling proficiency. Rice interpreted his results as showing "the futility of the spelling grind" and recommended that no more than fifteen minutes per day be devoted to spelling instruction. Cornman claimed similar results after surveying thirteen elementary schools in the Philadelphia area.

In Hillerich, fifth and sixth graders participated in a program in which time devoted to spelling was reduced. Their compositions, however, contained fewer spelling errors than compositions written by fifth and sixth graders in a traditional program. The experimental program also emphasized "many experiences in writing and focus on the clarity and interest of that writing, as opposed to its mechanical correctness" (63: p. 839). This raises the possibility that it was writing, not reading, that led to spelling improvement.

Clarke compared first grade children who were allowed to use invented spelling with children whose teachers emphasized correct spelling in their writing. Both groups had traditional (basal) reading instruction, including phonics. The invented spellers scored significantly higher on two out of three spelling tests at the end of the school year (they also did better on the third test, but the difference was not significant). Traditional spellers spelled more words correctly in their writing, but had access to dictionaries and word lists, and were encouraged to consult the teacher for help. The invented spelling group, as expected, wrote much more (on the final writing assignment it averaged 40.9 words, compared to 13.2 for the traditional group), which means that these results, like those of Hillerich, are consistent with both OH and IH.[14]

*Conclusions and Alternative Hypotheses.* IH handles the results of the studies reviewed in this section quite well.

• In-school free reading programs typically result in equivalent, and often better vocabulary development, when compared to traditional programs (Tables IV, V, VI), and in the only study comparing free reading and traditional instruction in spelling (51, 53), no difference was found. Reading alone is thus at least as effective as formal instruction for spelling and vocabulary development.

• Picking up vocabulary from reading is more time-efficient than methods that aim to give students a thorough knowledge of words. Methods that are more time-efficient than reading do not appear to provide as deep a knowledge of words as reading does.

• Some studies show spelling instruction to be no more effective than incidental acquisition alone (23, 112), while others show that instruction produces measurable gains (24, 55, 58, 135). In one (55), gains were modest; in another (135), they required extraordinary effort. In Hammill (58), children without instruction caught up with instructed children by grade five.

• The results of several studies suggest that more instruction in spelling does not result in more proficiency. In some cases, in fact, more instruction appears to result in less spelling proficiency (18, 63).

SBH must work very hard to explain these results. In the case of in-school free reading, it could be hypothesized that free reading in-

spired more word study. It could also be argued that reading aloud had a similar effect. Skill-builders could also argue that the instructional programs utilized were incorrectly planned or executed, or that the children didn't apply themselves. A few more repetitions, a little more drill, might have made the difference.

OH does better. It needs only to hypothesize that in-school free reading and reading aloud were accompanied by more writing and/or oral language use, which certainly happens in "whole language" programs, or that children in these programs were stimulated to do more writing and speaking, and that they received accurate feedback on their attempts to use new words.

To account for the finding that traditional programs have little or no effect, OH needs only posit that these programs included little opportunity for language production and feedback. OH even finds some support here, since two programs found to be better for developing spelling ability provided more writing (18, 63).

## COMPLEXITY/SIZE OF LANGUAGE

Native speakers and advanced second language performers of a language have mastered large and complex systems of vocabulary and spelling. This fact alone is devastating for strong versions of both SBH and OH, since inspection of these systems shows they are too complex to learn consciously—so complex, in fact, that professional linguists have not yet succeeded in describing them. This fact is not predicted by IH, but IH has no trouble dealing with it. The complexity argument has also been used for grammar (73), for phonics (123), and for the acquisition of "planned discourse," or expository prose style (74).

*Vocabulary Size.* Using the technique of testing subjects on samples of words chosen randomly from a dictionary, Seashore and Eckerson estimated that the average college undergraduate knows about 156,000 words (58,000 "basic" words, 96,000 "derived" words, and 2,000 "rare" words; an example of a basic word is "legal"; "legally" is a derived word). As Smith (123) has noted, this knowledge could not have come from 156,000 trips to the dictionary, 156,000 flash cards, or 156,000 fill-in-the-blank exercises.

Not everyone has agreed with this estimate. Lorge and Chall criticized Seashore and Ecker-

son's methodology, and concluded that Seashore and Eckerson's estimate "based on their test may be reduced by at least one-half to three-fourths" (87: p. 153). Taking Lorge and Chall's conservative figure, reducing 156,000 by three-fourths, leaves about 39,000 words, still far too many to do by direct teaching.[15]

What about *second* language performers? While this research remains to be done, it seems obvious that many second language acquirers have huge vocabularies, and it is quite doubtful that they developed them exclusively from exercises and dictionary work.

*Vocabulary Complexity.* Not only are there many words to acquire, there are also subtle and complex properties of words that competent language users have acquired. As noted above ("The Effects of Instruction"), the meaning of a word is nowhere near adequately represented by a synonym. Indeed, it is often very hard to come up with a precise definition of a common word—that is, it is hard to describe the knowledge that advanced language users have acquired.

Finegan and Besnier provide some good examples of the subtleties of word meaning that we acquire. They note:

> . . . we often find that words that appear to be synonymous at first glance are used to refer to slightly different sets of concepts or occur in different situations of use. The adjectives *fast, quick,* and *rapid* may be used interchangeably in reference to someone's running speed, for example. But only *fast* can be used to describe someone's talking speed (as in a fast talker—which is different from a "quick talker") or in the expression *life in the fast lane; quick* is the most appropriate term to describe a mind or a glance; and *rapid* is more usual than the other two terms if reference is made to a person's strides . . . (41: p. 184).

Words that refer to the same thing often have different social and affective meanings. Finegan and Besnier point out that:

> . . . even though *movie, film, flick,* and *motion picture* all have the same referential meaning, the terms differ in social and affective meaning. *Film* strikes (North Americans) as a British word or a word that applies more to movie classics or art movies. *Flick* is recognized as a term that can be used only in the most informal contexts. The term *motion picture* is quaintly outdated; if someone were to use it in a conversation, it would be for its connotation as a term from the thirties or forties. Thus we can consider the terms synonymous if we specify that we are taking only referential meaning into consideration. At

the social and affective levels, the terms are not synonymous (41: p. 184).

When we acquire a word, we also acquire considerable knowledge about its grammatical properties. With verbs, for example, this includes knowing whether they are transitive or intransitive, what kinds of complements they can be used with, etc. Very little of this is deliberately taught.

*Spelling.* The complexity of the English spelling system is well known. This fact was noted by Townsend, who commented that "English orthography seems to demand the mental prowess required of a student in astronomy" (138: p. 470). The difficulties in English spelling have been documented repeatedly. Horn, for example, after analyzing a corpus of 10,000 words, pointed out that single sounds often are represented many different ways in spelling. The sound /sh/, for example, was spelled seventeen different ways, including "ti" (attention), "sh" (she), "ci" (ancient), and "ssi" (admission). /k/ was spelled 11 ways, including "c" (call), "k" (keep), "x" (expect, luxury), "ck" (black), and "qu" (quite, bouquet).

Researchers have formulated rules relating sounds and spelling (e.g., spell /sh/ as "ti" in initial position of unaccented syllables), but there are a lot of rules, some rules are quite complex, and many rules don't work very well. Smith, citing research by Hanna, Hodges, and Hanna, pointed out that the rules of spelling developed by researchers "will lead to an incorrect spelling more than 50 percent of the time, and they are particularly unreliable for the words we want most to spell, the common words of our language. The 'regular' words that conform most to the rules tend to be infrequent words for which we rarely have a need" (122: p. 153).

The complexity of English spelling and our failure to describe it adequately lead to the hypothesis that competent spellers acquire spelling knowledge by reading, and not from the study of spelling rules. This hypothesis correctly predicts Henderson's observation, that good spellers do not know the rules and bad spellers remember them incorrectly.

*Alternative Hypotheses.* As noted throughout this section, the complexity and size of spelling and vocabulary make any strong version of SBH untenable. If the rules are too complex for professionals to describe, how can they be learned by language students?

OH has similar difficulties. For the strong version of OH to be correct for vocabulary, each new word, or at least each basic word (but see note 15), must be used in speech or writing, with each shade of meaning, exhibiting each of its grammatical properties. In addition, the language user must receive feedback on his or her use of the word, must notice the feedback, and must be able to use the feedback to arrive at a correct meaning of the word, or a meaning closer to the correct meaning. For spelling, OH must assume that each spelling rule is tested out in writing, that writers receive feedback on each rule, that they notice the feedback, and make a correct analysis of the spelling rule from this feedback, or at least an analysis leading to a better version of the rule. If we must learn to spell each individual word this way, the burden, of course, is greater. Given the complexity and size of the tasks, and the infrequency with which children write, these scenarios are highly unlikely.

SUMMARY AND CONCLUSIONS

In some cases, the strong versions of SBH and OH struggle to account for the results that IH handles with ease. In other cases, they fail completely.[16] According to accepted scientific method, just one failure would be enough to eliminate a competing hypothesis. Here, the competing hypotheses fall short again and again.

Nevertheless, the data do not support a pure IH. Despite the presence of a few studies that suggest that learning has no effect (23, 110) or a negative one (18, 63), learning appears to have some impact, as evidenced by the finding that students in traditional methods do make some gains. While a substantial part of these gains is probably due to incidental comprehensible input, there are gains over and above what one would expect from comprehensible input alone (24, 135). Also, subjects who participate in intentional Read and Test studies make gains superior to incidental readers, showing that focusing on form has some effect. A combined position does fit the data: CI results in acquired competence, while skill-building and output plus feedback can lead to consciously learned competence.

But conscious language learning does not appear to be as efficient as acquisition from input.

Thus, while both acquisition and learning exist, they are not equal partners. This conclusion is consistent with the hypothesis that the acquisition of vocabulary and spelling involves the language faculty, the mental organ specialized for language. When vocabulary and spelling are consciously learned, mental faculties outside the language faculty are used, and only a limited amount of "language-like" competence can be developed (16, 17, 75, 120).

Nearly all of the research I have reviewed here is from first language acquisition—the small amount of second language research we have, however, points in the same direction. A hypothesis that spelling and vocabulary are developed in second languages as they are in the first language, by reading, is thus at least reasonable.

If these conclusions are correct, the pedagogical implications are obvious: we are teaching vocabulary and spelling, as well as the rest of language, the hard way. (Even if it were shown that conscious learning was as good as acquisition, or even twice as efficient, I would still prefer comprehensible input: an hour of pleasure reading is far preferable to thirty minutes of drill.) The easy way is to encourage a lot of reading, especially free voluntary reading. Nearly everyone in the language teaching profession agrees that reading is beneficial, even without research evidence. Yet, few first language and nearly no second or foreign language teaching programs do anything to encourage it.

We have, of course, tried nearly every other teaching device but the interesting book or magazine. If reading is so effective, we need much better libraries, filled with books in first and second languages that our students will read, and we need to provide students help in finding books—courses in popular literature, newspapers, magazines, etc.

*Problems.* Whenever I suggest a comprehensible input-based approach, certain problems are pointed out: 1) we lack books and money for them; 2) our students need to pass discrete-point, form-based tests; 3) next year's teacher will expect them to know certain words, certain rules, etc.; 4) reading in school should focus on works of proven worth; 5) parents, school boards, and administrators expect to see vocabulary lists and spelling drills.

Here are my answers:

● If you lack books, get them. My suspicion is that reading is not simply a way to develop vocabulary, spelling, and other important aspects of competence, it is the only way. We have no choice. The problem is not always money; often it is a matter of priorities. Just think how many books can be bought for the price of one computer.

● Students who read more will do well on discrete-point exams of spelling and vocabulary. Nevertheless, we do need to get rid of the exams. The problem has nothing to do with the validity of discrete-point exams; some of them are valid, that is, they test what they are supposed to test. Students who know more vocabulary, for example, will do better on a valid discrete-point vocabulary test than those who know less.

There are exceptions: when vocabulary tests are based on particular texts. Kingsley (see Table Vb) argued that her self-selected readers did not excel on vocabulary for this reason—the test was based on words from a basal series. Her readers did exceed expected growth in reading comprehension, but not in vocabulary. Also, students in comprehensible input-based classes who have not "learned" will be at a disadvantage when tests focus on late-acquired rules.

Even valid discrete-point language arts tests cause problems, however, because of their impact on teachers and students. Teachers will teach to the exam, and students will study for the exam, and no force is likely to change this. Even if free reading is the best way to build vocabulary, it is hard to convince teachers and students to throw away the vocabulary lists and read.

Ironically, dumping vocabulary and spelling tests can result in better vocabulary and spelling development. No testing means no time devoted to studying word lists, time that can be devoted to reading, and better vocabulary and spelling development.

● Just because next year's teacher does it wrong doesn't mean this year's teacher should also do it wrong. Except for the situations noted previously (tests based on particular texts, and grammar tests that emphasize late-acquired rules), students will be better prepared for any situation if they have acquired more language.

● Massive quantities of pleasure reading in the students' own areas of interest may, ironically, be the best way to prepare them for the serious study of literature. While it is desirable to have students read works of "great literary merit" from the start, it is not always possible to provide enough books of literary merit that are comprehensible to the less advanced reader (136). Large quantities of light, "low risk" reading, in which students are not held responsible for content, in which they can skip words without fear of missing anything that affects their grade, will result in vocabulary growth and overall language competence that will make reading the classics easier.[17]

Light reading may also provide the foundation for the appreciation of more sophisticated literature. Britton argues that ". . . a taste for the stereotyped, the second-rate, may at times be the first rung of a ladder and not the first step to damnation" (8: p. 268).

● The problem here is that the teaching profession is controlled by outsiders, by amateurs, a situation unheard of in other professions (125). It is as if hospital administrators dictated to surgeons how to operate. We simply need to take control.

Even if we do control our profession, it will certainly be helpful if the public understands what we are doing and why. Part of the long-term solution lies in informing students about the language acquisition process. As Sternfeld has pointed out, this information will help students continue their language acquisition progress after the class ends. It will also eventually produce an informed citizenry that understands language acquisition.

NOTES

[1]This paper is an expanded version of a presentation made at the *MLJ*/OSU Symposium on Research Perspectives in Adult Language Learning and Acquisition, Ohio State University, 21 October 1988.

[2]I do not claim that vocabulary can only come from reading; the general hypothesis is that vocabulary is acquired from comprehensible input. Reading, however, appears to be the best kind of comprehensible input for vocabulary development. Nagy and Anderson suggest that while aural language experience is important, aural language "typically contains a lower proportion of difficult or low-frequency words than written language" (95: p. 327); written language, they hypothesize, is the primary source of vocabulary beginning at about the third grade.

The contribution of aural input remains an empirical issue. There is excellent evidence, as we shall see in the text, that aural input in the form of stories and in the form of written stories read aloud has a positive effect on vocabulary acquisition. For evidence that aural input in the form of conversation can increase vocabulary, see Drum and Madison.

[3]Some theorists argue that the explicit rule may be forgotten by the learner (the "discarded crutch" hypothesis), while others assume it is remembered. This issue is not relevant to the discussion in this paper. Also not dealt with here is a form of skill-building in which the learner is neither given an explicit rule nor expected to discover one (so-called "mechanical" drill).

[4]As noted in Krashen (75), and contrary to Ellis' characterization of my position, there is a version of OH that I think is correct, that is fully consistent with IH: output aids language acquisition indirectly by encouraging CI, via conversation. When you speak, it invites others to talk to you. Moreover, as you speak, your output provides your conversational partner with information about your competence and whether he or she is communicating successfully. This information helps your conversational partner adjust the input to make it more comprehensible (38: p. 94; 86). Conversation is an excellent way of obtaining CI, but strictly speaking it is not necessary.

OH can be divided into two subhypotheses. In "output plus correction," the learner's output is comprehensible, but not grammatical. In the "comprehensible output" hypothesis, output is not comprehensible. For additional discussion of comprehensible output, see Swain (133, 134), Pica (104), and Krashen (75). One could also argue that SBH is an output hypothesis, because "practice" entails language production.

Output can have positive affective effects as well. As Smith (125) has argued, production in the form of writing can make the writer feel more like a member of the "literacy club," like someone who reads and writes. In terms of the theoretical framework assumed here, this means a greater openness to input, a lower "affective filter," and more language acquisition. The writer will "read like a writer" (124). The same may be true of oral language production; second and foreign language students who actually speak the language may feel more like members of the group who use the language, resulting in a desire for more interaction and a greater receptivity to input.

A growing amount of research shows that output, especially writing, can have very positive cognitive consequences. Writing helps clarify thinking, and helps problem-solving (33, 81).

[5]In this section, I restrict the evidence to CI outside of school, in the "informal" environment, and to in-school programs where extra CI is provided as a supplement to regular instruction. In-school programs in which CI (free reading) is compared with regular instruction are considered in "The Effects of Instruction."

Note that the relationship between CI and language development need not be strictly linear, since factors other than the amount of input may influence language development (e.g., the Affective Filter, the type of input).

[6]The only exception in Table I, Sperzel's study, was a short-term program. I have argued (76) that short-term free reading programs are less effective because they do not give children enough time to get involved in reading. On the other hand, the positive results in Table I do not give a true picture of Minton's study: SSR clearly "flopped" in this school. While SSR students did gain more during the SSR semester than they did over the previous semester, gains were small (three months in vocabulary compared to no gain at all during the previous semester), and the program was very unpopular. Minton outlines the reasons for this: The program was implemented with very little staff consultation, inservicing was inadequate (the staff received only a memo describing SSR, and were invited to a few voluntary meetings), and the entire school did SSR at exactly the same time, which made it very inconvenient for students in industrial arts and physical education classes.

[7]Watson presents evidence suggesting that stories may be an excellent vehicle for vocabulary acquisition. In her study, one group of nine kindergarten pupils heard a new word ("protozoa") in a straightforward lesson. Here is an excerpt:

> . . . a protozoa is an animal you can't see, it's one cell . . . and it loves moist places such as your mouth and nose and eyes. It lives in water, it can live in the ocean, it can be food for animals, some of them are good and some of them maybe aren't so good, and they can make us ill. . . ."

> A second group heard the new words as part of a story:
> . . . I asked the fisherman "what do these little fish eat?" . . . and he said, "oh, there's this stuff that's sort of animal-like, plant-like stuff, the smallest animal that we know, it's called a protozoa. . . ."

When asked afterwards what "protozoa" meant, only one child in the expository group displayed any knowledge of the word, while seven out of the nine who heard the story remembered the word. Of course, the quality of the lesson and story could be a factor: it could have been a bad lesson and a wonderful story. But, the results are suggestive and are consistent with the research on reading aloud and vocabulary development.

[8]Guthrie provides apparent counterevidence to the claim that vocabulary knowledge and free voluntary reading are related. Guthrie reported that reading achievement in three countries (New Zealand, the United States, and Iran) was "highly associated" with the volume of reading that took place in these countries; students from countries in which more reading took place were better readers. Vocabulary knowledge, however, was not clearly associated with reading volume; in fact, for the fourteen-year-olds, the country with the least reading volume (Iran) had the highest vocabulary scores. There was some doubt, however, as to the comparability of the vocabulary tests used in different languages; the English version may have been harder than the other versions (137: p. 31). The English language comparisons are not inconsistent with the hypothesis that vocabulary comes from reading; New Zealand is reported to have more reading volume than the United States, and vocabulary scores in New Zealand are either equal to (fourteen-year-

olds) or higher than (eighteen-year-olds) scores from the United States: Scores on Word Knowledge Test: 14-year-olds—Iran, 19.6; New Zealand, 16.8; U.S.A., 16.8. 18-year-olds—New Zealand, 24.7; Iran, 23.4; U.S.A., 13.7. Reading volume—1. New Zealand; 2. U.S.A.; 3. Iran. (Word Knowledge scores from Thorndike [137]; reading volume calculated by Guthrie.)

[9]It could be argued that the children in Wells (142) gained vocabulary from their parents' speech; families owning more books might also use a wider vocabulary. If true, this still supports IH (Note 2 above).

[10]Vocabulary research also shows that children of the same age differ substantially in vocabulary size. Smith (126) found that some second graders had larger vocabularies than some high school students! According to Smith, the range of basic words known by first graders was from 5,500 to 32,000, and for twelfth graders from 28,200 to 73,200. Other researchers have come up with more conservative data. Graves, Brunett, and Slater, limiting their analysis to the 50,442 most frequent words in school printed English, found a gap of 1,200 words between middle and lower class second and third grade students. What is clear is that some children acquire much more vocabulary than others. Nagy and Herman argue that ". . . children who acquire a larger than average vocabulary—who could easily be learning 1,000 words per year over and above those learned by the average student—are not doing so simply through better vocabulary lessons" (96: p. 23).

[11]Nagy (97, 98) cites research showing that the average fifth grader reads about 400,000 words per year outside of school, and about 600,000 in school, assuming fifteen minutes of in-school reading per day at 200 days per year at a rate of 200 words per minute.

[12]In several Read and Test studies, less able readers were less successful at deriving the meanings of words from texts, leading to the hypothesis that there is significant individual variation in the ability to acquire words from context. This result has been found both in intentional (5, 11, 34, 88, 109) and incidental studies (5, 62, but see 98). It has been suggested, on the basis of these studies, that reading may not be an effective means for improving vocabulary for everyone.

However, other interpretations exist. First, even if there is individual variation in acquiring words from reading, those less able to do so may still be better off reading than doing drills and exercises. While less proficient readers may not do as well as more proficient readers, they are still able to acquire words from context (see 62).

Second, good readers do not typically develop the ability to derive words from context from instruction, since such instruction is not regularly provided. They quite likely developed their facility the same way they became good readers—by reading (48, 77, 123). Less adept readers will likely improve their ability to derive words from context in the same way.

Third, it is not clear that all differences in the ability to derive vocabulary from texts represent individual variation in an underlying ability. In some cases, what appears to be individual variation may really be a result of the fact that less able readers find certain texts less comprehensible,

and thus do not gain as much new vocabulary from them. According to this interpretation, what less able readers need is more suitable texts, a problem that is easily solved by self-selection.

Daneman and Green found that Working Memory Capacity (WMC) relates to the ability to derive words from context; it has also been reported that WMC correlates with overall vocabulary competence (Daneman and Green, but see Ormrod and Cochran, where correlations were not quite significant) and spelling competence (Ormrod and Cochran). WMC is measured by asking subjects to read a series of sentences and then recall the last word of each sentence after the entire series is read. Daneman and Green hypothesize that those with better Working Memory are better able to retain context cues while working out the meaning of unknown words. While this explanation is plausible, it is also possible that Working Memory Span is itself influenced by reading experience. In other words, reading experience may be the cause of working memory, reading comprehension, spelling, and the ability to derive words from context.

[13]These studies assume that reading aloud time was taken from that of regular language arts instruction. Whether this was the case or not is not clear from Cohen's description. If reading aloud was added to traditional instruction, this study belongs in another category: "More CI, more acquisition." In Feitelson, it appears that comparison children were getting traditional language arts instruction while experimental children were being read to. Experimental children were read to during the last twenty minutes of the school day; during this time, comparison children "were engaged in other learning activities (including reading and writing)" (39: p. 353). Comparison teachers were asked not to increase the amount of reading aloud they did beyond what they usually did, but did increase their reading aloud somewhat, even though they did not do it regularly (39: p. 350).

[14]Fox and Eaton's results are less clear. Their massive study of spelling performance (82,833 students in grades two through eight in the state of Indiana) reported that more daily time devoted to spelling did not result in better spelling. According to their analyses, the optimal amount of time appeared to be about twenty minutes per day; less than this produced slightly inferior results, as did more than this. They also found, however, that students who had daily spelling instruction did better than those with instruction four days per week, while those with four days did better than those with three days, etc., but differences were small. Unfortunately, their analyses of daily spelling time and days per week of spelling were done individually; there was no combined analysis of the effects of total time devoted to spelling.

In contrast to the results seen in spelling research, more second language instruction often results in more second language acquisition. I have argued (73, 75) that second language instruction results in improvement when the classroom is the main source of comprehensible input. Second language classes, especially those conducted in the second language, typically provide at least some comprehensible input (some more than others). This is probably not the case for spelling instruction, which is usually based on skill-

building, with little or no comprehensible input (reading for meaning).

[15]Do we need to acquire derived words? It could be argued that once basic words are acquired, all we need to do is learn or acquire rules of affixation. Even if this is true, the task of vocabulary acquisition is still gigantic. If Seashore and Eckerson are correct, there are still 58,000 basic words to be acquired—less if Lorge and Chall are correct, but an impressive number nevertheless.

Also, rules of affixation are themselves complex. Teaching students the meanings of roots and affixes are not of much help when word meanings are not obviously derived from component parts. Levin, Carney, and Pressley report that direct instruction on roots and affixes helped in clear cases such as "exsect" (to cut off, from "ex" [out] and "sect" [cut]), but not in less clear cases, such as "premit" (to introduce, from "pre" [before] and "mit" [send]).

[16]Note that a competing hypothesis need not fail completely. As Chomsky (14) points out, the fact that a hypothesis can handle data only awkwardly is reason enough to doubt it.

[17]Ironically, skipping words is an excellent way of building vocabulary. When we skip unessential words, we read more, and acquire the meanings (or parts of the meanings) of other words. If we stop to look up every strange word, we read less and acquire less vocabulary. I personally know people who refuse to read in other languages, because they have the mistaken notion that they should never skip words they do not know, and they dread the work that looking up every word entails.

Here is a three-step plan for dealing with new words (inspired by Smith and Goodman's ideas): 1) if possible, skip the word, for reasons just given; 2) if you can't skip the word, if it appears to be essential to the meaning of the text, guess (more accurately, allow yourself to guess before you reach for the dictionary; guessing the meaning of unknown words in context occurs automatically and rapidly). As you keep reading, the text itself will tell you whether you guessed right or wrong; if the subsequent text makes sense, your guess was probably right, or at least correct enough to allow you to interpret the text correctly and acquire at least part of the meaning of the word. If the subsequent text doesn't make sense, you guessed wrong. Try again. (It is possible, of course, that the text will make sense even with a wrong guess, and that a reader may carry around a false hypothesis about what a word means [7, 116]. This situation will not last for a long time, however, since contexts that lead to the right interpretation will predominate. The cure for wrong hypotheses is more reading!); 3) if guessing doesn't work, if you keep guessing incorrectly and cannot come up with a reasonable idea of what the word means that makes sense in the text, and the word appears to be essential to the meaning of the passage, look it up (or ask someone). Going to the dictionary is thus the last resort.

The system presented here is for low-risk free voluntary reading. There are, of course, times "when the comprehension must be total whatever the cost in time" (139: p. 77), when readers will need to know every word of a passage for precise interpretation. This is often the case in reading great literature, as well as in technical reading. But pleasure reading is excellent preparation for this kind of intensive reading, and will make appeals to the dictionary less necessary.

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## APPENDIX I
Good Reader, Poor Speller?

If spelling comes from reading, why do so many people consider themselves to be good readers but poor spellers? Here is a possible explanation:

First, we need to distinguish *good* spelling from *poor* spelling. Most good readers are *good* spellers, not *poor* spellers. There is a huge difference between good spellers and poor spellers. Good spellers misspell only a small percentage of the 39,000–156,000 words they know, the "demons" that plague many of us (i.e., words ending in "-ent" or "-ant"). Poor spellers misspell thousands of words. (I also suspect that when good spellers are about to make a spelling error, they are aware of it. Poor spellers are not.)

In most cases, reading will develop *good* spellers, but it may not develop *great* (nearly perfect) spellers. The reason extensive reading may not result in perfect spelling is that fluent readers do not need to pay attention to every bit of visual information, but only need enough information to confirm their predictions (48, 123). Thus, fluent readers need not process everything.

Since our standards in spelling are 100%, we need to develop great spellers, not just good spellers. (As noted in the introduction, a single spelling error in public means humiliation—I suspect this is one reason why presidential debates are oral and not written.) The way to develop great spellers, I suggest, is first to help students become good spellers, through large amounts of free voluntary reading. We can then teach them techniques for bridging the gap

### TABLE IX
The Relationship between Reading Ability and Spelling Ability

| Type of Speller | Comment |
| --- | --- |
| *Good Readers:* | |
| Great (nearly perfect) | Has read enough, has strategies for demons |
| Good | Has read enough, misspells demons |
| Poor | No explanation |
| *Poor Readers:* | |
| Poor | Has not read enough |

Hypothesis: Reading will help a poor reader–poor speller become a good reader–good speller. Reading will not help a poor speller become a great speller. Many people who think they are poor spellers are really good, but not great spellers. There are only small differences between good spellers and great spellers.

from good spelling to great spelling, e.g., using a spelling dictionary, using a spelling checker program.

This hypothesis is intended to explain the difference between good readers–great spellers and good readers–good spellers. It does not explain the difference between these groups and good readers–(truly) poor spellers, a well-researched issue (see, for example, some of the papers in Frith's collection). My point is that many of us who think we are good readers–poor spellers are really good readers–good spellers. Table IX attempts to describe the relationship between reading ability and spelling ability.

## APPENDIX II
Time Efficiency of Reading and Instruction for Vocabulary Acquisition

The effectiveness of different approaches to vocabulary acquisition is difficult to compare due to the many different experimental conditions used by researchers, differences in tests, etc. Here, I attempt a crude comparison by calculating time efficiency, the average number of words acquired per minute. This allows a comparison of deliberate vocabulary teaching methods with Nagy, Herman, and Anderson's figure of .25 words per minute acquired through reading for meaning. (For a thorough meta-analysis of vocabulary instruction studies based on effect size, see Stahl & Fairbanks.)

To achieve some uniformity, I have limited this comparison to studies using a multiple choice test format. Efficiency was calculated by multiplying the rate of presentation by the percent of target words acquired.

| Study/Subjects | Method | Rate of Presentation (words/minute) | Percent Acquired | Efficiency (words/minute) |
| --- | --- | --- | --- | --- |
| *Studies with Children:* | | | | |
| Beck et al. (7), grade 4 | Rich instruction | .05 | 82 | .04 |
| McKeown et al., grade 4 | Rich instruction | .05 | 75 | .04 |
| Levin et al., grade 4 | Keyword | .48 | 85 | .41 |
| | Contextual analysis | .48 | 72 | .35 |
| | Semantic mapping | .48 | 81 | .39 |
| Bull & Wittrock, grade 5 | Imagery (1) | .67 | 57 | .38 |
| Eeds & Cockrum, grade 5 | Teacher interaction | .07 | 84 | .06 |
| | Dictionary | .07 | 64 | .05 |
| | Read | .07 | 55 | .04 |
| Stahl & Vancil, grade 6 | Semantic mapping | .04 | 67 | .03 |
| *Studies with Adults:* | | | | |
| Anderson & Kulhavy | Generation | 10 | 65 (2nd trial)[a] | 6.5 |
| | Read word & definition 3 times | 10 | 73 (2nd trial)[a] | 7.3 |
| Pressley et al. (exp 4) | Keyword | 6 | 79 | 4.7 |
| | Imagery (2) | 6 | 55 | 3.3 |
| | Synonym (1) | 6 | 27 | 1.6 |
| | No strategy | 6 | 50 | 3.0 |
| Johnson & Stratton | Definitions | .67 | 87 | .58 |
| | Sentences | .67 | 90 | .60 |
| | Classification | .67 | 90 | .60 |
| | Synonym (2) | .67 | 86 | .58 |

[a]Corrected for guessing.

Efficiency in adult studies is significantly greater than efficiency in studies using children as subjects (adult mean = 2.876, sd = 2.555; child mean = .179, sd = .176; t = 3.330, df = 9, p < .01).

### Vocbulary Teaching Methods
*Classification:* subject given short phrases describing objects or events, asked to classify them with one of four target words. Subjects allowed to check answers.

*Contextual analysis:* word and definition presented with paragraph containing the word. Context cues pointed out.
*Definitions:* subject reads definition, writes own definition.
*Dictionary:* subject looks up and copies definition.