DOCUMENT RESUME

ED 378 445 CE 068 230

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TITLE Assessing Adult Literacy by Telephone.
INSTITUTION Applied Behavioral & Cognitive Sciences, Inc., San Diego, CA.
SPONS AGENCY William and Flora Hewlett Foundation, Palo Alto, Calif.
PUB DATE Jan 95
NOTE 50p.; Project of the San Diego Consortium for Workforce Education & Lifelong Learning. Paper presented at the National Reading Conference (San Diego, CA, January 1995).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Adult Basic Education; *Adult Literacy; *Educational Research; Mail Surveys; *Research Design; *Research Methodology; *Telephone Surveys

ABSTRACT

Recently, several industrialized nations have engaged in extensive and expensive assessments of adult literacy using door-to-door surveys and tests of "functional" reading. A study examined the use of simple checklists of author's names, magazine titles, famous people's names, and vocabulary works used earlier by West, Stanovich and Miller (1993) to sample adults' declarative knowledge by telephone. Data were derived from telephone interviews with 538 randomly selected adults residing in the San Diego, California, metropolitan area, and by a survey mailed to a subsample of 280 of these adults who agreed to participate (about 50 percent of the surveys were returned). Analyses revealed strong relationships among checklist knowledge (r = .80) when assessed either by listening (telephone) or by reading (mailed surveys). A comparison of findings using the telephone methodology with that of the recent U.S. Department of Education's National Adult Literacy Survey (NALS) showed that all major relationships of literacy to education, age, gender, occupation, income, ethnicity, father's and mother's education that have been found in the NALS and other literacy surveys over the past 75 years were found with the telephone method. Given the much lower cost of telephone versus door-to-door surveys (less than one-sixth the cost), the results suggest that the assessment of adult literacy by telephone is a promising and cost-effective method that should be further developed as a means of monitoring national progress toward the achievement of greater levels of adult literacy, as well as other important aspects of adult knowledge development, such as acculturation for immigrants and technical knowledge for vocational and professional education. (Contains 43 references.) (Author/KC)

Assessing Adult Literacy By Telephone

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January 1995

Preparation of this report was supported in part by a grant from the William and Flora Hewlett Foundation to the Applied Behavioral & Cognitive Sciences, Inc., 2062 Valley View Blvd., El Cajon, CA 92019-2059, telephone (619) 444-9595. The opinions expressed herein do not necessarily reflect the official positions of the member organizations of the San Diego Consortium for Workforce Education and Lifelong Learning or the William and Flora Hewlett Foundation.

Abstract

Assessing adult literacy by telephone

Recently, several industrialized nations have engaged in extensive and expensive assessments of adult literacy using door-to-door surveys and tests of "functional" reading. Following a review of research relating listening to reading, and a critique of the role of knowledge in literacy, this research examined the use of simple checklists of author's names, magazine titles, famous people's names, and vocabulary words used earlier by West, Stanovich & Miller (1993) to sample adult's declarative knowledge by telephone. Analyses revealed strong relationships among checklist knowledge (r=.80) when assessed either by listening (telephone) or by reading (mail out surveys). A comparison of findings using the telephone methodology with that of the recent U. S. Department of Education's National Adult Literacy Survey (NALS) showed that all major relationships of literacy to education, age, gender, occupation, income, ethnicity, father's and mother's education that have been found in the NALS and other literacy surveys over the last 75 years were found with the telephone methodology. Given the much lower cost of telephone versus door-to-door surveys (less than one sixth the cost), it is argued that the assessment of adult literacy by telephone is a promising and cost-effective methodological innovation that should be further developed as a means of monitoring national progress toward the achievement of greater levels of adult literacy, as well as other important aspects of adult knowledge development, such as acculturation for immigrants and technical knowledge for vocational and professional education.

Assessing Adult Literacy by Telephone

The assessment of adult literacy skills in industrial nations has taken on a new significance in the last decade. The Organisation for Economic Co-operation and Development (OECD) notes that, in regard to concerns for economic competitiveness among member nations, "... one area that is receiving growing attention from educational policymakers and analysts in a number of OECD countries is the direct measurement of literacy levels in the labor force of industrialized countries" (Benton & Noyelle, 1992, p. 11).

The OECD report goes on to note that, while some OECD countries, including the United States and Canada, have carried out national, direct assessments of adult literacy skills involving door-to-door surveys and the testing of thousands of respondents, the costs of such direct assessments are extensive. Therefore, some nations may be reluctant to undertake such assessments, or, if they do, then they may resist performing follow-on assessments to determine whether adult literacy levels are improving.

In the United States, the National Governor's Association selected the National Adult Literacy Survey (NALS) administered in 1992 to measure progress in achieving national education goal number 5 - that all adults will be literate by the year 2000. However, in a Memorandum prepared for a meeting of the National Governor's Association's Resource Groups for Goals 3, 4, and 5, it was indicated that there would be no follow-up to the 1992 NALS (Prince, 1994). In the discussions of the meeting of Resource Group 5 (now called Group 6, which one author of this paper attended as a member), it was noted that the NALS had been very expensive to administer, and hence it was not scheduled for re-administration.

In a later telephone conversation with Dr. Andrew Kolstad at the U. S. Department of Education, National Center for Education Statistics, it was learned that the NALS had cost some $10.85 million to administer as a national survey, and with additional data collection for 12 of the states in the U. S., the total cost of the NALS exceeded $14 million (Kolstad, 1994, personal communication).

In Canada, too, concerns for the cost of administering direct assessments of adult literacy led the Department of the Secretary of State in Ottawa to explore the use of proxy measures of adult functional literacy (Neice, Adsett, & Rodney, 1992, pp. 69-87). Using as a criterion the data from a 1989 national assessment of adult literacy skills, with items and procedures similar to those in the U. S. NALS, the Canadian team

investigated the use of lower-cost proxy measures such as self-reported assessments of skill, frequency of reading of newspapers, magazines, or books, years of education completed, and other factors related to literacy achievement to predict the direct assessment data. The investigators in Canada concluded that using such proxy measures, they might be able to construct simulation models accounting for as much as 90 percent of the direct testing results (p. 84).

Assessing reading by listening

The present study, like that of the Canadian Secretary of State's study, was motivated by the need to find a more cost-effective method for assessing the literacy skills of adults than those used in the NALS or the Canadian direct assessments of household samples. But unlike the Canadian study of *proxies* for literacy assessment, the present study explored an alternative approach consisting of the assessment of one component of literacy, the *knowledge* used in comprehending during reading, but assessed by telephone without the use of written documents. Instead, the assessment of the knowledge component of literacy was based on the well-established relationship of listening to reading (Sticht, Beck, Hauke, Kleiman & James, 1974; Sticht & James, 1984; Sinatra, 1990; Stanovich, 1991). Sticht & James (1984, p. 297) surveyed literature comparing comprehension of various materials either by listening or by reading. Averaging across numerous studies at different grade levels and into adulthood, they found that the average correlations among listening and reading increased from .35 in the first grade to around .65 in the sixth grade and remained at that level into adulthood.

The data reviewed by Sticht & James (1984) were based on a variety of studies at each grade level and in adulthood. In these studies, the comparisons of listening and reading were made using materials that were not always carefully designed to make the listening and reading passages comparable. Additionally, task demands, such as the amount of time for listening versus reading and the types of questions (fact; inference) were not carefully controlled.

To overcome these limitations, research by Sticht, Hooke & Caylor (1981) used a specially developed test battery to compare the listening and reading comprehension of adults. In that study, brief paragraphs were developed for assessing listening and reading comprehension. The paragraphs were equated for difficulty using readability formulas and by magnitude estimation to equate passages on the basis of adults' subjective judgments of the difficulty of the passages. The time for reading passages was limited to the time needed to

present the passages for listening. Only factual recall questions were asked and item statistics were used to ensure that the questions used to measure comprehension were of comparable difficulty in the reading and listening tasks. Under these carefully controlled conditions, the data for over 2,000 young adults with reading skills from the 2nd to the 14th grade levels produced correlations of .75 for listening and reading paragraph comprehension (Sticht, Hooke & Caylor, 1981, Table 8, p. 39).

The foregoing indicates that there is a body of research to suggest that listening and reading tests tend to rank adults in the same order. That is, low, medium and high ability adult listeners are likely to be low, medium and high ability readers, respectively. Therefore, an assessment of adults' listening competence may provide a valid estimate of their reading competence. The following discussion elaborates on some of the mechanisms involved in listening and reading that produce positive correlations among these two types of language information processing.

A simple model of a human cognitive system

In their formulation of research hypotheses regarding relationships among listening and reading skills, Sticht et al. (1974) developed a simplified version of the Atkinson and Shiffrin (1971) human information processing system model. In the simple model, the cognitive system was considered to include essentially two major subsystems. One of these subsystems is the long term memory with a store of content called the knowledge base. The other is the working memory which is a short term memory that operates on the knowledge base using various processes including such language-based processes as listening/speaking and reading /writing.

In this simple model of the human cognitive system, both listening and reading draw upon the same knowledge base (lexicon; syntax; pragmatics of language use; other episodic, schematic, semantic, declarative and procedural knowledge) and use it for producing or comprehending language whether the language is represented in an oral or written mode. Developmentally, the ability to represent knowledge by oral language generally precedes the ability to represent knowledge by the written language. But as literacy develops, then both oracy and literacy converge upon the same knowledge base.

In a direct test of this *convergence* hypothesis using college undergraduate students, Sinatra (1990) concluded "... that listening processes and reading processes converge at the word level" (p.126). She went on

to suggest that, "A student whose reading skills in listening comprehension and reading comprehension are comparable may be reading as well as can be expected, and may be able to improve his or her reading ability only by building a larger vocabulary or a larger knowledge base" (p. 127).

By the above reasoning, adults who possess low knowledge bases with relatively small vocabularies for representing their knowledge, will possess only limited ability to comprehend language-based messages presented in either the oral or written mode, and they will tend to be the poorly literate members of society. Conversely, those with large amounts of knowledge and the words for representing that knowledge will tend to be the highly literate members of society. The fact that both listening and reading share a common knowledge base forms the basis for the approach to assessing literacy by telephone described herein. But first it is useful to understand some of the differences between literacy and oracy that may tend to lower empirical associations among listening and reading assessments.

Listening and literacy: some differences

Though there is considerable comparability among listening and reading, the information displays used in speaking and writing are not the same and so relationships among these two types of receptive language processes are not perfect. The information displays used in presenting spoken and written language differ greatly and permit the development of knowledge and information processing strategies and skills that differ for listening and reading. Sticht (1978) and Sticht & McDonald (1992) have distinguished between literacy considered as a *second signaling system* for speech, and literacy as a special case of the use of *graphics technology* to aid communication, reasoning, and problem solving.

The positive relationships among listening and reading tests reflect the use of graphics technology to produce a graphic display called "written language" that can serve as a second signaling system for speech. What can be spoken can be written, what can be written can be read, what can be read aloud (i.e., spoken) can be comprehended by listening.

The second aspect of literacy recognizes that graphic displays possess elements that permit people to develop knowledge and skills beyond that used in oral language. The graphic information display is more or less permanent, it can be arrayed in space, and it uses the properties of light (contrast; color). These properties are drawn on by literates to design information processing tools such as more or less permanent pages of print

(knowledge bases stored outside the head) with **bold** (use of light: contrast) headings to direct attention to important concepts, with information arrayed spatially to assist comprehension of complex relationships, as in a train schedule with numerous intersecting rows and columns, or other information presentation devices (tables, figures, charts, schematics, etc.).

Because of these properties of graphics displays, literates n ay acquire knowledge about such displays and information processing skills for using such displays that go beyond the use of written language as a second signaling system for speech. The relative permanence of graphic displays permits the development of various information "search and locate" processes (Guthrie, Britten, & Barker, 1991) that are not possible with the temporally fleeting spoken language (though audio recording devices have made possible the use of information "search and locate" strategies for recorded speech, but these processes are not relevant to the present discussion).

The National Adult Literacy Survey (NALS) in the United States used literacy tasks that were based, to a large extent, on a theory of "document literacy" that emphasized "search and locate" information processing skills (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993, p. 9; Mosenthal & Kirsch, 1991, pp. 147-179). The NALS report states that, "On the prose scale, for example, tasks with low scale values ask readers to *locate or identify* information in brief, familiar, or uncomplicated materials, while those at the high end ask them to perform more demanding activities using materials that tend to be lengthy" (italics added) (Kirsch, et al., 1993, p. 9).

In terms of the simple model of a human cognitive system, locating information in texts or complex documents places demands on working memory because information that is to be searched for has to be held in working memory while simultaneously bringing into working memory information from the document to determine whether it matches the sought information. In general, increases in the amount of information that is being sought and the amount of information that must be searched to locate the correct information place greater demands on working memory and greatly increases the difficulty of tasks (Meyer, Marsiske, & Willis, 1993, pp. 234-249; Kirsch & Mosenthal, 1990, pp. 5-30).

Knowledge, information processing and literacy

Literacy assessments such as the NALS engage the respondents in tasks that involve much more than comprehending written language as a second signaling system for speech, though they also include this aspect

of literacy, too. The use of tasks that tend to overload working memory while simultaneously engaging the reader in comprehending various domains of knowledge creates a scale of literacy tasks of increasing difficulty that systematically differentiates readers into low, medium and higher skilled literates. According to the theory that underlies the creation of the NALS items and scales, literacy tasks grow more difficult as (1) there is more information in the document, (2) the tasks require more categories to be processed, and (3) the tasks require significant use of problem-solving ability or unique prior knowledge to relate different types of information in the tasks (Mosenthal & Kirsch, 1991, p. 175).

In terms of the simple model of a human cognitive system given above, what this means is that the performance of increasingly difficult tasks such as those on the NALS depends both upon the possession of a broad knowledge base to understand task directions and to comprehend the various contents of the materials, and efficient information processing skills that operate in working memory to hold instructions, perform search and locate actions, and problem solve (make inferences; reason) to accomplish tasks.

A five-year research program known as the Learning Abilities Measurement Program (LAMP), conducted by researchers at the Air Force Human Resources Laboratory (AFHRL-now called the Armstrong Laboratory) explored the cognitive skills that comprise reading comprehension and other general learning abilities (Payne, Christal, & Kyllonen, 1986). A major outcome of the first five years of the project was the finding that individual differences in reading and reasoning were predictable by the capacity of working memory, the breadth of the declarative and procedural knowledge base, and the speed with which these cognitive subsystems and a perceptual subsystem operate (Kyllonen & Christal, 1990). Generally speaking, highly literate individuals possess large bodies of knowledge and efficient information processing in working memory to process information in complex graphic documents.

However, though large bodies of knowledge and efficient information processing skills typically go together, the graphic display, being somewhat permanent, makes it possible for some with less efficient information processing skills (e.g., slow word recognition) to nonetheless perform fairly complex literacy tasks because the display persists and can be repeatedly searched and studied to locate and extract information.

Of course, adults who are practically completely illiterate may perform by listening tasks that they simply cannot do by reading. For these groups, the correlation of listening with reading will be very low, if not zero, because there will be little variation in reading es. However, as a group, these same persons will tend to perform at the lower end of the distribution of listening when a full range of educated and literate adult listeners are assessed. Hence, their *relatively* low listening scores will predict their low literacy skills, too.

Additionally, because people who spend a lot of time studying and learning broad bases of knowledge typically do much more of this using texts than by listening, they may recognize some words when they see them in writing but not when they hear them spoken. These differences in the auditory and graphics displays and the differences in information processing they afford may serve to reduce correlations among listening and reading tasks.

What makes people highly literate?

As noted above, generally speaking, highly literate individuals possess large bodies of knowledge and efficient working memory processes to decode written language. But how do the highly literate obtain these vast bodies of knowledge and efficient information processing skills, such as those used in the automatic recognition of written words?

Several lines of research have converged to suggest that people become highly literate largely by engaging in numerous literacy practices (Reder, 1994, pp. 33-74), such as reading books, magazines, newspapers, and so forth. A review of the major assessments of adult literacy in the United States revealed that, since 1937 it has repeatedly been found that for adults, as years of education increases there are corresponding increases in both the number of literacy practices in which adults engage and the amount of skill displayed in the assessments (Sticht & Armstrong, 1994, pp. 43,63,99,113).

In an illuminating program of research, Keith Stanovich and associates have explored how the extent of engagement in literacy practices by children and adults has contributed to their development of literacy and, more broadly, "verbal intelligence" (see Stanovich, 1993 for a general summary of much of this research; Stanovich & Cunningham, 1993). The present study uses the methods developed by Stanovich and associates, and therefore their research program is discussed in some detail.

Using an innovative method for assessing knowledge with checklists that call for a simple "yes" or "no" judgment on the part of the reader, Stanovich and associates have demonstrated that performance on these checklists correlates significantly with a variety of literacy activities and assessments.

Reading out of school:children

Amount of out-of-school reading time that fifth grade children reported in activity diaries was significantly correlated with scores on various checklists asking for knowledge about book authors, book titles, and other kinds of knowledge. The correlation of reported amount of time spent reading books during the day with scores on an Author Recognition Test (ART) consisting of a checklist of names, some of whom were authors and some of whom were not, was .52. Corrected for attenuation due to low reliabilities of diary reports and the checklists, the correlation was .70. The uncorrected correlations of two forms of a Title Recognition Test (TRT) with the diary reports of time spent reading were .48 and .43, and these correlations rose to .65 and .59 when corrected for attenuation. (Allen, Cipielewski, & Stanovich, 1992, pp.496-497). A major conclusion from this research was that the simple checklists could serve as easy to obtain, low-cost proxies for the more expensive and difficult to obtain diary studies of the amount of print to which readers expose themselves. For this reason, Stanovich and associates refer to the various checklists as measures of print exposure.

Reading out of school: adults

In a study of adult "real world" reading, West, Stanovich, & Mitchell (1993, pp. 35-50) observed passengers waiting for their flights in National Airport, Washington, DC, USA. If the subjects engaged in reading for 10 minutes, they were designated as "readers" and if they did not read for 10 minutes they were designated "nonreaders." Both groups were approached to determine if they would participate in a study in which they completed a set of simple checklists including an Author Recognition Test (ART), a Magazine Recognition Test (MRT), a Cultural Literacy Test (CLT) consisting of names of people, some of whom were famous and some were not, a Vocabulary Recognition Test (VRT) consisting of a list of real words and some pronounceable, non-words, and several other checklists calling for knowledge of televison programs, televison newspersons, and so forth. The major finding was that there were significant differences between the "readers" and "nonreaders" in their knowledge as assessed by the various checklists, with the "readers" out-performing the "nonreaders." This confirms the findings with the fifth grade children that the checklists are useful for

distinguishing those who expose themselves to print by engaging in greater amounts of literacy practice (the "readers") from those who engage in less amounts of such practice (the "nonreaders").

Cognitive correlates: children

For the fifth grade students discussed above, significant, positive coefficients were found in 20 out of 24 correlations of print exposure checklists with various measures of verbal ability, including vocabulary, general knowledge, Wechsler Intelligence Scale for Children-Revised, and reading comprehension. Significant correlations ranged from a low of .28 to a high of .63 between different checklists and different criterion indictors of literacy (Allen, Cipielewski, & Stanovich, 1992, p. 498, Table 5).

Cognitive correlates: adults

Studies with college students also revealed a positive manifold of correlations among print exposure checklists including an Author Recognition Test (ART) , a Magazine Recognition Test (MRT) , a Newspaper Recognition Test (NRT), and a composite score for these checklists, with a wide variety of general ability measures and measures of knowledge (Stanovich & Cunningham, 1993, Table 1, p. 216). The general ability measures included high school Grade Point Average, the Nelson-Denny Reading Test, the Raven Advanced Progressive Matrices and a mathematics test. Significant correlations ranged from .20 to .47 with the checklists and these various measures of general ability.

The measures of knowledge included a multiple choice test of "cultural literacy," with items assessing knowledge in science and other topics, a practical knowledge test (If a substance is carcinogenic it means that it_____?), a cultural knowledge checklist, which included names of famous people from movies, history, art, etc., a multicultural knowledge checklist to overcome male and European bias in cultural knowledge, an acronym test and a composite of these tests. Importantly, the ART, MRT, NRT and print exposure composite checklists correlated even higher with these knowledge tests than with the general ability tests. Significant correlations ranged from .53 to .81. The correlation of the print exposure composite scores with the general knowledge composite scores was .85. Interestingly, the correlation of the cultural with the multicutural checklist was .78. This, plus the fact that the intercorrelations among the various measures of knowledge were themselves all positive, indicates that highly literate individuals tend to possess great breadth of declarative knowledge, as suggested in the LAMP project reported above.

In the airport study, analyses revealed that among both the "readers" and "nonreaders" scores on the print exposure measures af author, magazine title, and newspaper title recognition contributed significantly above and beyond age and education variables to the prediction of scores on vocabulary and cultural literacy checklists, when these were treated as outcome or dependent variables (West, Stanovich, & Mitchell, 1993, Table 6, p. 44 & Table 7, p. 45).

From a causal perspective, across these various studies, the argument by Stanovich and associates is that those who read a lot acquire, mostly through incidental learning, a large declarative knowledge base containing the names of authors, magazines, newspapers, persons known for their contributions to film, theatre, music and other cultural activities, and a large vocabulary of words that are typically not encountered with high frequency in day-to-day oral communication nor on television or radio. Scores on these various checklists are indicators of both the amount of reading in which individuals engage and of the cognitive outcomes of that reading in terms of the growth in the individual's declarative knowledge base.

Age and education are related to performance on these checklists for at least two reasons. First, with more age people have had more time to complete more years of education and to engage in incidental learning by reading. Second, education directs people into various domains of reading and this helps develop the vocabulary and other declarative knowledge needed to read more broadly and with greater comprehension and interest.

Using the Stanovich checklists to assess literacy by listening

The checklist approach to knowledge assessment developed by Stanovich and associates lends itself readily to the assessment of knowledge by listening. Based on the ideas of reading as a second signaling system for listening and the convergence hypothesis, that is, that spoken and written language converge at the word level of processsing (Sinatra, 1990), it seems likely that one could assess the knowledge base that a person draws upon in performing reading tasks by asking the person about his or her knowledge of literacy sources (authors; magazine titles) and information that may be gained by wide-ranging reading (famous persons or events from history, the arts, and science; vocabulary words).

The use of simple items such as names or single vocabulary words, with each yes/no decision made independently of the other does not overload working memory. This is an especially important factor when

assessing the literacy of elderly adults. In the U. S. National Adult Literacy Survey (NALS), data for performance on prose, document, or quantitative scales indicated that, depending on which scale is discussed, performance gradually improved by about .16 to .36 standard deviations as age increased from 16-18 through 40-54 years. However, above age 54, there was a rapid decline of about a half standard deviation for those 55-64 years, and over one standard deviation for those 65 years and older (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993, p. 31). Since it is well established that working memory becomes increasingly less efficient with advanced age (Bernstein, Roy, Srull, & Wickens, 1988, p. 401; Meyer, Marsiske, & Willis, 1993, p. 235), these findings strongly suggest that the NALS tasks derive a great deal of their difficulty from the load they place upon working memory. Hence they may seriously underestimate the breadth of materials that older adults can read and comprehend using their knowledge base and the tasks they can perform in working memory given sufficient time to study materials and without the pressure for efficiency that is typical of test-taking situations.

The assessment of *knowledge* as distinct from complex literacy task performance is also warranted when the definition of literacy that was adopted by the advisory panel of experts for the NALS is examined. The definition of literacy agreed to was as follows ((Kirsch, Jungeblut, Jenkins, & Kolstad, 1993, pp. 2-3).

> "Using printed and written information to function in society, to achieve one's goals, and to *develop one's knowledge* and potential (italics added)."

The importance of knowledge in literacy was also acknowledged by the advisory panel for the NALS in its acceptance of the definitions of the three different literacy scales that were developed (p. 3, italics added in each case):

> "Prose literacy --the *knowledge* and skills needed to understand and use information from texts...."
>
> "Document literacy -- the *knowledge* and skills required to locate and use information contained in materials...."
>
> "Quantitative literacy -- the *knowledge* and skills required to apply arithmetic operations...embedded in printed materials."

From these definitions, it is clear that the advisory panel for the NALS understood that the use of printed and written information to accomplish tasks requires, as a prerequisite, certain knowledge and skills to make

such use possible. Strictly speaking, therefore, literacy is *not* "using printed or written material to function in society, etc" as given in the advisory panel's agreed upon general definition. Rather, literacy is the *prerequisite knowledge and skills* that make the use of printed and written materials possible.

As indicated above, the Stanovich checklists make possible the assessment of knowledge that is at one and the same time indicative of (1) the *extent of use* that one makes of printed and written materials, (2) the *knowledge* that one has derived from the use of these materials, and (3) the *added potential* for engaging in future literacy practices as a consequence of having a broader base of knowledge prerequisite for wide-ranging reading.

The simple checklists are indicators of the extent to which adults *have used* written or printed information in the past. By examining relations of the checklist scores to other information, such as number of years of education completed, occupational standing, and income, one should be able to estimate the degree to which printed materials may have been used as in the NALS definition, i.e., to function in society to achieve one's goals in education, work and economic standing.

The following study investigated the assessment of the knowledge component of adult literacy using telephone interviews as the mode of presentation, listening as the mode of reception, and the Stanovich checklists to assess aspects of the declarative knowledge base that are likely to be developed by reading. To evaluate the hypothesis that reading and listening converge on the same internal knowledge base, including language as a part of the knowledge base, a mail out survey was sent to a subset of the telephone survey sample and the correlations of scores obtained by reading the written survey and by listening to the telephone survey were computed.

To permit comparisons of the results of the telephone survey to the findings from other surveys of adult literacy, especially the NALS, the interview included questions to obtain data on the relationships of literacy knowledge (i.e., scores on the checklists) to factors that have been shown in the past to relate to adult literacy, including education, age, primary language, ethnicity, engagement in literacy practices (e.g, reading books, magazines, newpapers, etc.), intergenerational relationships of father's and mother's years of education to the respondent's literacy knowledge scores, occupational status, and income.

Method

Subjects

Data for this study were derived from telephone interviews with 538 adults residing in households that could be reached by listed or unlisted telephone in the larger San Diego, California metropolitan area. This included approximately 96 percent of all households. Sampling was conducted by using a Random-Digit-Dialing procedure designed to reach households without numbers listed in the telephone directory, due to unlisted numbers or newly listed numbers not yet printed, as well as households listed (Dillman, 1978, pp. 232-281; Frey, 1989, pp. 79-116). A sub-sample of those reached by telephone who agreed to participate was included in a mail-out, follow-up survey.

In the telephone interviews subjects reported averages of having lived in the San Diego area for 20.6 years (SD=15.5 years), having completed 14.5 (SD=2.6) years of education, being 41.0 (SD=16.0) years of age, earning a total household income of $34, 340 (SD=$12,240), and having an average of 3.0 persons (SD=1.8) in the household.

Similarity of the survey sample to U. S. Census data

The survey procedures resulted in a sample that matches 1990 U. S. Census data closely, with several notable exceptions. Table 1 shows statistics for the telephone and mail-out surveys and U. S. Census

[insert table 1 about here]

population parameters for the San Diego region. Telephone and mail-out samples of marital status, gender, age, and income were similar to census distributions. The telephone and mail-out sample data were skewed upward in educational attainment. The lowest level of of educational attainment is underrepresented and the highest level is overrepresented among the sample data in comparison to the census data. Because the less educated are likely to have lower scores on literacy assessments, the low numbers of less educated adults in the telephone and mail-out samples may bias population literacy estimates upward somewhat. Regarding ethnic distributions, whites are slightly overrepresented and minorities slightly underrepresented in the telephone and mail-out samples in comparison to the census data. There are, nonetheless, sufficient numbers of minorities to permit an estimate of literacy levels by ethnicity for this demonstration study.

Procedures

Telephone interviews

Interviewing was conducted by university students who had been trained for telephone interviewing for the project during the late spring and early summer, 1994. Subjects were called between 4:30 p.m. and 9:30 p.m. weekdays and between 9:00 a.m. and 9:30 p.m. on weekends. Interviewers introduced the survey to the person who answered the telephone, gained informed consent, and asked to speak to the adult (18 years of age or older) who had "the most recent birthday" as a method of selection among adults in the household. No substitutions were allowed so that interviewers frequently were required to call the household back in order to complete an interview with the appropriate respondent. Up to four callbacks were made to residential households and a response rate of approximately 50 percent was attained. Due to resource constraints, interviews were conducted only in English, a procedure that eliminated approximately 4 percent of households.

The telephone interviews provided an oral presentation of information which required the respondents to listen and respond from what they heard. Interviewers followed a protocol containing 63 questions, some with multiple sub-questions. About half of the questions were concerned with the assessment of literacy. The literacy-related questions were interspersed among other questions that were asked as part of another on-going research project conducted in the area of political science. Those questions and their responses are not included in this study. The average interviews required 27.7 (SD= 7.6) minutes to complete.

Mail-out survey

At the end of each of the telephone interviews, subjects were told: "My office may wish to contact people who have helped us in this project to ask a few more questions.by mail. May I include you on this list?" Subjects who responded affirmatively to the request (n=280) were then mailed a questionaire consisting of paper and pencil versions of the four literacy assessment checklists, a 26 item cloze test developed by Mikulecky & Diehl (1980, p. 78) that was used to assess the general literacy skills of employees in 100 occupations, with a scale for converting cloze raw scores to reading grade levels, and several items calling for demographic information.

Questionaires were sent under the university letterhead of one of the authors with a letter reintroducing the project and requesting that each subject "take a few minutes" to fill out the questionaire and return it to the research office. Two waves of mailouts were used, the first occuring 7-14 days following the initial telephone interview, and a follow up mailing to those who had not responded within 21-28 days. About 50 percent

(n=140) returned usable questionaires. From several small-scale pilot tests with subjects ranging from those enrolled in an adult basic education class to college graduates, it was estimated that 10-15 minutes would be needed to complete the written survey.

Instrumentation

As mentioned above, the telephone survey involved a number of questions that were not relevant to this study. Those that were relevant were demographic questions, including years of education, age, ethnicity, gender, English and other language use, occupation, and income. The appendix presents a list of additional questions that provide information similar to various categories of information obtained in the National Adult Literacy Survey (NALS).

The literacy knowledge checklists

For the sake of time, four abbreviated versions of the checklists used by West, Stanovich and Mitchell (WSM) (1993) were used in the telephone survey. The appendix shows the items used in the Author Recognition Test (ART) (Q26), the Magazine Recognition Test (MRT) (Q27), the Cultural Literacy Test (CST) (Q31) and the Vocabulary Recognition Test (VRT) (Q36).

For the ART, 10 actual author's names and 5 foil names taken from the 25 items in the WSM study were used. The items were chosen to give a good range of difficulties. Similarly, the MRT was comprised of 9 actual and 6 foils from the 25 items used by WSM. The CLT was made-up of 17 actual and 6 foils from the WSM list of 45 items, and 14 actual and 7 foils were taken from the list of 40 vocabulary items used by WSM. The foils for the VRT were pronounceable nonwords.

For each checklist, the score was the proportion of correctly identified real names or words minus the proportion of foils identified as being real names or words. For instance, if a person said "yes" to 10 of the 17 names of famous people on the CLT and to 2 of the 6 foils, the person's score for the CLT was (10/17) minus (2/6) or 58.8 minus 33.3 equals 25.5. The reason for the correction for guessing was to prevent people from simply saying "yes" to all items. The rationale and references regarding the scoring procedures are given in WSM (p. 38). The appendix shows the scores corrected for guessing for each item on the four checklists, along with corresponding data from WSM for those designated as "readers" and "nonreaders" (there were no scores provided for the vocabulary checklist in WSM).

Split-half, internal consistency (Spearman-Brown) reliabilities of the checklists ranged from .80 (MRT) to .88 (CLT). To increase the reliability of the checklists as measures of the knowledge component of literacy, a Total score was calculated made up of the full number of 50 actual and 24 foil names and words. The internal consistency reliability for Total literacy was .91. Table 2 presents test-retest, "alternate modalities," stability reliabilities for the Total score (.80) and each of the checklists, ART (.71), MRT (.67), CLT (.73), and VLT (.63), obtained under the telephone (listening) and mail-out (reading) conditions for 140 respondents. Thus, strong evidence of reliability, both in terms of internal consistency and test-retest, was present for each of the four scales and the total scale.

Engagement in literacy practices/print exposure

Questions were asked regarding the number of times in an average week the subject engaged in various literacy practices such as reading for pleasure newspapers, books, and newsmagazines or reading job-related materials for work (Q7;Q25). Question 25 also asked for frequencies per week that the person engaged in reading to a child or listening to someone read aloud. This is related to the interest in the intergenerational transfer of literacy, but in this case the interest was in the transfer of literacy from the respondents to their children.

Self report indicators of literacy competence

Two questions asked the respondents to rate their skills in reading in general (Q28) and reading to meet the requirements of their jobs (Q40). Self perceptions of skills were also obtained in questions that asked subjects whether they thought they could get a better job if they received additional training in reading and writing English (Q45) or in mathematics (Q46). Ratings of how respondent's competence in understanding what they read at work were obtained (Q30a,b,c,d,e). Additionally, indirect self-reported indicators of literacy skills were obtained in a series of questions about the extent to which the respondent received help from family or friends in reading and/or writing various materials (Q33a,b,c,d,e).

Intergenerational relationships

Two sets of questions provided information about subjects' childhood home influences on their present literacy. Questions 34 and 35 each asked for information about the subjects' literacy environments when they were in high school (e.g., Q34c. When in high school did you have more than 25 books in the home?) and

whether they had the same literacy resources in their homes at the time of the interviews. Information regarding the respondents' fathers' (Q53) and mothers' (Q54) years of education permitted the determination of the intergenerational relationships among parents' education levels and the subsequent education and literacy achievement of their adult children.

Results

The results of the mail-out survey in comparison to the telephone survey are presented first, to confirm the relationships among listening (telephone) and reading (mail-out) discussed above.

Listening and reading

Some 140 of the 538 adults reached in the telephone survey completed and returned a mail-out survey that contained the same knowledge checklists as used in the telephone survey. Analyses revealed that the mail-out subsample was slightly better educated than the full telephone sample (mean years of education=15.01, S.D.= 2.39 versus mean=14.53, S.D. = 2.62 for the total telephone sample). Respondents to the written version scored somewhat higher (mean percent correct for Total literacy = 61, S.D. = 23) than they did on the telephone survey (mean percent correct for Total literacy = 57; S.D. = 22)

Table 2 presents the correlations among the literacy knowledge checklists when completed by the same 140 subjects by listening in the telephone interview and some two to three weeks later by reading the mail-out survey. The underlined coefficients are the alternate modality, test-retest reliability scores resulting from correlating checklist scores obtained by listening to the telephone interview with the scores on the same items obtained by reading the mail-out survey. These correlations are in the range of those reviewed earlier establishing relationships among listening and reading. They indicate that adults who scored low, medium, or high on the checklists when listening in the telephone interview tended to maintain their relative rank orders two to three weeks later when they completed the checklists by reading on the mail-out survey.

[insert table 2 about here]

Validity coefficients are given in Table 2 as correlations of the checklist scores obtained by listening and by reading with the scores on the cloze test that was included in the mail-out survey. All the correlations among checklist and cloze scores were positive and statistically significant. The predictive validity coefficients for checklist knowledge and cloze scores, resulting from correlating checklist scores obtained by listening two

to three weeks before completing the cloze test on the mail-out survey, were only slightly lower than the concurrent validity coefficients obtained with the cloze tests and the written checklists when completed together on the mail-out survey.

The telephone survey results

Table 3 presents the correlations among key demographic variables, the checklists and a "practice" variable (e.g., How often during an average week do you read a local or national newspaper?) computed as the average of questions 25a-k (see appendix) . The practice variable is an indicator of "print exposure" and relates average frequency of weekly reading of different materials for various purposes to education, age, and the knowledge checklists. [insert table 3 about here]

In Table 3, the data from the telephone survey are presented above the diagonal, while for comparison purposes below the diagonal, data from West, Stanovich, & Mitchell (WSM) (1993) are presented . Overall, there is remarkable consistency between the findings of the telephone survey and the work of WSM. In both studies, education is positively related to the amount of knowledge of authors, magazines, famous people and vocabulary indicated by scores on the checklists.

Table 4 presents the means and standard deviations of Total literacy scores for six major demographic variables. The data of Tables 3 and 4 show positive correlations among demographic and literacy variables that have been consistently found in adult literacy assessments for over 75 years (Sticht & Armstrong, 1994). Better educated respondents scored higher than the less well educated, respondents with better educated parents scored better than those with less well educated parents, the majority group (whites) scored better than minorities (Hispanics, Blacks, Asians, others), managers and professionals performed better than clerical and sales persons, who, in turn, performed better than unskilled workers and laborers, those who earned more scored higher than those who earned less, and those who spent more time per week reading scored higher than those who read less. [insert table 4 about here]

Engagement in literacy practices/print exposure

The appendix presents mean scores and SD's for questions 7 and 25a-k dealing with respondent's estimates of the frequency with which they engaged in various literacy practices in a typical week. Overall, respondents reported that they read a newspaper 4.4 times a week (SD=2.8) (Q's 7 & 25g). Reading for pleasure (Q 25a)

was the most frequent reading practice (M=4.68; SD=2.50) while listening to someone read aloud was the least frequently engaged in weekly literacy practice (M=0.52; SD=0.74).

To obtain a summary indicator of the frequency of weekly engagement in literacy practices, the responses to questions 25a through k were summed and averaged. Table 5 presents these averages and SD's for various demographic groups. Generally, the trends for practice follow those for Total literacy (Table 4). As education (r=.34) , age (r=.08), occupational status (r=.17), income (r=.26), and father's education (r= .08) increase, the average frequency of weekly literacy practices increases (though the correlation of father's education and literacy practice were not significant at p<.09). Whites were slightly more likely to engage in literacy practices than nonwhites (r=.09).

[insert table 5 about here]

Questions 5A and 6 in the appendix present the average hours per day that were reported to be spent either watching television or listening to the radio. There was a significant, negative (-.14, p<.001) relationship among the number of hours of television watched and the average weekly literacy practice score. No relationship of radio listening to literacy practices was found. Neither television viewing nor radio listening were related to any of the literacy knowledge checklist scores.

Factor analysis of practice items

To better understand relationships of literacy practices to demographic and literacy knowledge variables, the items in question 25a through k were subjected to a principal components factor analysis and loadings were rotated to simple structure by varimax criteria. Table 6 lists the factor loadings greater than .30. The four factors extracted account for over 62% of the total variance.

[insert table 6 about here]

Practice 1 (News) groups the questions dealing with newspaper and magazine reading. Practice 2 (Job) groups the reading at work items. Practice 3 (Pleasure) groups the items pertaining to the reading of books and other materials for pleasure, while Practice 4 (Family) groups items that suggest literacy practices for parenting or social communication around the home.

The correlations of Table 7 provide information to aid in the interpretation of relationships among literacy practices and various demographic variables. For instance, literacy Practice 4 (Family) is significantly

and negatively related to age, suggesting that elderly adults do not read to or listen to children read very much; positively to gender, suggesting that females are more likely to read to others than are males; negatively to Latino status, suggesting that Latinos are less likely to engage in the types of reading in practice 4; and negatively to Total literacy, the Author Recognition Test, and the Vocabulary Literacy Test (VLT), suggesting that reading to or listening to children or others read aloud does not contribute much to the growth of knowledge or vocabulary as measured in the checklists. In all cases, however, these Practice 4 (Family) correlations are very low and do not appear to account for much variance in the variables examined.

[insert table 7 about here]

Interestingly, literacy Practice 3 (Pleasure), reading books or other things for pleasure is consistenty the highest correlate with the various literacy knowledge checklists. Literacy Practice 2 (Job) , reading on the job, is the only factor significantly related to both father's and mother's education. Literacy Practices 1 (News) and 3 (Pleasure) , reading newspapers, magazines and books for pleasure are positively related to age, while reading for work and for parenting are negatively related to age. This suggests that older people read more for pleasure and information, while younger people tend to read more for work and parenting. Women were less likely to read as much as men in the newspaper sections asked about in literacy Practice 1 (News) or the types of materials asked about on the job (Practice 2).

Self-report indicators of literacy competence

Questions concerning self-reports of literacy competence showed a positive manifold of significant correlations with literacy checklist scores in the expected directions. For instance, as Total literacy scores increased, respondents were more likely to say that they understood nearly all or all of what they read (Question 28 in the appendix, $r=.35$, $p \leq .001$), that their reading skills were adequate or more than adequate for their job (Q40, $r=.34$, $p \leq .001$), that reading or writing training in English would not help them get a better job (Q45, $r=.26$, $p \leq .001$), and that additional training in mathematics would not help them get a better job (Q46, $r=.21$, $p \leq .001$). Similar, though somewhat lower significant correlations were found with the four separate checklists. Those who engaged in more literacy practices (average of Q's 25a-k) rated themselves able to understand more of what they read (Q28, $r=.27$, $p \leq .001$).

The frequency of responses to the rating scales for question 28 indicated that 6.7 percent of respondents thought they sometimes had trouble understanding what they read, but four percent thought that their reading skills were either "not at all adequate" or "not as good as they should be" to do their job (Q 40).

Consistent with these positive self-perceptions of reading skills, question 33 asked respondents to estimate how often they had help from family members or friends in accomplishing a variety of literacy practices and most reported that they never had any help. However, when it came to dealing with government, business, medical , etc. agencies or personnel, about 15 percent reported that they got help on a monthly basis from friends or relatives. Less than 2 percent reported receiving help on one or another literacy practice on a daily basis.

Despite these generally optimistic ratings of reading ability, there were some indicators that many respondents may have had a low sense of security about their reading abilities. Over 10 percent disagreed or strongly disagreed that they could read well enough to do their jobs well even when there were distractions (Q 30d), and almost one in ten (9.4 percent) disagreed or disagreed strongly that they could read well enough to do their job when under pressure to meet a deadline (Q 30e).

Many seemed to place a high value on being able to read better than they do. One in six (14.4 percent) thought they would get more respect at work if they understood what they read better (Q30a). One in five (19.4 percent) thought they would be able to do a better job if they could read better (Q30b), and one in eight (13.1 percent) thought they could earn more money if they could read better (Q30c).

Intergenerational relationships

Father's education was positively and significantly related to Total literacy ($r=.10$, $p\leq .03$), MRT ($r=.14$, $p\leq .002$), VLT ($r=.11$, $p\leq .014$), and literacy practice 3 (reading on the job) ($r=.20$, $p\leq .001$). Table 4 shows the means and SD's on Total literacy by levels of father's education, while table 5 shows the means and SD's for father's education levels and total practice (average of Q's 25a-k) score. Mother's education was positively and significantly related only to MRT ($r=.18$, $p\leq .002$) and literacy practice 3 (reading on the job) ($r=.13$, $p\leq .002$).

Establishing Literacy Levels

Both the Armed Services and the National Adult Literacy Survey have cast distributions of scores on literacy assessments into five levels of proficiency to identify groups of the least to the most proficient literates (Sticht & Armstrong, 1994). Similarly, then, to illustrate the feasibility of that widely used approach in the present case, the results of the telephone survey were cast into five levels of proficiency using Total Literacy scores.

The five levels were obtained using the mean (45) and standard deviation (25) of the percent correct scores for the Total Literacy distribution. Literacy levels were defined from low to high proficiency as: Level 1= scores at -1.0 SD or lower (0-20), Level 2= scores between -.5 to -1.0 SD (21-32), Level 3= scores between ± .5 SD (33-58), Level 4= scores between +.5 to +1.0 SD (59-70), and Level 5= scores from +1.0 SD and above (71-100).

Table 8 gives the percentage of the telephone sample that fell into each of the five levels for the full sample as well as for various groups within several demographic variables. For comparison purposes data are presented showing the percentage of cases under the portions of the normal curve that were used to define the five literacy levels, the percentage of cases falling within each of the Armed Service's five categories for the Armed Forces Qualification Test (AFQT) based on the 1980 renorming of the Armed Services Vocational Aptitude Battery (Eitelberg, 1988, p. 101), and the percentage of cases falling within each of the five literacy levels defined by the National Adult Literacy Survey (NALS) (Kirsch, et. al, 1993). It should be noted that the Armed Services label their five levels from 5 as the lowest to 1 as the highest proficiency. Here we have reversed the numbers to be consistent with the present survey and the NALS. Also, to represent the NALS, we used the median percentage for each level for the three scales of prose, document and quantitative literacy.

(insert Table 8 about here)

Given the vast differences in materials, tasks, contexts, samples, and procedures for scoring and grouping people, there is little reason to expect any great similarities among the telephone survey, the AFQT and the NALS in terms of the percentages of cases that fall into each of the five levels. Table 8 confirms that there is little similarity. This is a point for discussion later on.

The demographic data indicate that the less well educated, the young, nonwhites, and workers in less skilled occupations are over-represented in Level 1 in comparison to the total distribution of scores in the five categories. More females than males are found in the higher levels of literacy.

Discussion

This research was motivated by the interest being increasingly shown by government agencies in finding more cost-effective ways to assess adult literacy proficiency than the use of expensive door-to-door surveying and testing procedures (Reder, 1994; Neice,Adsett, & Rodney, 1992). Therefore, we set out to answer a fairly simple and straightforward question. Can we assess adult literacy proficiency by telephone? Based on the results reported above, we believe the answer is, yes.

The results of the telephone and mail out surveys confirm previous research in showing strong relationships among listening and reading when the task demands due to differences in modalities are kept to a minimum (Sticht, Hooke, & Caylor, 1981; Sinatra, 1990). For the telephone and mail out surveys, the correlation of .80 obtained with the Total literacy scores and the slightly lower correlations, ranging from .63 to .73 for the separate, brief checklists, indicates that people tended to fall in similar rank order positions regardless of whether they had responded to the checklists by listening over the telephone or by reading them in written form. Therefore, by assessing people's relative knowledge by listening, we can infer quite closely the relative knowledge they would exhibit by reading.

Costs of telephone vs. door-to-door surveys

In addition to sponsoring the collection of academic skill achievement data by direct testing in the United States, the National Center for Education Statistics (NCES) also has an office for conducting telephone surveys. According to Dr. Kathryn Chandler of the NCES, costs per interview by telephone are a fraction, certainly less than a fourth, of the costs of conducting door-to-door interviews (Chandler, 1994, personal communication). Chandler estimated that a sample of 6,000 telephone interviews with adults might easily be achieved for less than $1 million. This suggests that to interview a national representative sample of 13,600 adults, with an oversampling of Black and Hispanic households, as was done in the NALS (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993, p. 5), the cost would be around $2 million or less. This compares with the approximately $10.85 million cost of obtaining the national sample for the NALS.

Does the telephone survey method provide as useful information as obtained with the door-to-door survey method?

The differences in the estimates of the cost of telephone and door-to-door assessments, the simplicity of the telephone survey of literacy methodology, and the high correlation of listening with reading in the telephone and mail out samples, support the use of the telephone survey and checklist methodologies as a *cost-effective* way to assess adult literacy.

However, the concept of *cost-effectiveness* requires that both the *cost* and the *effectiveness* of some alternative methods for achieving the same or at least very similar outcomes be considered. There is no question that the telephone survey methodology is a lower cost approach to interviewing than door-to-door canvassing. But many may question whether the checklist methodology is superior to the actual performance of literacy tasks, as in the National Adult Literacy Survey (NALS), for usefully characterizing the literacy of the adult population.

But this raises the very important question of just what it means to "usefully characterize" the literacy of the adult population. Why try to do this at all? Indeed, some have argued that it cannot be done. Following a review of six major books on adult literacy published during 1979-1990, Kazemek (1990) expressed his opinion that "...attempts at defining "ability levels" and "norms" are not only futile but potentially dangerous as well. How can we possible arrive at acceptable definitions of literacy when there are countless life goals, needs, and desires among the adult populations? Realistically we cannot, but in our attempts to do so we usually produce reductive lists, scales, and criteria... which are then used to categorize large segments of the population, often in detrimental ways" (p. 56).

Despite such strongly held doubts by scholars regarding the feasibility of defining and assessing adult literacy (see also papers in Venezky, Wagner, & Ciliberti, 1990), the U. S. Congress passed the Adult Education Amendments of 1988 that required the U. S. Department of Education to submit a report to Congress on the definition of literacy and then to report on the nature and extent of literacy among adults in the nation (Campbell, Kirsch, & Kolstad, 1992, p. 2.). With the aid of a national advisory board, the National Center for Education Statistics (NCES) agreed upon the definition of literacy and the three literacy scales discussed earlier in this paper. Then in September of 1989 the NCES awarded a four-year contract to the

Educational Testing Service to conduct a nationally representative household sample survey to assess the literacy skills of the adult population of the United States.

The report of the design of the NALS stated that "Results from the National Adult Literacy Survey will provide policymakers, business and labor leaders, educators, researchers, and citizens with vital information on the condition of literacy in the United States that is not currently available from the frequently administered school-based surveys (Campbell, Kirsch, & Kolstad, 1992, pp. 2,3.)." The report goes on to outline several informational products that the NALS would provide. For the present purposes, this provides a list of outcomes, or "benefits" that the NALS was intended to provide. This makes it possible to conduct a cost-effectiveness analysis to determine if the same outcomes or "benefits" as were produced by the NALS can also be obtained by the telephone survey approach.

The following discussion first states the informational products that the NCES survey design report said the NALS would provide. This is followed by a discussion of what the NALS and the telephone survey method provide for the informational product under consideration. The NCES survey design report stated that the NALS would do the following.

1. Describe the levels of literacy demonstrated by the total adult population as well as by adults comprising various subgroups, including those targeted as "at risk."

What the NALS did was develop three groups of tasks called prose, document and quantitative literacy, administer the tasks to samples of adults, use the tasks to scale both the adults' literacy proficiencies on each of the three scales and the difficulty levels of the tasks using item response theory. The difficulty level of each task was defined as the level of literacy needed to have an 80 percent probability of being able to perform the task. The NALS defined five levels of literacy proficiency using ratings of features of the tasks that included such things as the type and amount of information that had to be searched during the task performance (Mosenthal & Kirsch, 1994). On a scale ranging from 0 to 500, Level 1, the lowest level of literacy included tasks scaled from 0 to 225 in difficulty, Level 2 tasks ranged from 226 to 275, Level 3 tasks ranged from 276 to to 325, Level 4 from 326 to 375, and Level 5 from 376 to 500.

People were assigned to each level based on their proficiency scores. For instance, people designated as having skills in Level 1 were there because they had an 80 percent probability of being able to perform the

average tasks in that level (tasks rated about 200 in difficulty). Level 2 people were those who could perform 80 out of a hundred of the average tasks in Level 2 and so forth. Table 8 shows the percentage of the adult population (age 16 and older) that was placed in each of the five levels of literacy proficiency following the NALS procedures.

How well do these procedures characterize the literacy skills of adults? It all seems very arbitrary. First, the decision to scale adults' literacy proficiency and tasks using a probability of .80 of being able to perform a given task is arbitrary. Why not 70 percent or even 60 percent? This would drastically change the outcomes of the analyses.

Second, the decision to assign people to five levels of literacy proficiency based on their being able to perform 80 percent of the average tasks at a given level means that any competence to perform at higher levels was not "credited" to the adults. For instance, people who scored on the average in Level 1 could also perform fifty percent of Level 2 tasks, 25 percent of the Level 3 tasks, 20 percent of the Level 4 and one in six of the Level 5 tasks. This seems to leave plenty of room for uncertainty about just what *the* literacy levels of adults "really" are.

The telephone survey methodology also permits people to be assigned to levels, as indicated in Table 8. By using means and standard deviations to establish level boundaries, all the arbitrary decisions regarding the probability figures for task performance are eliminated. Further, all other available test information that is based on normal curve statistics, such as the Armed Services Vocational Aptitude Battery, various IQ tests, the Scholastic Achievement Tests, etc., becomes relevant to interpreting the telephone survey data.

2. Characterize the demonstrated literacy skills in terms of demographic and personal background information.

Major demographic data collected by the NALS were also collected in the telephone survey (see Tables 3,4, and 5). In both assessments, literacy proficiency is positively and consistently related to education, age, ethnicity, income, occupational status, father and mother's education, and extent of engagement in literacy practices such as newspaper and magazine reading. These same relationships have been reported for the last 75 years in every major mass assessment of adult "intelligence," "aptitude," or "literacy" (Sticht & Armstrong, 1994). These types of demographic/practice data are obtained at much less cost by the telephone survey.

3. Characterize the work force of the country with respect to demonstrated literacy skills and activities reported by individuals in various occupational categories.

The NALS and telephone surveys both characterize the literacy proficiencies and practices of adults in major occupational groups. Both surveys produce similar results: laborers are not as proficient as clerical workers who are not as proficient as managers and professionals. These findings have been consistently found in numerous adult literacy assessments since the introduction by the U. S. Army of mass testing during World War I (Sticht, & Armstrong, 1994). The telephone survey method collects occupational data much less expensively than the door-to-door survey method.

4. Provide an increased understanding of the skills and knowledge associated with functioning in a technological society.

When the NALS research report directly raised the most important question about literacy and functioning in our technological society, the question that must have motivated the U. S. Congress to ask for the survey in the first place, and the question surely of most interest to corporate America, labor unions, adult educators, and adults themselves, the answer was, at best, disappointing. The report asked, "Are the literacy skills of America's adults adequate? That is, are the distributions of prose, document, and quantitative proficiency observed in this survey adequate to ensure individual opportunities for all adults, to increase worker productivity, or to strengthen America's competitiveness around the world (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993, p. xviii)? "

The NALS authors then went on to answer the question. "Because it is impossible to say precisely what literacy skills are essential for individuals to succeed in this or any other society, the results of the National Adult Literacy Survey provide no firm answers to such questions (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993, p. xviii)."

In short, the most important question from a policy point of view was not answered by the NALS. The authors went on to discuss the relationships of being in the lower literacy levels (which, it should be reiterated, were not so much "observed" as they were "created" by the many arbitrary decisions made in the survey study) to one's social standing as indicated by more limited occupational opportunities, income, and so forth. From this readers were invited to make inferences about how lower literacy skills may tend to limit one's functioning

in society. But all of these same relationships are readily studied by the telephone survey methodology at a much lower cost.

There is some reason to argue that the assessment of knowledge (by checklists and/or other methods) is a more useful method for characterizing the "skills and knowledge associated with functioning in a technological society." The NALS study in its definitions of prose, document and quantitative literacy and numerous other studies of reading have concluded that high levels of "prior" or "background" knowledge about what one is to read is a prerequisite for comprehending at a high level. Recht & Leslie (1988) found that low reading ability (≤ 30th percentile) fifth grade students with a lot of prior knowledge about baseball were able to read, recall, and summarize information from passages about baseball better than higher ability (≥ 70th percentile) readers. In this case, high relevant knowledge offset a 30 percentile difference in general reading "skill."

Sticht et al (1986) found that U. S. Navy personnel with high background knowledge about the U. S. Navy were able to comprehend at a 70 percent correct level with 6th grade reading skills, as measured by a general reading test, while personnel with little background knowledge needed to be reading at the 11th grade level to achieve 70 percent comprehension. In this case, high relevant knowledge offset a five "year" difference in reading grade level of "skill."

These studies of special knowledge support the idea that those with vast bodies of knowledge, perhaps made up of many interconnected smaller bodies of "special" knowledge, will be able to perform the broad range of tasks called for in the NALS and in a literate, technological society in general better than those with more limited knowledge bases. Indeed, the vocabulary and other literacy checklists used in the telephone survey were designed to be especially sensitive to knowledge that might be gained by wide-ranging reading. That being the case, then such knowledge is likely to be predictive of those who will be better able to perform well on a wide range of literacy tasks enounterd in our literate society, including those of the NALS. The correlation between these two types of assessments is not known, but because the literacy checklists are correlated with years of education, and years of education is correlated with performance on the NALS, then we can infer that performance on the checklists is correlated with the NALS, and vice versa.

It is also likely that assessments of knowledge will better predict the performance of "real world" literacy tasks better than will the NALS-type scales. For this reason, the Armed Services have spent decades and tens of

millions of dollars on the Armed Services Vocational Aptitude Battery (ASVAB). This test battery consists of ten tests, all of which require some reading and eight of which are tests primarily involving general and special vocabulary and conceptual knowledge (e.g., knowledge of geometry, electronics, automobiles, etc.) (Sticht, & Armstrong, 1994, pp. 31-39). These tests are used to select applicants for military service and to predict who will be most likely to succeed in different kinds of technical training and jobs. This supports the position that knowledge assessment can serve to identify those who can use printed and written materials to function in society, at least in the high-technology world of the armed services.

A final point to be made regarding the usefulness of the telephone/ knowledge checklist methodology for assessing adult literacy in relationship to functioning in a technological society concerns the differences between the findings of the NALS and the telephone survey with older adults. As discussed earlier, in the NALS, averaged across the prose, document, and quantitative scales, adults' literacy performance increased from age 16 to age 54. Then it dropped a full standard deviation for those 65 and older, and fell well below the levels of the youngest adults (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993, p. 31).

On the telephone/checklist survey, Total literacy scores increased from age 16 to 64 and then dropped a half a standard deviation at age 65+ (see Table 4). However, they remained a full standard deviation above the scores for the young adults. This suggests that declarative knowledge may grow over most of the adult lifespan and remain at fairly high levels above age 65. This is consistent with a large body of research on "verbal intelligence" suggesting that "crystallized intelligence," i.e., breadth of declarative knowledge, grows and is sustained over the lifespan of adults (Kimmel, 1990, pp. 183-186).

The differences between the NALS and the telephone survey for the older adults may reflect the differences between the load on working memory that the NALS tasks impose. Given the general decline in working memory of elderly adults, the NALS may underrepresent their literacy competence by imposing demands on working memory in the context of a possibly stressful test situation that the elderly would not encounter in their day-to-day lives. Given the relative permanence of printed documents, older adults may be able to perform a much broader range of tasks in our technological society than the NALS would suggest because they can be selective in the tasks they encounter and they can carefully study, read and reread materials to bring their high levels of knowledge to bear in making sense of the materials.

5. Interpret the findings related to information-processing skills and strategies in a way that can inform curriculum decisions pertaining to the education and training of adults.

Not surprisingly, the NALS survey results and methdology have led some to suggest that adult basic skills programs should be geared to improving adults' skills in prose, document and quantitative (PDQ) literacy (Mosenthal & Kirsch, 1994). Indeed, the Educational Testing Service has an interactive video, computer-based instructional series under development that would teach such skills. After a small pilot study with a group of some 10-12 adult basic skills students who worked on a brief (about 40 hours) document literacy instructional program, the class averaged a gain of 7.78 scale score points (about .17 standard deviations) on a NALS-like test of document literacy. But the adult students made three to four times as much gains on prose and quantitative literacy tests as on the document literacy tests. This led the instructor who administerd the pilot course to observe that, "The gains were interesting considering the PDQ curriculum did not include instruction in these skills." (Orr-Holley, 1992, p. 1).

This raises questions about the validity of the three scales as distinct scales as claimed by the NALS/NCES developers. Others who have analyzed the NALS data have concluded that there are high intercorrelations among the three scales (around .90+) (Reder ,1994) and that the results of factor analysis (Salganik & Tal, 1989) suggest that the three scales are not really providing any different, unique information and that they overlap considerably. The results of the pilot instructional program would seem consistent with this point of view.

When asked how it was that they made such improvements in the document literacy program, some students commented, "it refreshed my thinking skills" ;"it made me remember some of my ways of reading and comprehending" ; "I got practice in taking tests by the end (of the course)"; "...all we did was read! I haven't read this much since I've been out of school!"; "The computer lessons made me think of questions and making sure I did what it asked me. That helped me read that other (prose) test better this time"; and "I think that I read faster now" (Orr-Holley, 1992, p. 1).

From the comments, it seems that most of the gains in the document literacy pilot program were perceived by the students to result from re-learning or practicing what they had earlier learned to do in school.

In other words, they seem to think that they had simply brushed up their existing competence, rather than having developed new competence. This type of "warm-up" effect has been found in numerous adult literacy programs that report making one or two "years" of gain in anywhere from 2 to 10 hours of practice (Sticht, 1987).

The theory behind the knowledge-based approach to literacy assessment used in the telephone survey is the practice-engagement theory of literacy development (Reder, 1994; Stanovich, 1993). This theory holds that by engaging in extensive practices involving reading of a wide-ranging nature literates build vast bodies of knowledge (both declarative and procedural) and automaticity of word recognition that in turn make it possible to engage in and successfully complete a large number of literacy tasks.

Consistent with practice-engagement theory, Krashen (1993) reviewed 41 studies comparing free, voluntary reading to traditional reading instruction and reported that 16 showed free reading to be superior to traditional reading instruction in improving reading scores, 22 showed no differences between the two methods, and only 3 showed that traditional reading instruction is superior to wide-ranging reading. The longer the students engaged in free, voluntary reading, the more they improved in tests of reading, writing, and spelling over the traditional approach to reading instruction.

This suggests one simple recommendation for curriculum development for adult literacy programs from the telephone/checklist mthodology. To help people develop large bodies of knowledge and hence to become highly literate, literacy programs should arrange conditions that will encourage students to engage in extensive, wide-ranging reading over long periods of time.

Conclusions

From the foregoing it appears that the telephone survey method can provide all of the same five informational products that the NALS was designed to provide. However, the NALS sample included recent immigrants and longer term residents who did not speak English while the present demonstration research did not. That is one reason why the NALS has so many people in Level 1 (Table 8) . Many of the non-English speaking adults were unable to perform most of the NALS tasks and were assigned scores through estimation techniques that placed them in Level 1. This procedure, could, of course, be carried out with telephone surveys.

One would simply assign a score of zero to non-English speaking respondents and this would place them in Level 1 of the telephone survey.

Alternatively, the telephone survey could be conducted in the major languages of non-English speakers, primarily Spanish. Because of the simplicity of the checklist knowledge assessment methodology, various checklists sensitive to various cultural backgrounds could be easily developed and administered to estimate adults' literacy in their native language. Pilot studies with Chinese immigrants showed that the longer they are in the west, the more likely they are to know more of the information on the various checklists. This suggests that the checklist methodology might offer a good measure of acculturation.

The NALS utilized item response theory (IRT) methods to scale tasks for difficulty. This permits the compilation of multiple forms of assessments with known psychometric properties without the need to develop new norms everytime a new assessment is needed. It also permits the determination of the probabilities that persons with literacy ability levels established on the same scale that the items have been scaled on will be able to perform each of the various items. While IRT scaling was not used in the telephone survey/checklist approach in this demonstration study, there is no reason in principle while this could not be accomplished.

Finally, in regard to what these types of surveys accomplish, it should be noted from Table 8 that years of education alone does not accurately portray the literacy abilities of the adult population. Accepting reports of years of education completed as an indicator of adult literacy understates the problem of adults with lower levels of literacy. Fagan (1994, p. 268) notes that surveys such as the NALS or the telephone/checklist serve the generally useful purpose of keeping the issue of adult literacy visible to policymakers, business and industry leaders, labor unions, educators and adults themselves who may be stimulated to seek additional literacy development.

Perhaps the relatively low-cost of the telephone/checklist survey methodology will stimulate governments or businesses to monitor adult literacy development more closely and provide the resources needed to help more adults achieve the rewards of higher literacy. This may also be a cost-effective way to help the public schools be more effective. Through the intergenerational transfer phenomenon, an investment in the education of adults may produce returns in the educability of the adults' children.

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Appendix A

Items from the telephone survey relevant to the assessment of adult literacy.

Item	X	SD	N
Q5A. On an average day about how many hours do you watch television?	2.47	1.69	529
Q6. On an average day about how many hours do you listen to radio?	2.68	2.93	533
Q7. In an average week about how many times do you read a newspaper?	4.40	2.76	534
Q25. How often during an average week do you do each of the following:			
a. Read something for pleasure?	4.68	2.50	528
b. Read something because your job requires it?	3.37	2.80	524
c. Read a book to a child?	0.64	0.83	529
d. Read a book for pleasure?	3.10	2.78	527
e. Read letters?	0.91	0.73	527
f. Read a newsmagazine?	0.79	0.67	528
g. Read local or national news in a newspaper?	4.38	2.77	529
h. Read the sports section of a newspaper?	2.38	2.91	529
i. Read the editorial section of a newspaper?	2.69	2.85	529
j. Listen to someone else in your household read aloud?	0.52	0.74	529
k. Read books or manuals to help you do your job?	2.34	2.51	523

Author Recognition Test (ART)

Q26. I will now read you a list of names. Some of the people in this list are popular writers of books, magazines and/or newspaper columns, and some are not. Please just tell me if you recognize each one as a writer. Please do not guess. (10 real/5 foils) Data are percent of respondents saying "yes" to each name. WSM= West, Stanovich, & Mitchell (1993, pp. 35-50).

				Data from WSM	
	X	SD	N	Reader	Nonreader
a. Andrew Greeley	0.26	0.44	498	0.48	0.23
b. Irving Wallace	0.50	0.50	501	0.69	0.33
c. Nancy Roser (foil)	0.05	0.22	490	0.02	0.00
d. James Clavell	0.44	0.50	502	0.65	0.32
e. Isabel Beck (foil)	0.14	0.35	494	0.01	0.03
f. Louis L'Amour	0.64	0.48	515	0.69	0.43
g. Robert Tierney (foil)	0.20	0.40	491	0.02	0.03
h. Judith Krantz	0.58	0.49	509	0.77	0.48
i. F.E. Bryant (foil)	0.13	0.34	494	0.00	0.02
j. James Michener	0.66	0.47	516	0.90	0.65
k. Sidney Sheldon	0.82	0.39	517	0.88	0.75
l. Gerald Duffy (foil)	0.09	0.29	494	0.01	0.03
m. J.R.R. Tolkien	0.58	0.49	506	0.80	0.57
n. Joseph Wambaugh	0.49	0.50	512	0.63	0.29
o. Bob Woodward	0.43	0.50	502	0.73	0.36

Magazine Recognition Test (MRT)

Q27. I will now read you a list of magazine names. Some of the names are real magazines, and some are not. Please listen to the names and tell me if you recognize each as an actual magazine. Please do not guess. (9 real/6 foils). WSM= West, Stanovich, & Mitchell (1993, pp. 35-50).

	X	S D	N	Data from WSM Reader	Nonreader
a. Harper's Magazine	0.73	0.45	517	0.77	0.52
b. Gentlemen's Quarterly	0.66	0.47	515	0.73	0.53
c. Fitness Today (foil)	0.46	0.50	489	0.26	0.36
d. American Journal Review (foil)	0.35	0.48	486	0.04	0.08
e. New Yorker	0.79	0.41	517	0.89	0.69
f. Trends American (foil)	0.10	0.31	478	0.00	0.02
g. Ladies Home Journal	0.81	0.39	516	0.92	0.79
h. Scientific American	0.53	0.50	505	0.61	0.43
i. Town & Country	0.75	0.43	508	0.72	0.54
j. Health & Life (foil)	0.22	0.42	483	0.09	0.15
k. Psychology Today	0.72	0.45	513	0.83	0.67
l. Outdoor Times (foil)	0.27	0.45	484	0.05	0.09
m. Esquire	0.90	0.31	520	0.98	0.83
n. Forbes	0.81	0.39	520	0.95	0.81
o. Motor Sports (foil)	0.24	0.43	481	0.08	0.12

Q28. Many people tell us that they have difficulties in understanding what they read. In general, would you say that you sometimes have trouble understanding what you read (1 point), you understand most of what you read (2 points), you understand nearly all you read (3 points), or you understand all you read (4 points) ? (Don't know/Not applicable (code as 9).

				Frequency (%)			
				1	2	3	4
Average rating:	2.95	0.88	522	6.7	21.5	41.8	30.1

Q29. How connected would you say reading ability is to how well you do your job at work? Not at all connected (1), not very connected (2), somewhat connected (3), very connected (4). (Don't know/Not applicable (code as 9).

				Frequency (%)			
				1	2	3	4
Average rating:	3.53	0.80	4.71	4.5	6.2	21.4	67.9

Q30. For each of the following statements, just tell me whether you agree strongly (1 point), agree (2 points), disagree (3 points), disagree strongly (4 points). (Don't know/Not applicable (code as 9).

				Frequency (%)			
				1	2	3	4
a. If I understood what I read better, I would get more respect where I work.	2.51	0.88	452	14.4	31.6	42.3	11.7
b. If I understood what I read better, I would be able to do better at the job.	2.36	0.91	454	19.4	35.7	34.4	10.6
c. If I understood what I read better, I would be able to earn more money.	2.50	0.83	457	13.1	32.4	45.7	8.8
d. I can understand what I read well enough to do my job well even when there is a lot of distraction.	1.82	0.61	467	29.1	60.4	10.1	0.4
e. I can understand what I read well enough to do my job well even when I am under a lot of pressure to meet a deadline.	1.80	0.60	468	29.5	61.1	9.2	0.2

Cultural Literacy Test

Q31. I will now read you a list of names of persons. Some of the people in this list are popular famous persons, and some are not. Please listen to each name and tell me if you know the person to be famous. Do not guess. (17 real/6 foils). WSM= West, Stanovich, & Mitchell (1993, pp. 35-50).

				Data from WSM	
	X	S D	N	Reader	Nonreader
a. Ingmar Bergman	0.73	0.44	511	0.95	0.78
b. John Gottman (foil)	0.11	0.31	485	0.02	0.03
c. Steve Biko	C 12	0.32	485	0.46	0.23
d. Harry Houdini	0.90	0.30	514	0.93	0.75
e. Paul Cezanne	0.41	0.49	497	0.64	0.26
f. Marie Curie	0.71	0.45	509	0.88	0.65
g. Dale Blyth (foil)	0.05	0.23	479	0.02	0.01
h. Jean Jacques Rousseau	0.57	0.50	505	0.51	0.34
i. Enrico Fermi	0.30	0.46	493	0.55	0.26
j. Darwin Muir (foil)	0.15	0.35	483	0.01	0.00
k. Carlos Fuentes	0.33	0.47	493	0.31	0.15
l. George Gershwin	0.84	0.37	510	0.98	0.82
m. Reinhold Klieger (foil)	0.09	0.29	482	0.02	0.01
n. Rosa Parks	0.56	0.50	500	0.57	0.35
o. Margaret Mead	0.69	0.46	508	0.87	0.64
p. Miriam Sexton (foil)	0.12	0.32	482	0.02	0.02
q. Georgia O'Keefe	0.46	0.50	496	0.64	0.43
r. Sylvia Plath	0.25	0.44	488	0.39	0.13
s. Cole Porter	0.73	0.44	509	0.92	0.69
t. Walter Raleigh	0.65	0.48	505	0.76	0.54
u. W. Patrick Dickson (foil)	0.10	0.30	484	0.00	0.02
v. Margaret Sanger	0.37	0.48	493	0.43	0.22
w. Greta Garbo	0.90	0.30	516	1.00	0.88

Q. 33. In general, how frequently do family members or friends help you with the following activities? Never (0), annually (1), monthly (2), weekly (3), daily (4). (Don't know/Not applicable (code as 9).

				Frequency (%)				
				0	1	2	3	4
a. Filling out forms	0.58	0.91	517	64.4	19.9	10.3	4.4	1.0
b. Reading or explaining newspaper articles or other written information	0.52	0.95	521	72.0	11.9	8.8	6.7	0.6
c. Dealing with government agencies, public companies, business, medical personnel, etc.	0.70	0.94	514	56.6	23.3	15.0	3.9	1.2
d. Writing notes and letters	0.44	0.96	518	79.0	7.1	6.6	5.6	1.7
e. Helping you with things you need to read at work	0.29	0.77	479	85.0	6.1	5.2	2.7	1.0

Vocabulary Literacy Test (VLT)

Q36. I will now read you a list of vocabulary words. Some of the words in this list are real words, and some are not. Please listen to the words and tell me if you know the word to be real. Please do not guess. (14 real/7 foils). WSM= West, Stanovich, & Mitchell (1993, pp. 35-50).

	X	S D	N	Data from WSM Reader Nonreader
a. absolution	0.77	0.42	507	Not reported in WSM
b. arrate (foil)	0.30	0.46	496	
c. nitrous	0.71	0.45	512	
d. audible	0.90	0.30	513	
e. ceiloplaty (foil)	0.06	0.24	476	
f. comectial (foil)	0.05	0.22	472	
g. confluence	0.53	0.50	494	
h. connote	0.53	0.50	498	
i. polarity	0.84	0.37	516	
j. disconcert	0.80	0.40	506	
k. ineffity (foil)	0.18	0.38	483	
l. nuance	0.74	0.44	510	
m. irksome	0.65	0.48	503	
n. ubiquitous	0.61	0.49	504	
o. metention (foil)	0.09	0.28	481	
p. neotatin (foil)	0.11	0.31	481	
q. purview	0.44	0.50	490	
r. nonquasity (foil)	0.13	0.33	481	
s. optimize	0.85	0.35	513	
t. eventuate	0.48	0.50	491	
u. epicurean	0.57	0.50	500	

Q40. In terms of what is required for your occupation, how would you rate your own reading skills? Not at all adequate (1), not as good as should be (2), adequate for job (3), more than adequate (4). (Don't know/Not applicable (code as 9)).

				Frequency (%)			
				1	2	3	4
Average rating:	3.52	0.58	499	0.4	3.0	41.1	55.5

Q45. Do you think you could get a (better) job if you received additional training in reading or writing English? (1=yes; 2=no) (9=Don't know/Not applicable).

				Frequency (%)	
				1	2
Average rating:	1.67	0.47	483	33.3	66.7

Q46. Do you think you could get a (better) job if you received additional training in mathematics? (1=yes; 2=no) (9=Don't know/Not applicable).

				Frequency (%)	
				1	2
Average rating:	1.62	0.49	484	37.8	62.2

Table 1. Comparison of the San Diego telephone and mail out samples with the 1990 U. S. Census figures for San Diego County.

Variables[a]	San Diego Survey Sample Telephone	Mail Out	U. S. Census
Marital Status	(519)	(137)	
Single	30.4	24.8	30.2
Married	52.0	54.7	51.8
Separated/Other	2.0	1.6	2.5
Widowed	6.2	8.0	5.6
Divorced	9.4	10.9	10.0
Household Income	(478)	(131)	
Under $10,000	9.0	6.1	6.8
$10,000-49,999	59.6	59.5	56.5
Over $50,000	31.4	34.4	36.7
Age	(512)	(137)	
18-24	15.4	12.4	17.8
25-34	23.6	21.2	26.4
35-44	27.7	26.3	20.1
45-59	17.8	23.4	16.4
60-64	3.3	2.2	4.7
65+	12.1	14.6	14.4
Education[b]	(517)	(135)	
0-11/Not HS	4.8	2.2	18.1
12/Completed HS	20.7	20.7	22.8
13-15/Some Coll.	35.4	33.3	25.6
16/AA or BA	18.0	17.0	24.7
17+/More	21.1	26.7	8.8
Race/Ethnicity	(520)	(137)	
White	72.9	82.5	65.6
Black	4.6	3.6	6.0
Asian	5.4	5.1	7.5
Other	3.5	1.5	0.0
Hispanic-All	13.7	7.3	20.0
Gender	(522)	(138)	
Male	47.9	44.2	50.9
Female	52.1	55.8	49.1

[a] Numbers are percentages of the samples and 1990 U. S. Census with the characteristics listed. [b]Education categories are codified differently for sample and census data, with sample data matched as closely as possible to census categories. Labels for sample data precede labels for census data for education. Numbers in brackets are total numbers for samples for a given characteristic

Table 2. Correlations of checklist literacy scores on the telephone survey (listening) with scores on the mail out (reading) survey.

	Reading					
Listening	1	2	3	4	5	6
1. Total Literacy	.80	.71	.64	.74	.62	.38
2. ART	.67	.71	.50	.60	.43	.29
3. MRT	.63	.51	.67	.57	.39	.31
4. CLT	.71	.59	.55	.73	.53	.36
5. VLT	.59	.51	.35	.51	.63	.30
6. Cloze	.39	.34	.41	.34	.31	1.00

Total Literacy= scores summed over the four checklists; ART=Author Recognition Test; MRT=Magazine Recognition Test; CLT= Cultural Literacy Test; VLT=Vocabulary Literacy Test. *=Not significant; all others significant beyond $p < .01$. Underlined r's are alternate modality, test-retest reliability coefficients. N's ranged from 135-137 except for the cloze test where N's ranged from 108-109.

Table 3. Correlations among literacy and demographic variables. Correlations below the diagonal are from West, Stanovich & Mitchell (1993) using versions of the checklists with more items.

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Education	1.00	.07*	.23	.31	.31	.36	.37	.34	.14	-.10[a]	.34
2. Age	.16	1.00	.25	.16	.25	.19	.27	.08*	.30	.05*	.04*
3. ART	.33	.16	1.00	.61	.61	.53	.81	.23	.27	.10[a]	.23
4. MRT	.33	.06	.34	1.00	.58	.54	.82	.22	.30	.05*	.23
5. CLT	.48	.21	.43	.60	1.00	.62	.84	.23	.32	.05*	.18
6. VLT	.53	.26	.46	.48	.71	1.00	.82	.25	.29	-.04*	.26
7. Total Literacy							1.00	.28	.36	.05*	.27
8. Practice								1.00	.09[a]	-.16	.26
9. Ethnicity									1.00	.06*	.13
10. Gender										1.00	-.13
11. Annual Income											1.00

ART=Author Recognition Test; MRT=Magazine Recognition Test; CLT= Cultural Literacy Test; VLT=Vocabulary Literacy Test. Total Literacy= scores summed over the four checklists; Practice = mean scores on questions 25a through k (see appendix) for different reading practices. *= Not significant, [a]= $p < .05$, all others significant beyond $p < .01$. Underlined r's are part-whole correlations. Ethnicity= nonwhites (0) and whites (1); gender= males (1) and females (2).

Table 4. Scores on Total Literacy by demographic groups.

Education	X	SD	N	Age	X	SD	N	Occupation	X	SD	N
0-8 years	38.6	29.9	6	16-18	24.4	18.4	14	Laborers	28.1	22.7	50
9-12	32.3	22.3	126	19-24	30.2	22.5	65	Semi/Skilled*	40.7	22.8	103
13-14	42.0	22.7	146	25-39	41.7	23.0	198	Clerical/Sales	42.9	24.8	97
15-16	51.1	23.0	130	40-54	57.2	23.8	141	Tech./Engrs*	52.4	23.1	60
17+	59.9	23.1	109	55-64	57.3	22.5	32	Man-Exc-Prf*	54.6	23.3	165
				65+	46.1	23.0	62				

*Semi-skilled & skilled; technical and engineers; managers, executives and professionals.

Education	X	SD	N	Ethnicity	X	SD	N	Father's Educ.	X	SD	N
< S10K*	34.6	25.5	43	Caucasian	51.2	22.8	379	0-8 years	45.6	25.5	84
10-19K	40.7	26.6	54	Black	34.2	19.3	24	9-12	44.6	25.0	182
20-29K	38.1	24.3	98	Hispanic	29.8	24.3	71	13-14	47.2	21.0	44
30-39K	46.6	23.3	69	Asian	28.9	27.9	78	15-16	48.6	23.2	84
40-49K	49.4	21.4	64	Other	33.3	22.7	18	17+	52.9	24.4	72
50+K	52.5	23.9	150								

*K=thousand

Table 5. Average frequency of engaging in various literacy practices in a week by demographic groups.

Education	X	SD	N	Age	X	SD	N	Occupation	X	SD	N
0-8 years	1.8	0.7	6	16-18	2.1	1.1	14	Laborers	2.4	1.3	51
9-12	2.3	1.2	127	19-24	2.2	1.1	66	Semi/Skilled*	2.6	1.1	103
13-14	2.6	1.1	147	25-39	2.8	1.2	198	Clerical/Sales	2.5	1.2	98
15-16	2.9	1.1	131	40-54	3.1	1.2	142	Tech./Engrs*	3.1	1.0	60
17+	3.3	1.2	109	55-64	2.7	1.2	33	Man-Exc-Prf*	3.1	1.2	165
				65+	2.6	1.2	62				

*Semi-skilled & skilled; technical and engineers; managers, executives and professionals.

Education	X	SD	N	Ethnicity	X	SD	N	Father's Educ.	X	SD	N
< S10K*	2.2	1.4	43	Caucasian	2.8	1.2	380	0-8 years	2.7	1.1	84
10-19K	2.5	1.2	55	Black	2.7	1.0	25	9-12	2.8	1.2	183
20-29K	2.5	1.1	98	Hispanic	2.5	1.2	72	13-14	2.7	1.2	45
30-39K	2.8	1.2	69	Asian	2.6	1.1	28	15-16	2.9	1.2	84
40-49K	2.8	1.0	65	Other	2.4	1.2	18	17+	3.0	1.2	72
50+K	3.1	1.2	150								

*K=thousand

Table 6. Component loadings for practice items (questions 25a-k in appendix) after varimax rotation (n=538).

Times Per Week		Practice Factors 1 News	2 Job	3 Pleasure	4 Family
Q25G	Read local or national news	.84	–	–	–
Q25I	Read editorial section	.79	–	–	–
Q25H	Read sports section	.74	–	–	–
Q25F	Read newsmagazines	.43	–	–	–
Q25K	Read books or manuals on job	–	.88	–	–
Q25B	Read because job requires it	–	.86	–	–
Q25E	Read letters	–	.31	–	–
Q25D	Read a book for pleasure	–	–	.88	–
Q25A	Read for pleasure	–	–	.86	–
Q25J	Listen to others read	–	–	–	.79
Q25C	Read a book to a child	--	--	--	.79

Dashes represent component loadings lower than .30.

Table 7. Correlations among demographic, literacy knowledge, and the four literacy practices factors of table 6 (n=538).

	Practice Factors			
Variables	1 News	2 Job	3 Pleasure	4 Family
Education	.17	.32	.22	.02[a]
Age	.26	-.19	.15	-.19
Gender[b]	-.23	-.18	.11	.13
Ethnicity[c]	.08[a]	-.01[a]	.15	-.08[a]
Income	.19	.18	.08[a]	.05[a]
Father's education	-.09	.20	.06[a]	.03[a]
Mother's education	-.03[a]	.13	.06[a]	.06[a]
Latino[d]	.08[a]	.04[a]	.08[a]	-.10
Total literacy	.17	.12	.30	-.13
ART	.12	.09	.28	-.13
MRT	.10	.10	.24	-.07[a]
CLT	.15	.07[a]	.25	-.08[a]
VLT	.14	.17	.25	-.17

[a] not significant at $p < .05$. [b]gender: male=1, female=2. [c]Ethnicity: whites=1; nonwhites =0. [d]Latino: Are you of Mexican, Hispanic, or Latino descent? yes=1, no=2. Total Literacy= scores summed over the four checklists; ART=Author Recognition Test; MRT=Magazine Recognition Test; CLT= Cultural Literacy Test; VLT=Vocabulary Literacy Test.

Table 8. Percentage of telephone survey respondents falling into each of five levels of literacy on the Total Literacy scale.

		Literacy Levels*				
Variables	N	1	2	3	4	5
Total	538	19.2	14.1	31.4	16.7	18.6
Normal Curve[a]		16.0	15.0	38.0	15.0	16.0
AFQT Categories[b]		7.0	24.0	32.0	33.0	4.0
NALS Levels[c]		22.0	27.0	31.0	17.0	3.0
Education						
0-8	6	33.3	16.7	16.7	0.0	33.3
9-12	126	31.0	30.2	21.4	11.9	5.6
13-14	146	22.6	22.6	21.9	18.5	14.4
15-16	130	13.1	13.1	25.4	26.9	21.5
17*	109	9.2	11.0	12.8	23.9	43.1
Age						
16-18	14	35.7	42.9	21.4	0.0	0.0
19-24	65	41.5	23.1	16.9	13.8	4.6
25-39	198	21.7	21.2	23.2	21.7	12.1
40-54	141	9.9	13.5	15.6	24.1	36.9
55-64	32	6.3	12.5	28.1	18.8	34.4
65+	62	17.7	19.4	22.6	21.0	19.4
Ethnicity						
White	379	11.9	17.4	22.4	23.2	25.1
Black	24	25.0	37.5	16.7	20.8	–
Hispanic	71	45.1	19.7	18.3	8.5	8.5
Asian	28	42.9	21.4	14.3	14.3	7.1
Other	18	33.3	38.9	5.6	11.1	11.1
Occupation						
Laborer	50	42.0	26.0	14.0	12.0	6.0
Semi/Skill	103	21.4	22.3	25.2	20.4	10.7
Clerk/Sales	97	21.6	23.7	18.6	16.5	19.6
Tech/Engr	60	10.0	11.7	31.7	23.3	23.3
Mn/Ex/Prf	165	12.1	15.8	15.2	25.5	31.5
Gender						
Male	250	21.2	19.2	22.0	18.8	18.8
Female	272	16.8	19.5	19.1	21.3	21.3

* Literacy levels are based on the Total Literacy score (sum of the four checklists). Range of percent correct scores for each level are: Level 1=0-20, Level 2=21-32, Level 3=33-58, Level 4=59-70, and Level 5=71-100. [a]Normal Curve=the percentage of cases under the same areas of the normal curve that were used to define the five literacy levels. [b]AFQT=Armed Forces Qualification Test categories numbered from 1 (low) to 5 (high) instead of 5 (low) to 1 (high) as the Services do. [c]NALS=National Adult Literacy Survey.