As part of a project that identified the specific literacy skills required in ten occupations, this report provides two levels of instructional information about welders. Factual data are presented in Parts I and II for use in decision making by program developers, administrators, teachers, and counselors. These sections note the specific literacy requirements (reading, writing, listening, speaking, and mathematics) that were identified at three job sites and in three vocational training programs. Part III presents instructional methods/materials that adult basic education teachers can use to develop literacy skills while imparting job related knowledge. The lesson format is based on a directed reading activity and includes vocabulary and concept development, sentence and organizational structure, silent reading, and skill development. Appendixes list the technical vocabulary that welders need to know, the 100 words that represent 45% of the language sampled for the entire project, and occupational literacy requirements for the ten occupations that were studied. (A66)
THE LITERACY REQUIREMENTS OF A WELDER ON THE JOB AND IN A VOCATIONAL TRAINING PROGRAM

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* * *

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Purdue University
West Lafayette, IN
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PROJECT ABSTRACT

THE IDENTIFICATION OF LITERACY REQUIREMENTS OF JOBS IN INDUSTRY
AND CORRESPONDING VOCATIONAL TRAINING PROGRAMS

1. Need Addressed: Meeting the educational needs of adults with minimal literacy skills who wish to enter skilled or semi-skilled occupations.

2. Population Served: Adults with minimal literacy skills.

3. Brief Description: Specific literacy requirements (reading, writing, listening, speaking, and mathematics) of semi-skilled and skilled occupations in business, industry and vocational training programs were determined. The literacy demands of three work contexts and training programs for each of the ten occupations were analyzed and reported.

4. Major Objectives: To provide educators, counselors, and administrators with a description of the literacy requirements of semi-skilled and skilled occupations and training programs to which functionally illiterate adults aspire.

5. Products: A description of the literacy requirements necessary to hold a job in each of ten occupations and the corresponding requirements necessary to succeed in vocational training programs which prepare individuals for each of those occupations is provided. A booklet for each of the ten jobs was prepared.
INTRODUCTION

This project was undertaken in response to a need, expressed by adult basic educators and counselors, for information about the specific literacy skills necessary for success in several occupations. The occupations studied had been identified as desirable careers during informal interviews with adults who were enrolled in basic education programs in the Lafayette, Indiana area. Employment counselors and officials of the Office of Career Development confirmed that the occupations identified for study were appropriate. Because Greater Lafayette offers a wide range of occupational and training opportunities, the project staff was able to study both job sites and vocational training sites for each of the following occupations: account clerk, automotive mechanic, draftsmen, electrician, heating and air conditioning mechanic, industrial maintenance mechanic, licensed practical nurse, machine tool operator, secretary, and welder.

Purpose and Audience

This report provides descriptive and instructional information to adult educators at two levels. Factual data are presented in Parts I and II for use in decision making by program developers, administrators, lead teachers, and counselors. Part III presents instructional methods and materials and is meant for use by adult basic education teachers. Members of both groups may be interested in the entire report, but in preparing it the project staff attempted to address the needs of the two audiences separately.
Procedures

To identify reading, writing, speaking, listening, mathematics, and other characteristics which are necessary for success both on the job and in the training program, three job sites and three vocational college courses were studied.

Required reading materials from each of the six settings were evaluated using two widely used readability formulas, the Dale-Chall Formula and the Fry Readability Graph. Readability estimates were computer assisted. A minimum 2000 word sample of written language was taken from each site. Special considerations and problems related to reading the technical materials were identified, and the relative use of reading as a work tool and as a learning tool was determined.

To identify speaking and listening requirements, one hour samples of oral language were recorded at each job site and in each vocational college course. Language recorded at each site was rated for its technical and formal qualities, and computer-analyzed to assess vocabulary and syntax. Written and oral language samples were used to develop the Key Technical Vocabulary List found in Appendix A. The combined language samples from all occupations studied were used to develop the Highest Frequency Word List found in Appendix B. A summary of the literacy requirements for all ten occupations studied is found in Appendix C.

Writing samples were obtained at each of the six sites and used to determine the nature of written communication demands on the job and in the vocational training program.

Mathematics demands were determined through surveys of materials from the job sites and classrooms. Instructors and supervisors
responded to a questionnaire about the specific mathematics skills necessary for job and/or training program success.

Important non-literacy characteristics were identified by supervisors who completed a rating scale which asked for their estimate of the importance to job success of such factors as cooperativeness, reliability, and attitude toward work.

The following sections of this report are organized according to the requirements of the job, the requirements of the training program, and instructional recommendations.
Job Sites Studied

At each of three separate job sites, the literacy demands placed on one successful welder were studied. Reading, writing, oral language, and mathematics were the specific literacy skill areas examined. Welders from three shops of distinctly varying sizes cooperated in the survey. From each job site, examples of the reading, writing, and mathematics tasks done on the job were obtained. Samples of the oral language requirements of the jobs were obtained by tape recording a randomly chosen one hour period of on-the-job verbal interaction. At each job site, the welder's immediate supervisor completed a questionnaire which was concerned with the importance of thirteen worker characteristics. Supervisors were also asked to identify the mathematics skills necessary for job success and to estimate the amount of time per week that welders spent on mathematics-related work.

Reading Requirements

Strong reading skills are not considered to be an essential aspect of welding. Supervisor estimates of the amount of on-the-job time involving reading indicated that less than ten percent of a welder's time is devoted to reading tasks.
Very few reading materials were found at the job site. Welders and their supervisors, however, emphasized the importance of the ability to read blueprints. The blueprints generally contained only a few words, such as size, length, use, and total. Because of the scarcity of required reading materials on the job, readability estimates of job site materials were not determined.

Frequent task repetition and familiarity with specialized technical vocabulary may offset the apparent difficulty of any on-the-job reading requirements.

Uses of Reading on the Job

Each welder who participated in the project completed questionnaires concerning the use of reading in three separate job-related tasks. The questionnaire results showed that when reading was done on the job, it was used primarily as a tool for accomplishing work. Blueprints were interpreted for each daily welding job. The few work texts reported by the welders, a book of steel charts and a guide for choosing rods, were checked on occasion to perform an unfamiliar task. Overall, the few reading tasks on the job site were used to accomplish work correctly.

Writing Requirements

Grammatically correct writing skills were not essential for welders on the job. Supervisors rated the ability to communicate in writing as the least desirable quality of a welder. If writing was involved on the job, it tended to be one- or two-word descriptions of work accomplished.
Mathematics Requirements

Supervisors varied in their judgment of mathematics skills required by a welder on the job. The estimates ranged from a maximum of simple measurement ability to that of skills in fraction conversion and use of the decimal system. It can be assumed that basic arithmetic processes (addition, subtraction, multiplication, and division) and knowledge of measurement are common requirements for most welding jobs.

Scales on welding equipment and measurement symbols on blueprints were encountered by most welders daily.

Oral Language Requirements

The oral language samples collected on the three job sites were largely informal in nature. Conversation was casual and often not job-related. At times, however, discussions focused on the specific problem or object with which the welder was working. In this case, language was heavily weighted with technical vocabulary. Example I demonstrates a typical technical interaction.

EXAMPLE I

On-the-job Technical Language

"Do you think it's the air hole or do you think it's the valve? That other handle is not in there, is it? Is the forex nipple there under the coupling?"

Supervisors also emphasized the importance of the ability to follow spoken directions concerning a welding task.

Special Considerations and Problems

As mentioned previously, the welders surveyed in the study relied
heavily on blueprints to accomplish daily welding tasks. These blueprints contained welding symbols, measurement indications, and single words or phrases describing the components of the welding job. Inability to interpret these blueprints, many of them highly complicated, would result in failure to complete a job or the inaccurate completion of a job. Example II illustrates the graphic nature of the material.

**EXAMPLE II**

**Graphic Material**

![Blueprint diagram](image)

**Key Non-Literacy Requirements**

Supervisor ratings of requirements important to job success brought out the following important non-literacy characteristics: cooperation with fellow employees, job knowledge, good attendance, and ability to follow spoken directions. Each of these characteristics was rated as high or higher than reading and mathematics abilities.
Courses Studied

The reading, writing, oral language, and mathematics requirements of three courses in a post-secondary vocational college welding training program were studied. The courses, Arc Welding, Electrical Fundamentals, and Gas Fusion Welding, had been determined by their instructors and the school administration to be representative of the training program as a whole. The literacy demands placed on students in other welding courses are approximately the same as those presented here. Practical experience was a large part of each course studied. Students participated in laboratory exercises designed to practice the skills and concepts presented through lectures and reading. This concrete practical experience may reduce the apparent demands of the training program.

Reading Requirements

Because of the need to present large quantities of information in a limited period of time, training programs typically have greater literacy demands than do the occupations to which they correspond. Lectures and written materials are used in place of first-hand experience.
and more personalized supervision occurring at the job site.

Reading materials including textbooks, workbooks, and examinations were studied and rated according to the style in which they were written. The rating scale included informal, formal, literary, and technical levels. The materials surveyed in the welding training program were written in technical style such as that illustrated in Example III.

EXAMPLE III

Technical Writing Style

"The electric induction furnace is essentially a transformer with the molten metal acting as the core. It consists of a crucible, usually made of magnesia, surrounded by a layer of tamped-in magnesia refractory. Around this is a coil made of copper tubing." (Sacks, 1976, p. 63)

The level of difficulty of the reading materials required in the course studied was determined by computer analysis using two widely accepted readability formulas. The Dale-Chall Formula and the Fry Readability Graph provided estimates of the general level of reading ability required for comprehension of the materials. Because the estimates of the two formulas were not identical, the estimates of readability for the three courses are presented as ranges of difficulty below.

READABILITY ESTIMATES

<table>
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<tr>
<th>Course</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course One</td>
<td>10th Grade to college graduate level</td>
</tr>
<tr>
<td>Course Two</td>
<td>11th Grade to college graduate level</td>
</tr>
<tr>
<td>Course Three</td>
<td>8th Grade to college graduate level</td>
</tr>
</tbody>
</table>

16
Readability estimates do not account for factors such as knowledge of a specialized vocabulary, as in the case of reading blueprints, nor do they take into account reader motivation. Such factors are known to affect reader success in mastering difficult material.

**Special Reading Considerations and Problems**

The written materials used in the welding courses made extensive use of tables, figures, and illustration. Instructions and routines were presented in list of steps which had to be interpreted and followed. Example IV illustrates the use of figures and illustration.

**EXAMPLE IV**

Use of Figures and Illustration

![Diagram of electrode and ground cable]

(Electrode and ground cable)

Example V presents a sequence of steps to be followed in completing a welding task.
EXAMPLE V

Listed Steps in Accomplishing a Task

1. Shut off torch by shutting off acetylene torch valve, then shutting off oxygen torch valve.
2. Shut off both oxygen and acetylene cylinder valves.
3. Bleed gas lines. Open the acetylene torch valve. Close when pressure is released. Repeat with oxygen torch valve.

Uses of Reading

In welding training, reading is used both as a tool for accomplishing work and as a learning tool. Laboratory exercises resembling on-the-job welding tasks are done on a regular basis. When reading directions or diagrams, reading to do is implemented. When studying is required, reading to learn is used. Instructional techniques related to both reading to do and reading to learn are found in Part III of this report.

Writing Requirements

The ability to communicate important information through writing was necessary in the welding training program. Standard grammatical conventions, however, were not required. Answers presented in legible short-answer form were acceptable. An example of a written response is included in Example VI.

EXAMPLE VI

Student Written Response

Question: What is the function of a regulator?
Answer: Controls gas flow.
Tasks such as this found in workbook exercises are relevant to instruction but may have little resemblance to on-the-job tasks.

Mathematics Requirements

Welding instructors defined skill in the basic arithmetic processes of addition, subtraction, multiplication, and division as being required. Work with fractions, the decimal system, measurement, word problems, and geometrical problems was also a requirement of the training program. Some knowledge of algebra was rated as being desirable. Despite the broad knowledge of mathematics required, the instructors estimated that their students spent twice as much time on reading tasks as they did on mathematics-related tasks.

Oral Language Requirements

Oral language used in welding training programs was usually informal, but much technical information and vocabulary was involved. An excerpt from an instructor's technical conversation with a student is presented in Example VII.
EXAMPLE VII

Technical Oral Language.

A. Instructor: "In this case, we put the coil around the pole piece so we make a magnetic field in the pole piece to run electricity through the coil. We're putting AC into this coil so that the coil is going to change directions from time to time as the AC changes. We then put a coil of wire in here on an iron core."

B. Instructor: "All AC motors are fixed rpm based on the number of poles and frequency. Well, we get some states involved such as frictional losses and such. A true synchronous motor will be a pole multiple of the power line frequency. So, for instance, a common synchronous motor speed is 1800 rpm's."

Listening and note taking were important skills for the students in the training program. Students were expected to find and refer to specific pages and figures in textbooks to accomplish certain tasks. Students were also expected to carry out tasks by listening to oral directions given by instructors.

The styles of English observed in the training program were similar to those found on the job. Job tasks required the ability to follow oral directions.
PART III
INSTRUCTIONAL RECOMMENDATIONS

Project Overview

The vocational training program required a generally high literacy level in both reading and mathematics. The job site, in contrast, required little use of reading and higher level mathematics skills, implementing technical skills unique to the occupation. These skills included interpretation of blueprints and knowledge of welding equipment.

In the training program, the estimated readability of required materials extended from eighth grade to college graduate level. It was noted in previous sections of this report that knowledge of key technical concepts and vocabulary, combined with familiarity gained through daily use of reading materials, may reduce the perceived difficulty of reading tasks.

In the vocational training program, reading was used most often as a learning tool. Reading-to-do tasks, however, which were similar to on-the-job tasks, occurred frequently.

Writing requirements for the training program included the ability to respond to written questions in single words or phrases. The welders on the job, however, rarely made use of writing skills of any kind.
Basic arithmetic skills were necessary at both the job site and in the training program. Measurement skills were required to perform most welding tasks.

A brief summary of how the literacy requirements of the welder compare to those of the other nine occupations studied is found in Appendix C.

Organization of ABE Lessons

The recommendations which follow are meant to aid teachers and tutors in designing lessons which develop literacy skills while imparting job-related knowledge. Reading demands were found to be high in the welding training program. Reading skills were needed to accomplish tasks similar to those done on the job.

This section, therefore, presents background information and a method of organizing ABE lessons which emphasizes reading. Background information provided deals with the teaching of vocabulary and teaching about text structure and organization. The lesson format is based on a directed reading activity (DRA) and includes vocabulary and concept development, sentence and organizational text structure, silent reading, and skill development.

The guiding principle of a DRA method of lesson organization is that words, concepts, and skills must be introduced and practiced in situations and materials that are true to life. For example, words, sentences, tables, and illustrations should be similar to those used on the job or in the training program. It may be possible to teach an interested ABE student the words on the Key Technical Vocabulary List in isolation, but
it is a far better practice to introduce and practice such words in contexts such as those found in occupational reading materials. There may be a wide gap between the reading requirements of occupational materials and the reading abilities of the student. If possible, materials which parallel those found on the job and in the training program can be developed by teachers and tutors. Through paraphrasing sections of textbooks, reference books and manuals, the readability of occupational materials can be reduced so that literacy skills and job-related knowledge can be developed simultaneously.

The value of a DRA approach is that it allows the use of any appropriate reading material in a job-related reading skill development program.

Notes on Teaching Vocabulary

The specialized vocabularies of welders contain many key concepts and words which are common to the welding occupation in general.

The specialized technical words of the Key Technical Vocabulary List could be taught to ABE students interested in entering the welding field so that both the words and their meanings are recognized. This implies that the words will be taught in a meaningful context.

It is important for ABE students to be introduced to common high-frequency words and specialized vocabulary words via contexts which are similar to those found on the job and in the training program. As noted previously, this practice develops basic job-related knowledge and reading ability.
The following are suggestions for teaching vocabulary:

1. Pair the word to be taught with the concept or object that it refers to whenever possible.
2. Introduce the word using an approach which focuses student attention on the word.
3. Be sure that the new word is read in context very soon after it has been taught.
4. If in doubt, use the general rule that four to six new words per lesson be introduced. Learning and recall are typically most efficient when the number of words taught is in this range.
5. Review vocabulary words frequently.

Sources of job-related vocabulary words and concepts are included in the books cited in the bibliography of this report. The style and level of writing in the listed materials is often highly technical, thus, some teacher time could be devoted to preparing lower readability materials which parallel high-level passages.

Notes on Teaching About the Structure and Organization of Text

The above suggestions on teaching vocabulary words emphasize meaning; words have little use outside of a meaningful context. In the field of welding even solitary words on a chart or diagram have a meaningful context to a trained individual.

In reading, it is important to be aware of special patterns of organization used by writers. Formal technical reading materials are
organized differently from the short stories and novels used in teaching reading to most Americans. The expository style of writing used in textbooks and other specialized or technical materials is different from the narrative style of stories and novels at several levels of comparison.

At the sentence level, ABE students should learn that expository style often relates cause and effect. Sometimes this relationship is clearly stated as in the sentence in Example IX-A.

**EXAMPLE IX**

Stated and Unstated Cause and Effect Relationship

A. The joint separated because of a poor spot weld.
B. The spot weld was done improperly. The joint separated.

Often, however, the relationship is not stated, as in Example IX-B. In such cases, readers who are not expecting cause and effect connections may miss them.

At the paragraph level, writers of expository material often use a format which states the main idea in the first sentence. The last sentence summarizes the paragraph and may connect it to a paragraph that follows. Comprehension and learning can be improved when readers are aware of this organizational technique.

At the chapter level, expository material may contain many valuable aids to efficient reading. Key words are used as headings which introduced important sections. Pictures, diagrams, tables, and figures are used to illustrate important ideas. Introductions and chapter summaries are also available as aids to readers who know how to use them.
ABE students should learn about style factors such as these and use them to enhance comprehension. Efficient readers use their knowledge of expository style to organize their reading. Awareness of the use of cause and effect makes them sensitive to such relationships. Knowledge of paragraph and chapter organization is used to develop a 'mind set' which is helpful in organizing and remembering important information. Reader-composed questions based on paragraph lead-sentences, headings, pictures, and other graphic aids help readers organize, comprehend and remember what is read.

A directed reading activity, described in the next section, is a system which enables the ABE student to become efficient in using organizational factors as aids to comprehension and memory.

**Directed Reading Activity**

This system of preparing for efficient reading may be used with individual students or with groups. In groups, it requires very little class time to prepare students for reading assignments. For both individual and group use, it has been demonstrated to increase reading efficiency and comprehension.

After a review of previously taught, related concepts and assignments, follow the below procedures:
I. Develop Readiness for Reading the Assignment

Purpose: Motivate
Set purposes for reading
Develop vocabulary

Teacher role: Ask Questions –

- How familiar is the subject matter and vocabulary to your student?

Teach New Vocabulary –

- Be concrete: write out the words as you introduce them. Use examples, such as objects or pictures, point out word relationships. Have students write the words as they are taught.

Ask Questions to Stimulate Interest –

- Focus on titles, pictures, graphs. Relate an anecdote from your own experience or one your students might have had.

II. Direct the Silent Reading of the Assignment

Develop questions from sub-headings, graphs, pictures, and tables. Try to focus on relationships in the assignment. Useful questions are often provided by textbook authors.

Have pupils read silently from 5 to 20 minutes to find the answers (keeping questions in mind as they read).

Encourage students to ask for help when they are confused. Writing questions down in abbreviated form is a good practice when reading is done outside of class.

III. Discuss Student Answers to Questions

Do not restate the questions unless necessary. Students need to remember the questions or they lose the purpose for reading.

Ask higher level questions to develop comprehension (have student(s) interpret, draw conclusions, and make inferences as well as recall facts).
IV. Reread as Necessary

When answers demonstrate confusion, have the student reread the appropriate small section to determine the reason for the confusion.

V. Follow-up and Skill Development

Confusion or lack of comprehension may signal a need for extra work on vocabulary, concept building, or word recognition skill.

In this phase of the lesson, other important skills such as mathematics can be related concretely to the reading assignment.

REMEMBER:

A DRA is a system, a routine, that you want your student(s) to learn to use independently. Remind your students of this—tell them why you use a DRA system. It will help them in their future study.

Reading to Accomplish Work

The term, reading to do, has been used in research and development projects done for the U.S. armed forces (Sticht, et al., 1977). Reading to do refers to the use of reading for the purpose of getting work done. It involves following written directions and reading to find information which will be used immediately. Such information need not be learned or remembered. Looking up telephone numbers; finding information in a policy manual; or finding important data in a table, chart, or figure, are examples of reading to do. Preparation of ABE students for reading-to-do tasks can be incorporated in a directed reading activity lesson.

When lesson materials contain occupationally relevant concepts, ABE students are given important background information which will make high-

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er level training easier. Therefore, lessons should employ materials which are similar in structure and content to those found on the job or in the vocational training program. Paragraphs, tables, charts, and figures might be used verbatim from on-the-job or instructional materials. Alternatively, such materials might be paraphrased and reduced in difficulty to match student abilities.

Given appropriate materials and a period of orientation to them, the structural and organizational features of the table, chart, figure, paragraph, or chapter, should be pointed out to the student (see Notes on Teaching About Structure and Organization of Text). This is essentially the first step of the DRA described above. When the materials have been introduced, the student should be directed to find a particular fact in the material. In subsequent lessons, the difficulty of information-finding tasks should be increased.

Skill in following written directions can be developed using a DRA system and materials similar to Example X. Initial activities should contain only one or two steps.

EXAMPLE X

Written Directions

1. Listen to the directions on the Presentation Tape and execute those directions in Book I.
2. Do the Supplementary exercises for that lesson in Book II.
3. Complete the Self-Check for that lesson.
4. Take the information from the Dictation Tape for that lesson, reading back portions of it from your notes.
In information-finding lessons, the emphasis should be on understanding and careful identification of the required fact. Likewise, in lessons on following directions, understanding and careful execution of the required steps must be emphasized.

Reading to Learn Information

Skill in learning printed information for future use is very important in vocational training programs. The reading skills necessary for reading to learn (Sticht, et al., 1977) are taught and systematically practiced in directed reading activity lessons. That is, the use of previewing, attention to graphic and contextual information, and the organizational factors discussed in Notes on Teaching About the Structure and Organization of Text, above, should be practiced and learned during each DRA lesson. Questioning and rereading, also aspects of a DRA, reinforce important learning skills.

Sources of materials for use in reading-to-learn lessons, like those employed in reading-to-do lessons, should be occupationally oriented (See Bibliography). ABE students who receive reading instruction through job-related reading materials develop not only reading skills, but gain important job knowledge as well.

Counseling the ABE Student

ABE students should be made aware of the importance of reliability, cooperation, ability to follow directions, and other factors noted in Part I of this report. On the basis of the responses of supervisors surveyed in this study and previous research (Sticht, 1974), it seems that such characteristics contribute more to job success than do reading
and mathematics skills.

The literacy demands of the welding training program courses were high. It is, therefore, important that teachers, tutors, and counselors consider the facts presented earlier in this report, in addition to the individual students' levels of motivation and literacy skill development before beginning to prepare the student to enter a welding training program, either at a vocational college or on-the-job.

This does not mean that students with low literacy skills should be discouraged from preparing for a welding career. This report has indicated that higher level mathematics and reading skills are not necessarily required on the job. It does suggest, however, that an early and realistic estimate be made of the time and effort required to reach the goal of employment or, most specifically, formal training.

Summary

The literacy demands of welding training program courses were found to be more stringent than those required on the job. It is probable that individual experience and familiarity with specialized information reduces the perceived demands of training program tasks. The extent of such a reduction, however, is not known.

It was observed that vocational training programs for welding occupations provided students with tasks that were very similar to on-the-job tasks. Also, vocational program reading materials were shown to present important training concepts through texts which were more difficult than those found on the job.

Instructional recommendations in this report emphasized the develop-
ment of reading skills to aid those ABE students planning to enroll in a training program. Other literacy and non-literacy requirements were recognized as important, but it was clear at the training program sites studied that strong reading skills were important.

The recommended approach to ABE reading instruction was a directed reading activity (DRA), because it is systematic and provides for essential skill development and practice. Suggestions were presented on teaching vocabulary and the use of important structural and organizational factors which are related to comprehension.

Final recommendations sections focused on reading to accomplish work and reading to learn information. These two types of reading were discussed separately because they require different skills.

It was recommended that, in using the information and recommendations presented here, ABE teachers should be well acquainted with the occupational interests and motivation, as well as the literacy skills, of their students. The literacy requirements of welding training programs and specialized tasks on the job site are such that some students whose skills are well below those required may be unable to achieve sufficient skills in a reasonable period of time. Such students may choose to enter an on-the-job welding training program, or to alter their occupational goals.
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APPENDIX A
TECHNICAL VOCABULARY LIST

This list is based on the total oral and written samples of the language of welders both on the job and in the training program. Words included in the most frequent 1000 words of the Kucera-Francis list (based on adult language) have been deleted. The list was also edited to remove numberals; labels; names of people, places, products, and companies; contractions and possessives; and colloquialisms resulting from the oral language samples.

Some words included in the list are relatively uncommon words that occurred in the total language sample and are not necessarily technical terms. Thus, the list should be treated as a source rather than a criterion. The 91 most common words have been marked with an asterisk.

Total Sample Words = 13,687
Different Words = 2,375
<table>
<thead>
<tr>
<th>abbreviate</th>
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- 31 -

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burning  carved  check  coating  compounds
burns  cassette  chemical  code  compress
burnt  cast  chemically coils* compressed
buttons  castings  chemical coils compressor
buy  cat  chipping coke computer
buying  catch  choices cokes concentrate
buzz  category  cigarette collect condition
cafe*  cathode  circuit* colorless conditioned
cables  cathodes  circuits column conditioning
cadmium  caused  circulate combination conduct
calculator  causing  clamping combines conductor
calls  ceiling  clap combustion cone
cam  centerline  classes comment confined
canvas  centrifugal  classification commercial confused
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capacitor*  chamber  cleaned commutator connected
capacity  chances  cleaner compare connecting
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card  changing  clockwise compensate connectors
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| insulator  | keeps  | leaving | locations | match |
| insure     | key    | lecture | looks    | matches |
| intend     | kicks  | leg     | loose    | materials |
| intended   | killed | legs    | looseleaf | max |
| intense    | kindling | lenses | lose     | maximum |
| intensity  | kinds  | lesser  | loss     | meant |
| interchange| kink   | lever   | losses   | measure |
| intercom   | kitchen | leverage | loud    | measured |
| intermittent | knob | lie | lying | measurement |
| interrupted | knobs | lighted | machinable | measuring |
| invented   | label  | lighter | machine  | mechanical |
| invention  | laboratory | lighters | machined | mechanism |
| involves   | ladder | lighting | machines | medium |
| ionizes    | laid   | lightly | magical  | melt |
| iron*      | lamp*  | lights  | magnesium | melted |
| items      | lamps  | lightweight | magnet* | melting |
| janitor    | lap    | limit   | magnetic* | melts |
| jarred     | largely | limits  | magnetism | mention |
| jarring    | latent | lips    | magnetized | mercury |
| joint      | layer  | liquifying | magnets | metal* |
| join       | laying | lists   | mainly   | metals |
| joined     | leak   | litre   | maintained | meter* |
| joining    | leakage | load*  | maintenance | meters |
| joint*     | leaking | loader  | maltese  | metre |
| joints*    | leaks  | loading | manganese | metric |
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ruin ruin
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shunt* shunt*
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rules rules
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rust rust
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shut shut
snap snap
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seventy* seventy*
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<td>vee</td>
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<td>views</td>
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<td>travel*</td>
<td>unit*</td>
<td>violent</td>
<td>widely</td>
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</table>
APPENDIX B

HIGHEST FREQUENCY WORD LIST

The 100 words on the following page represented 45% of the words used in all the language sampled. This list is based on the combined oral and written language samples from all occupations studied. It shows the words used most frequently by adults in the ten jobs studied and in the vocational training programs corresponding to those jobs.

Total Words = 180,000

Total Different Words = 9,000.
| the | will | your | see  |
| of  | one  | was  | more |
| to  | not  | get  | these|
| and | an   | has  | into |
| a   | there| must | just |
| is  | can  | any  | them |
| in  | when | he   | down |
| it  | out  | got  | time |
| for | we   | know | about|
| that| which| then | been |
| you | what | don't| some |
| be  | do   | each | business|
| or  | up   | air  | how |
| on  | pressure| check| its |
| are | two  | that's| back |
| I   | so   | but  | over |
| this| they | system| work |
| with| here | through| would |
| as  | other| valve | temperature|
| by  | ok   | going | same |
| if  | right| well  | also |
| have| no   | use   | where |
| all | used | than  | now |
| at  | may  | it's  | only |
| from| should| go   | like |
APPENDIX C

SUMMARY OF OCCUPATIONAL LITERACY REQUIREMENTS

This appendix presents a brief summary of the literacy requirements for all ten occupations studied.
### SUMMARY OF OCCUPATIONAL LITERACY REQUIREMENTS

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<th>Training Program</th>
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</thead>
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<td><strong>Account Clerk</strong></td>
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</tr>
<tr>
<td>College to graduate level</td>
<td>11th grade to college graduate</td>
</tr>
<tr>
<td>addition, subtraction, multiplication, division, decimals, fractions, business machines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9th to college graduate level</td>
</tr>
<tr>
<td>basic processes, decimals, fractions, measurement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10th grade to college graduate level</td>
</tr>
<tr>
<td>basic processes, through geometry, algebra, trigonometry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12th grade to college graduate level</td>
</tr>
<tr>
<td>addition, and subtraction--more necessary to dispense medication</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9th grade to college graduate level</td>
</tr>
<tr>
<td>basic processes, decimals, fractions, measurement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8th grade to college graduate level</td>
</tr>
<tr>
<td>basic processes, fractions, decimals, measurement</td>
<td></td>
</tr>
<tr>
<td><strong>Automotive Mechanic</strong></td>
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<tr>
<td>9th to college graduate level</td>
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<tr>
<td>basic processes, decimals, fractions, measurement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9th to college graduate level</td>
</tr>
<tr>
<td>basic processes, through geometry, algebra, trigonometry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10th grade to college graduate level</td>
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<tr>
<td>basic processes, through geometry, algebra, trigonometry</td>
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<tr>
<td><strong>Draftsman</strong></td>
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<td>10th grade to college graduate level</td>
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<tr>
<td>basic processes, through geometry, algebra</td>
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<tr>
<td>basic processes, through geometry, algebra, trigonometry</td>
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<td>10th grade to college graduate level</td>
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<td>basic processes, through geometry, algebra, trigonometry</td>
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<td><strong>Electrician</strong></td>
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<tr>
<td>college to college graduate level</td>
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<td>basic processes, through geometry, algebra, trigonometry</td>
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<td>11th grade to college graduate level</td>
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<td><strong>Heating and Air conditioning Mechanic</strong></td>
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<td><strong>Industrial Maintenance Mechanic</strong></td>
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