Survival Literacy Training for Non-Native-English-Speaking Workers

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October 30, 2010

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Introduction

Prior to the recession of 2008, immigrant workers, 50 percent of whom were foreign-born Hispanics, had a higher employment rate than native workers and represented 16 percent of the total U.S. workforce. A disproportionate share of immigrant workers is concentrated in the agriculture, construction, production, and service industries (Cytron, 2009). The physical nature of the work in these industries increases the potential for accidents and the need for safety training. The U.S. Department of Labor's (USDOL) Occupational Safety and Health Administration (OSHA) recently issued an enforcement memorandum that instructs its compliance officers "to check and verify that workers are receiving OSHA-required training in a language they understand" (Occupational Health & Safety, 2010). In another issuance, OSHA sets forth the requirement that safety training materials match workers' literacy proficiency (Michaels, 2010). Although this measure is meant to protect non-native-English-speaking workers, it also could be an incentive for employers to restrict hiring to English speakers rather than conduct safety training in English and then again in as many languages as necessary to accommodate all non-native-English speakers. The OSHA directive places immigrants with limited English-speaking ability at risk for being excluded from industries where they are most dependent for employment because employers may view them either as greater training challenges or at greater risk for failing to follow workplace safety rules.

USDOL's Employment and Training Administration (ETA) is the locus for the Federal Government's resources for the nation's workforce development, with particular responsibility for training segments of the population who face disadvantages in the labor market. Under contract to ETA, the American Institutes for Research (AIR) produced a series of papers on literacy findings from the 2003 National Assessment of Adult Literacy (NAAL).[1] One paper in the series examined the characteristics of non-native-English-speaking adults with emphasis on their literacy levels, in comparison with the literacy levels of native-English-language speakers. In that paper, *Overcoming the Language Barrier: The Literacy of Non-Native-English-Speaking Adults,* AIR analyzed data from NAAL to study 2,807 **adults older than 16 years of age** who did not speak English before starting school. The findings of that analysis provided useful information on the characteristics of non-native-English speakers that is relevant to their challenges in the labor market. This paper, using the same guidelines for designating non-native-English speakers,[2] is based on NAAL data for 2,728 **adult workers older than 18 years of age.** The purpose of this paper is to explore options for addressing the specific challenges to remediating the literacy and limited English skills of non-native-English-speaking workers, options that will address both the OSHA safety training requirements and ETA's future occupational training of non-native-English speakers.

Study questions that guide this analysis are

- What characteristics of non-native-English-speaking workers will influence literacy and English as a Second Language (ESL) training?

- What levels of English and literacy skills are needed to master the requirements of industries where non-native-English speakers are concentrated?

- What training methods address both literacy and ESL training at these levels?

- What are the ETA's workforce investment system's[3] strategic options for implementing a systemic response to literacy and ESL training?

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[1] The 2003 NAAL study (http://nces.ed.gov/naal/) provided information on the literacy proficiency of nearly 18,000 adults, 16 years of age or older. See the appendix of this report for a description of the study. For an interpretation of the literacy scales and performance levels on the NAAL assessment, see Kutner et al. (2007).

[2] "Non-native-English-speaking adults" were defined as adults who reported they did not learn to speak English before starting school.

[3] ETA funds job training, income maintenance, labor market information, and job placement services through a system of State and local One-Stop Service Centers, http://www.doleta.gov/etainfo/wrksys/WIMission

Table 1: Percentage distribution of native- and non-native-English-speaking workers, by selected characteristics

Characteristic	Native-English-speaking adults	Non-native-English-speaking adults
Race/ethnicity		
White	79	19*
Black	13	3*
Hispanic	5	62*
Other	4	16*
Language (if not English) spoken before starting school		
Spanish and other language	N/A	62
Non-Spanish language	N/A	38
Age learned to speak English		
1–10 years	N/A	31
11–15 years	N/A	15
16–20 years	N/A	11
21 years or older	N/A	21
Does not speak English	N/A	22
Country of birth		
United States	96	16*
Other	4	84*
Highest educational attainment		
Still in high school	1	2
Less than/some high school	12	36*
High School grad/GED/equivalency	33	23*
Postsecondary but less than 4-year college	31	21*
College grad/graduate studies/degree	24	19*

*Significantly different from native-English speakers at the significance level of .05.
NOTE: Percentages may not sum to 100 because of rounding.

Characteristics of Non-Native-English-Speaking Workers

Demographic and Socioeconomic Comparisons

In addition to assessing the literacy skills of respondents, NAAL gathered extensive background information on their demographic and socioeconomic characteristics (e.g., age, gender, nativity status, schooling, labor force status, household income), along with their literacy practices. The size of the sample of non-native-English speakers is sufficient for NAAL findings to be representative of all non-native-English speakers in the United States.

Table 1 compares race/ethnicity, native language, age learned to speak English, country of birth, and highest educational attainment of the native-English speakers with non-native-English speakers.[4]

Generally, the adjustment of the population studied from all adults older than 16 years of age to workers older than 18 years of age did not reveal any new findings about the characteristics of non-native-English speakers and their comparison with native-English speakers. However, some characteristics of non-native-English speakers are particularly pertinent to workforce literacy training.

The NAAL data show that 31 percent of non-native-English-speaking workers learned English at an early age—during the first 10 years. Another group (15 percent) learned English between the ages of 11 and 15. A safe assumption, then, is that perhaps 46 percent of the workers have a good command of working English, having gone through years of education before reaching the working age of 18. The older students are when they learn English, that is, the closer they are to the age at which they are first employed, usually between the ages of 16 and 20, the less likely it is that they enter the labor market with a good command of the English language. This group represents 32 percent of non-native-English-speaking workers. Another 22 percent of the non-native- English-speaking workers have yet to learn English. Therefore, the workers who are most in need of English proficiency represent about half (54 percent) of the non-native-English-speaking workers.

The NAAL data also show that 62 percent of the non-native-English-speaking workers speak Spanish. There was no other language with concentrations of non-native- English-speaking respondents. These findings support earlier cited research showing that Spanish-speaking workers make up the largest segment of our non-native-English-speaking workforce.

Prose and Quantitative Literacy Comparisons

NAAL measured respondents' proficiencies on three literacy scales: prose, document, and quantitative. Because there was such a high correlation between the prose and document scores, the analyses in this paper are based on the prose and quantitative literacy scales only. Prose and quantitative proficiency was measured on a scale that ranged from 0 to

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[4] Many of the background variables examined in this report are based on self-reported data. Due to the limited scope of this report and because the variables are also related to one another, complex interactions and relationships among them cannot be explored. Therefore, readers are cautioned not to draw causal inferences based solely on the results presented here.

500. Scores on each of the literacy scales were characterized in terms of four literacy proficiency levels: Below Basic, Basic, Intermediate, and Proficient. A brief description of the four levels of literacy is presented below (Hauser, Edley, Koenig, & Elliot, 2005; White & Dillow, 2005).

Prose

- **Below Basic**—locating easily identifiable information in short, commonplace prose texts, with literacy assessment scores ranging from 0 to 209.
- **Basic**—reading and understanding information in short commonplace texts, with literacy assessment scores ranging from 210 to 264.
- **Intermediate**—reading and understanding moderately dense, less commonplace prose texts, as well as summarizing, making simple inferences, determining cause and effect, and recognizing the author's purpose, with literacy assessment scores ranging from 265 to 339.
- **Proficient**—reading lengthy, complex, abstract prose tests, as well as synthesizing information and making complex inferences, with literacy assessment scores ranging from 340 to 500.

Quantitative

- **Below Basic**—locating numbers and using them to perform simple quantitative operations (primarily addition) when the mathematics information is very concrete and familiar, with literacy assessment scores ranging from 0 to 234.
- **Basic**—locating easily identifiable quantitative information and using it to solve simple, one-step problems when the arithmetic operation is specified or easily inferred, with literacy assessment scores ranging from 235 to 289.
- **Intermediate**—locating less familiar quantitative information and using it to solve problems when the arithmetic operation is not specified or easily inferred, with literacy assessment scores ranging from 290 to 349.
- **Proficient**—locating more abstract quantitative information and using it to solve multistep problems when the arithmetic operations are not easily inferred and the problems are more complex, with literacy assessment scores ranging from 350 to 500.

There is a dramatic difference between the average literacy levels of native-English-speaking workers and non-native-English-speaking workers in both prose and quantitative literacy. Table 2, which compares literacy levels of non-native-English speakers with native-English speakers, shows that the discrepancy between the two groups is particularly striking when comparing the lowest and highest levels of literacy. Non-native-English-speaking workers are more than five times as likely to fall within the category of Below Basic as are native-English-speaking workers. Below Basic means that they had no more than the simplest and most concrete prose[5] and quantitative[6] skills.

By contrast, native-English-speaking workers were more than twice as likely to fall within the Intermediate literacy range and nearly four times as likely to fall within the Proficient literacy range for prose literacy.

Table 2: Means and distribution of non-native-English-speaking workers in each prose and quantitative literacy level

	Overall %	Prose Mean	Quant Mean	
Native-English speakers	87	283	289	
Non-native-English speakers	13	211	235	
	Below Basic	**Basic**	**Intermediate**	**Proficient**
Prose				
Native-English speakers	9	27	49	15
Non-native-English speakers	49*	28	20*	4*
Quantitative				
Native-English speakers	18	33	35	15
Non-native-English speakers	48*	28*	18*	6*

* Significantly different from native English speakers workers at the significance level of < 0.05.

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[5] Below Basic prose literacy is being able to locate easily identifiable information in short, commonplace prose texts.

[6] Below Basic quantitative literacy is being able to locate numbers and use them to perform simple quantitative operations, such as comparing two prices by subtracting.

These findings are consistent with the findings from the analysis of non-native-English-speaking adults versus native English-speaking adults cited in the earlier paper, *Overcoming the Language Barrier: The Literacy of Non-Native-English-Speaking Adults,* which showed that "Spanish-speaking [non-native-English-speaking] adults had lower prose and quantitative literacy levels than non-Spanish-speaking [native-English-speaking] adults. Sixty-two percent of the Spanish speakers had Below Basic prose literacy, compared with 26 percent of the non-Spanish speakers with Below Basic prose literacy."

In addition, findings from the multivariate analyses conducted for this paper revealed the following:

- More non-native-English-speaking adults with low literacy (Below Basic and Basic) failed to complete high school or receive a General Education Development (GED) certificate than native-English-speaking adults with low literacy. However, there was little difference in education attainment between the two groups when they scored either Intermediate or Proficient.

- A higher percentage of non-native-English-speaking adults with low literacy (10 percent) earned a college degree or completed graduate studies or a degree program than native-English-speaking adults with low literacy (7 percent).

- Non-native-English speakers (39 percent) with low literacy were less likely to have some computer literacy than their native-English-speaking counterparts (51 percent).

Non-native-English speakers seem to have greater difficulty completing high school when they also have low literacy levels than English speakers with low literacy levels. However, once they enter postsecondary education programs, the effects of low literacy are less apparent. In addition, non-native-English speakers with low literacy levels are not as likely as native-English speakers to benefit from computer-based education programs.

Literacy and Participation in Formal Instruction

If low literacy infringes on non-native-English speakers' ability to finish high school, will it also affect participation in ESL and Basic Skills (literacy) courses? Table 3 summarizes the percentage of non-native-English-speaking workers who have participated in formal instruction in ESL and Basic Skills by literacy level. The NAAL data show that non-native-English-speaking workers with lower prose literacy levels were more likely to participate in ESL classes than their counterparts with Proficient prose literacy levels. Participation in the ESL services among the low-literacy non-native-English-speaking workers indicates their felt need for English skills that enable them to function in an English-speaking environment. However, those with lower prose literacy levels were less likely to participate in Basic Skills training, indicating either a language barrier or the lack of understanding of the connection between prose and quantitative literacy and employment or job training. Interestingly, participation in Basic Skills classes was the same, regardless of literacy level.

Literacy and Labor Force Behavior

Tables 4–7 summarize data that show how prose and quantitative literacy correlate to various aspects of labor force behavior—probability of full-time employment, length of employment, and occupations held. All are aspects of workplace survival.

Full-time employment

It is not surprising to see that non-native-English-speaking workers with low levels of prose and quantitative literacy are less likely to be employed full time than their more literate counterparts. The same pattern was found among the native-English-speaking workers, as well. This finding is similar to studies of other populations and the effects of literacy on employment. Literacy is clearly a factor in gaining full-time employment.

Table 3: Proportion of non-native-English-speaking workers participating in ESL and Basic Skills instruction

		ESL		Basic Skills	
		Yes (%)	No (%)	Yes (%)	No (%)
Overall %		38	62	11	89
Prose mean	Below Basic	39	61	10	91
	Basic	43	57	14	86
	Intermediate	31	69	12	88
	Proficient	18	82	11	90
Quantitative mean	Below Basic	38	63	11	89
	Basic	42	58	12	88
	Intermediate	35	65	12	88
	Proficient	28	72	9	91

Table 4: Literacy and labor force behavior

Prose

		Employed full time (%)	Employed part time (%)	Employed, not at work (%)	Unemployed (%)	Out of labor force (%)
Non-native	Below Basic	49	11	2	8	33
	Basic	53	12	2	8	26
	Intermediate	61	11	2	6	21
	Proficient	68	10	1	4	19
Native	Below Basic	27	8	2	8	55
	Basic	42	11	3	8	36
	Intermediate	54	13	4	6	23
	Proficient	62	13	5	4	16

Quantitative

		Employed full time (%)	Employed part time (%)	Employed, not at work (%)	Unemployed (%)	Out of labor force (%)
Non-native	Below Basic	47	11	2	5	34
	Basic	56	12	2	6	24
	Intermediate	62	11	1	5	21
	Proficient	63	10	1	7	19
Native	Below Basic	30	10	3	10	47
	Basic	46	12	4	7	31
	Intermediate	56	13	4	5	23
	Proficient	64	13	4	4	15

Duration of employment

Literacy is also related to length of employment, as shown in Table 5. Regardless of whether the workers were native-English speakers or non-native-English speakers, the more literacy proficient they were, the more they worked.

Table 5: Literacy and length of employment

Prose

		26 weeks or less (%)	27–51 weeks (%)	52 weeks (%)
Non-native	Below Basic	42	17	41
	Basic	37	14	49
	Intermediate	31	17	52
	Proficient	27	21	52
Native	Below Basic	65	12	23
	Basic	46	16	38
	Intermediate	31	19	50
	Proficient	22	20	58

Quantitative

		26 weeks or less (%)	27–51 weeks (%)	52 weeks (%)
Non-native	Below Basic	45	14	41
	Basic	33	17	50
	Intermediate	31	18	51
	Proficient	29	23	48
Native	Below Basic	60	14	26
	Basic	40	18	42
	Intermediate	29	19	52
	Proficient	0.20	0.19	0.61

Prose literacy levels and types of occupations held by non-native-English speakers

In terms of the effects of literacy on the types of occupations held by non-native-English speakers, both prose and quantitative literacy levels were very similar and had similar effects. For that reason, Table 6 uses data from prose literacy scores to demonstrate the effects of both.

Non-native-English speakers had lower prose and quantitative literacy than their native-English-speaking counterparts across all occupational groups (i.e., workers holding the same types of occupations.) The most common types of occupations held by **non-native-English speakers** were these:

1. Services, where the workers' average prose literacy score was 188

2. Professional and related, where workers' average prose literacy score was 288

3. Production, where the workers' average prose literacy score was 178

4. Office/Administrative support, where the workers' average prose literacy score was 237

Among the non-native-English speakers, 63 percent held occupations in these four categories, where the workers' average prose literacy scores fell in the range of 178 to 288. This range corresponds to below basic and basic literacy levels.

Table 6: Percentage of non-native-English-speaking workers versus native-English-speaking workers in each prose literacy level, by occupation

Prose

Occupational groups	Non-native				Native			
	Below Basic (%)	Basic (%)	Intermediate (%)	Proficient (%)	Below Basic (%)	Basic (%)	Intermediate (%)	Proficient (%)
Management/business/ financial	20	39	36	5	2	14	59	25
Professional and related	7	26	53	15	2	12	51	35
Service	61	25	12	2	10	34	48	8
Sales and related	33	39	26	3	5	28	56	12
Office/administrative support	32	34	31	3	3	23	59	14
Farming/fishing/forestry	83	14	2	0	20	30	40	11
Construction/extraction	68	21	10	1	14	34	44	8
Installation/maintenance/ repair	44	34	21	2	4	27	62	8
Production	67	24	8	0	10	36	48	6
Transportation/material moving	63	25	10	2	13	41	42	4

Table 6 also displays the most common types of occupations held by **native-English-speaking workers.** They are

1. Professional and related fields, where the workers' average prose literacy score was 320

2. Service, where the workers' average prose literacy score was 272

3. Office/administrative support, where the workers' average prose literacy score was 292

4. Management/business/financial, where the workers' average prose literacy score was 310

Among native-English-speaking workers, 66 percent held occupations in these four categories, where the average prose literacy score ranged from 272 to 320, a range that corresponds to intermediate literacy levels.

Across all occupational groups, more non-native-English speakers had Below Basic or Basic prose and quantitative literacy than their native-English-speaking counterparts, and the gap was fairly large. For example, among non-native-English-speaking workers in the service occupations, 61 percent had Below Basic prose literacy, in contrast with only 10 percent among the native-English speakers. Among non-native-English-speaking service workers, 66 percent had Below Basic quantitative literacy, compared with 25 percent of native-English speakers.

For both native- and non-native-English-speaking workers, increased prose literacy proficiency levels were associated with strong and steady gains in weekly earnings, as shown in Table 7. Similar relationships were found between quantitative literacy and earnings, as well.

Weekly salary	Non-native		Native	
	Overall (%)	Score (mean)	Overall (%)	Score (mean)
Less than $300	13	175	8	275
$300–$499	34	180	21	274
$500–$649	15	210	17	285
$650–$849	13	243	17	296
$850–$1149	12	263	16	306
≥$1150	13	273	22	320

Among non-native-English-speaking workers with Below Basic prose literacy, 67 percent earned less than $500 per week and 9 percent earned $850 or more. In comparison, 61 percent of those with Proficient literacy earned $850 or more and 7 percent earned less than $500, as shown in Table 8. Non-native-English speakers had lower prose literacy than their native-English-speaking counterparts earning the same weekly wage. The gap was largest among those earning less than $500 weekly.

Table 8: Literacy and labor market outcomes, by prose literacy level

		Less than $300 (%)	$300–$499 (%)	$500–$649 (%)	$650–$849 (%)	$850–$1149 (%)	More than $1150 (%)
Non-native	Below Basic	20	47	16	9	5	4
	Basic	11	30	17	14	13	15
	Intermediate	6	15	13	17	22	27
	Proficient	4	3	9	25	23	38
Native	Below Basic	14	34	22	15	9	6
	Basic	12	31	19	17	12	11
	Intermediate	7	19	17	18	16	22
	Proficient	4	9	11	17	21	40

All the above findings show a consistent relationship between literacy and survival in the workplace, in terms of duration and type of job, hours worked, and wages earned.

Survival Literacy for Non-Native-English-Speaking Workers

Survival literacy is the prose and quantitative literacy proficiency needed to function safely in an English-speaking environment and compete successfully for self-sustaining employment. Determining what these essential literacy skills are for the workplace requires an examination of occupational requirements that represent a sample from industries where significant numbers of non-native-English-speaking workers are employed—production, services, and construction.[7] For demonstration purposes, occupations were chosen that did not call for education beyond high school and required the lowest literacy levels, which provides the minimum base for determining survival literacy skills for self-sustaining employment.

On the basis of the multiple regression models developed by AIR that integrate Occupational Information Network (O*NET)[8] data and the NAAL literacy measures, each O*NET occupation's literacy requirements were derived so that they could be compared with the average literacy levels of the NAAL respondents who were non-native-English-speaking workers.[9] Table 9 shows the resulting range of literacy levels for the sample of occupations from the target industries.

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[7] Farm work is an occupation for which there are no minimal knowledge requirements according to O*NET and so was not included in the analysis.
[8] O*NET is a database of information describing all U.S. occupations. See http://online.onetcenter.org/
[9] The method used to link the O*NET data and the NAAL literacy measures is described in Appendix A.

Table 9: Literacy requirements for occupations common to non-native-English-speaking workers

Occupations	Industry	Prose literacy	Quantitative literacy
Rough carpenter	Construction	275	278
Operating engineer*	Construction	245	255
Team assembler	Production	250	257
Extruding & forming machine operator	Production	257	270
Sewing machine operator	Production	226	240

*High growth occupation

Collectively, these occupations represent a prose literacy range of 226 to 275 and a quantitative literacy range of 240 to 278. (See page 3 for corresponding literacy levels.) The prose mean for non-native-English-speaking workers is 211, and the quantitative mean is 235. Therefore, on the basis of this sample of occupations, non-native-English-speaking workers are employed in industries in which they cannot function safely because they fail to meet the literacy levels common to these occupations. It is reasonable to assume that each employer selects OSHA safety training materials that best match its workers' literacy levels because this is an OSHA requirement (Michaels, 2010). According to the concerns basic to Michaels' position on this matter, minority, non-native-English-speaking workers with average literacy proficiency below that of their native-English-speaking counterparts are subject to a disadvantage in the workplace that is unquestionably linked to their safety. This point was made by the USDOL Assistant Secretary for OSHA, and is confirmed by the NAAL data.

OSHA's proposed solution is for employers to conduct safety training in the native language of workers and at the literacy levels within their range of understanding. However, that would require employers to replicate safety training in many different languages and at many different levels of literacy proficiency. ETA has the option of examining its approach to occupational training to find alternative approaches that would be either more attractive to employers or more efficient to implement in its training institutions.

A Review of the Models for Teaching ESL and Literacy

Workforce investment system professionals are familiar with traditional methods for teaching ESL and literacy that require attendance in a classroom, usually located within a public school or college, during evening hours that accommodate working students. Teachers use a didactic approach for covering vocabulary, grammar, and numeracy, and provide practice through repetitive drills. Students rely on rote memory to recall and present information. ESL and Basic Skills (literacy) are usually taught as separate subjects, where ESL precedes Basic Skills teaching. Because non-native-English speakers can usually accommodate only one class at a time, some level of English is mastered before the Basic Skills program is attempted. As the NAAL data showed, non-native-English speakers were far more likely to attend ESL classes than Basic Skills training. In fact, non-native-English speakers rarely enroll in Basic Skills programs. NAAL data also show that non-English speakers are less likely to own or use personal computers or the Internet, which precludes online training. Altogether, the NAAL data raise questions about the benefits of traditional teaching methods for non-native-English-speaking workers.

New models for teaching ESL and Basic Skills, currently in evidence, could offer better solutions to teaching survival literacy to non-native-English-speakers. These models incorporate one or more of the following methods:

- Teaching ESL in the context of a vocational training program
- Teaching ESL through the immersion method
- Teaching workplace literacy using a work-based approach

Vocational English as a Second Language

One of the oldest of the new models is Vocational English as a Second Language (VESL), which was first used to address the language barriers of waves of new immigrants arriving from Third World countries during the late 1970s and early 1980s. The lack of employability skills created a need to teach English and vocational skills together to expedite job readiness. English is taught on an as-needed basis by a team of ESL and vocational instructors. This instructor team starts with the vocational learning objectives and creates a lesson plan for each unit that includes vocational subjects, language skills associated with each subject, and relevant cultural information (Harrison, 1986).

Several examples of modern applications of VESL involve partnerships among community colleges, nonprofit advocacy organizations, and sometimes corporations. One is the Instituto del Progreso Latino, a community-based organization in Chicago that is partnering with Humbolt Park Vocational Education Center to prepare first-generation Hispanic immigrants for jobs in advanced manufacturing and licensed practical nursing. Seattle's Shoreline Community College uses Washington State's Integrated Basic Education and Skills Training program to deliver training that integrates automotive skills, ESL, and employability skills (Cytron, 2009). These examples demonstrate a shift from sequential learning to integrated learning with a focus on priorities relevant to the vocational objective. This concentration on relevant language and numeracy skills is far more appealing to the students and more efficient than traditional methods; however, instruction still depends on bilingual teachers teaching students in their native language.

Immersion Methods

Immersion is based on the way children learn language—by listening and imitating and not worrying about getting everything correct. Immersion language training is now a common way to teach foreign languages in public elementary and secondary schools. Typical academic courses—for example, science—are taught in a foreign language so that the foreign language is the language of instruction. Homework assignments are in the foreign language, and students are encouraged to engage in activities with non-English speakers to practice. Students as young as sixth graders spend a week living in the home of a host family in a country corresponding to their language studies. Fairfax County, Virginia, public schools offer immersion language classes in Chinese, Japanese, French, Spanish, and German in a number of elementary and middle school classrooms.[10]

Immersion has proved to be a far faster way to acquire speaking and listening skills in a second language, although the grammar lags behind. Using immersion methods would enable non-native-English speakers to learn English at the same time that they are learning occupational skills or safety requirements. It also offers the advantage of not necessitating bilingual instructors.

Integrated Work-Based Methods

Work-based literacy programs teach literacy tailored to the needs of a specific employer or community of employers with common needs. Unlike traditional teaching methods and VESL programs, work-based programs occur at the workplace. Learning objectives are organized around needs identified by the employer or union representatives. Employers embrace the training as a means of ameliorating a particular problem, while the trainees see the immediacy and relevance of literacy instruction to their job success.

A report by Isserlis (1991) based on work done by AIR sees work-based literacy as especially well suited to the needs of non-native-English-speaking workers. AIR set out four major components of successful workplace literacy programs:

- Systematic analysis of literacy requirements
- Involvement of workers in defining the types of tasks they perform
- Involvement of stakeholders—employers, unions, and teachers
- Development of instructional materials that incorporate the first three elements

Work-based literacy programs address some of the logistical and motivational issues of literacy training. Workers learn where they work and in some cases are given paid time off to attend classes. Because the literacy training is directly relevant to their jobs and is sanctioned by their bosses, trainees are highly motivated learners.

Addressing Survival Literacy for Non-Native-English-Speaking Workers With a New Model

There is a very specific challenge before ETA's workforce investment system that concerns non-native-English-speaking workers: how to make the workplace safer and in compliance with OSHA requirements. This challenge affects the ETA occupational training programs that include OSHA safety training, as well as employer-managed safety training. ESL training alone will not address the literacy issues that also are at play. The answer is an integrated ESL/literacy program that is taught at the workplace in English and is tailored to the specific needs of each employer.[11] This program includes all workers with literacy deficiencies, regardless of English proficiency. Thus, the model addresses all OSHA concerns about the adequacy of safety training. Rather than "dumb down" the training, the model improves the literacy of all workers to achieve a common standard that matches all training, including the safety training materials.

Evidence-based best practices show the utility of integrating ESL and job-related literacy: It motivates learners and is more efficient. There are also numerous examples of the efficacy of teaching literacy to non-native-English speakers at the workplace. Malden Mills retrained its entire workforce of low-level fabric mill workers, many of whom were non-native-English speakers, to operate advanced manufacturing processes that produce Polartec fabric.[12] Malden Mills engaged a contractor that constructed a curriculum around the requirements of the new equipment, set up classes, and retrained all hourly workers during the shifts when they would normally work. All workers were paid their normal salaries, and learning became part of their job.

Using immersion methods will enhance the English speaking and listening skills of non-native-English-speaking workers on the job, while allowing all workers to be trained together on specific safety issues. Malden Mills did not use bilingual instructors, and only English was spoken. The non-native-English speakers came from a wide range of ethnic groups and had learned some English as a result of their previous employment at Malden.

Further research through demonstration grants would establish the feasibility and effectiveness of this combination of program elements. The optimal balance of methods could not only provide a solution to OSHA safety training but enable non-native-English-speaking workers to advance their progress to safer and more secure employment in the industries in which they are concentrated.

Summary

According to the 2003 NAAL data, a high percentage (62 percent) of non-native-English-speaking workers are Hispanic and more than a third do not have a high school

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[10] See http://www.fcps.edu/dis/OHSICS/forlang/partial.htm.

[11] Small employers can combine forces to bring about the economy of scale needed.

[12] Although there are numerous examples of employer-based adult basic education classes, Malden Mills is the most famous and well documented (www.compassionatwork.com/art_malden_mills.html).

diploma. About 20 percent do not speak English at all, while another 25 percent learned English as adults and are likely to have limited English skills. Their literacy levels are markedly lower than those of native-English speakers, even though they demonstrate higher employment rates than native-English-speaking workers. Comparisons of the literacy proficiency of non-native-English-speaking workers show that literacy is closely associated with length of employment, wages earned, hours worked, and occupations held.

Non-native-English speakers' limited English skills have raised concerns about the efficacy of OSHA safety training in the industries in which these workers are concentrated—agriculture, production, construction, and service industries. Employers are now directed to conduct training that meets the literacy and language skills limitations of their workers. This requirement poses a burden on employers, who may choose not to hire workers who lack the requisite literacy skills to master safety instruction. This same mandate must be addressed by ETA's workforce investment system, as well. Where OSHA safety training is an integral part of occupational skills training, ETA must ensure that the safety training is conducted within the language and literacy skills of the trainees.

A proposed solution to this dilemma incorporates evidence-based best practices into a new training model. USDOL has an opportunity to test and evaluate the model for use among employers who employ large numbers of non-native-English-speaking workers.

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Appendix A: Methodology and Technical Notes

This appendix provides more information about the methodology and research that are referenced in this paper, starting with an overview of the 2003 National Assessment of Adult Literacy (NAAL). This section also describes the background variables and statistical procedures used in this particular paper. A final section discusses the methods used to link the Occupational Information Network (O*NET} occupation descriptors to the NAAL literacy scales, so that literacy gaps between selected high-growth occupations and non-Native-English-speaking workers could be determined.

The 2003 NAAL Assessment

The 2003 NAAL assessed the English literacy of adults (16 years of age and older) in the United States for the first time since the 1992 National Adult Literacy Survey. NAAL provided information on the literacy proficiencies of a nationally representative sample of approximately 18,000 adults living in households and 1,200 prison inmates. In addition to assessing the literacy skills of respondents, NAAL gathered extensive background information on their demographic and socioeconomic characteristics (e.g., their age, gender, nativity status, schooling, labor force status, household income), as well as how they obtain information.

The NAAL measured respondents' proficiencies on three literacy scales:

- Prose literacy—the knowledge and skills needed to search, comprehend, and use information from continuous texts. Prose examples include editorials, news stories, brochures, and instructional materials.

- Document literacy—the knowledge and skills needed to search, comprehend, and use information from noncontinuous texts. Document examples include job applications, payroll forms, transportation schedules, maps, tables, and drug and food labels.

- Quantitative literacy—the knowledge and skills needed to identify and perform computations using numbers that are embedded in printed materials. Examples include balancing a checkbook, figuring out a tip, completing an order form, and determining the amount of interest on a loan from an advertisement.

For each of the literacy scales, proficiency was measured on a scale that ranged from 0 to 500. Scores on each of the literacy scales were characterized in terms of four literacy proficiency levels: *Below Basic, Basic, Intermediate,* and *Proficient.* For more information on the methodology and findings from the NAAL assessment, see *Literacy in Everyday Life: Results from the 2003 National Assessment of Adult Literacy* (Kutner et al., 2007).

Descriptions of Background Variables

Race and ethnicity

In 2003, all respondents were asked two questions about their race and ethnicity. The first asked them to indicate whether they were Hispanic or Latino. Then all the respondents, including those who indicated they were Hispanic or Latino, were asked to choose one or more of the following groups to describe themselves:

- White
- Black or African American
- Asian
- American Indian or Alaska Native
- Native Hawaiian or other Pacific Islander

Individuals who responded "Yes" to the first question were coded as Hispanic, regardless of their answer to the second question. Individuals who identified more than one group on the second question were coded as Multiracial. Respondents of Native Hawaiian or Pacific Islander origin were grouped with those of Asian origin.

Language spoken before starting school

All respondents were asked what language or languages they learned to speak before starting school. Their responses were then used to divide respondents into five groups: English only, English and Spanish, English and other language, Spanish only or with other language, or other language(s). The English and Spanish category includes adults who spoke languages in addition to both English and Spanish.

Age learned English

Respondents who spoke a language other than English before starting school were asked their age when they learned to speak English. They were classified into one of the following categories: 10 or younger, 11 to 15, 16 to 20, 21 or older.

Participation in English as a Second Language instruction

Respondents who spoke a language other than English before starting school were asked whether they were currently enrolled in or had ever taken part in an ESL class in the United States. Respondents were then asked when they last took a class to improve their English: within the last 2 years, 2 to 5 years ago, more than 5 years ago, currently taking an ESL class.

Participation in Basic-Skills Class

The NAAL respondents were asked whether they had participated in a program other than in regular school to improve their basic skills, that is, basic reading, writing, and arithmetic skills.

Highest educational attainment

All respondents were asked to indicate the highest level of education they had completed. The following options were provided:

- Still in high school
- Less than high school
- Some high school
- General Education Development (GED) or high school equivalency
- High school graduate
- Vocational, trade, or business school after high school
- College: less than 2 years
- College: associate's degree (A.A.)
- College: 2 or more years, no degree
- College graduate (B.A. or B.S.)
- Postgraduate, no degree
- Postgraduate degree (M.S., M.A., Ph.D., M.D., J.D., etc.)

Respondents who reported less than high school or some high school were asked how many years of education they had completed. For certain analyses, some of these groups were collapsed.

Occupation

Respondents who had held a job within the past 3 years were asked to provide the title of their occupation and its most important activities and duties. This information was used to assign each occupation a U.S. Census Bureau (2000) code. The occupations were then collapsed into eight major occupational groups:

- Management, business, and financial
- Professional and related
- Service
- Sales and related
- Office and administrative support
- Construction and extraction
- Installation, maintenance, and repair
- Production

Weekly wage

Respondents who were employed were asked to report their gross weekly wage or salary (before deductions) during the previous week. Some respondents were unable to report their weekly wage or salary before deductions. In these cases, the interviewers asked them to report their take-home pay and noted that fact. Some respondents reported their pay per hour, day, 2-week period, month, or year, rather than per week, as requested. This was also noted by the interviewers, who asked a follow-up question to clarify the timeframe the respondents were using.

All reported pay was adjusted to approximate gross weekly wages or salaries. For respondents who reported their earnings in units other than weekly (e.g., per hour or per day), information on the number of hours worked per week (collected in a separate question) was used to compute weekly earnings. For respondents who reported take-home pay rather than gross pay, adjustments were made to the wage or salary they reported by adding a FICA adjustment at a flat rate of 7.65 percent and an additional adjustment based on IRS withholding tables for single taxpayers in 2003. An additional 10 percent was added as a proxy for state taxes and miscellaneous deductions.

Statistical Procedures

Tests of statistical significance

All comparisons discussed in this report have been tested for statistical significance using the t statistic. Statistical significance was determined by calculating a t value for the difference between a pair of means, or proportions, and comparing this value with published tables of values at a certain level of significance, called the alpha level. The alpha level is an a priori statement of the probability of inferring that a difference exists when, in fact, it does not. The alpha level used in this report is .05, based on a two-tailed test. Differences in the means and proportions between subgroups were calculated using the following t statistic:

$$t = \frac{(p_1 - p_2)}{\sqrt{(se_1^2 + se_2^2)}}$$

where p_1 and p_2 are the estimates to be compared and se_1 and se_2 are their corresponding standard errors.

When a subgroup was compared to a total group, a modification of the standard error of difference was made to adjust for group dependence. The formula for the adjusted standard error of difference was as follows:

$$se_{Total-Subgroup} = \sqrt{se_{Total}^2 + se_{Subgroup}^2 - 2p \, se_{Subgroup}^2}$$

where p is the proportion of the total group contained in the subgroup.

Minimum sample sizes for reporting subgroup results

In the NAAL study, the sample sizes were not always large enough to permit accurate estimates of proficiency and/or background results for one or more categories of variables. For results to be reported for any subgroup, a minimum sample size of 45 was required. This number was arrived at by determining the sample size needed to detect an effect size of 0.5 with a probability of 0.8 or greater, using a design effect of 1.5. This design effect implies a sample design-based variance 1.5 times that of a simple random sample.

The effect size of 0.5 pertains to the true difference in a given mean estimate (e.g., mean proficiency) between the subgroup in question and the total population, divided by the standard deviation of that estimate in the total population. An effect size of 0.5 was chosen following Cohen (1988), who classifies effect size of this magnitude as "medium," as well as to be consistent with what was done in the 1992 National Adult Literacy Survey (NALS).

Linking O*NET Occupation Descriptors to NAAL Literacy Scales

Several studies support the use of the O*NET data to determine job requirement levels of employee aptitudes (LaPolice, Carter, & Johnson, 2008). To identify the literacy requirements of the selected occupations, including high-growth occupations, that potentially offer economic independence for the non-native-English-speaking workers, occupation data related to job analysis ratings of knowledge, skills, and abilities were collected through the O*NET database. However, the ratings of the O*NET occupation descriptors are not on the same scale as the NAAL literacy measures. Therefore, linkage needs to be established between the two measures so that the average literacy scores of the non-native-English speakers can be compared with the literacy requirements of those selected occupations. This section describes the method used to link the O*NET occupation descriptors to the NAAL literacy scales.

Following the approach taken by LaPolice, Carter, and Johnson. (2008) in their study "Linking O*NET Descriptors to Occupational Literacy Requirements Using Job Component Validation," AIR used multiple regression models to estimate the literacy requirement for the 50 selected occupations on the NAAL 2003 literacy scale. The LaPolice study used a job component validity approach to relate O*NET knowledge, skill, ability, and generalized work activity descriptor data to literacy test scores on

NALS, conducted in 1992. The study estimated mean NALS 1992 literacy scores for 902 O*NET–Standard Occupational Classification (SOC) (http://www.bls.gov/soc/) occupations using multiple regression models. The study also showed that the NALS literacy scores were highly predictable from the O*NET descriptors.

Specifically, for the purpose of this report, the prose, document, and quantitative literacy scores for 100 occupations were first estimated based on the NAAL database. More than 400 occupations were available through the NAAL database, but these 100 occupations had sufficient sample sizes to allow reliable estimates. These literacy scores were used as the dependent variable in the multiple regression models for each of the prose, document, and quantitative scales, respectively.

The NAAL occupations were classified according to the 2000 Census Industry and Occupational Codes (U.S. Census Bureau, 2000). The O*NET descriptor data were at the level of O*NET–SOC code. The Census occupational codes were matched to the O*NET-SOC codes before the multiple regression analyses were conducted.

To select the potential predictor variables for the multiple regression models, a team of AIR experts first identified the O*NET descriptors that were conceptually relevant to prose, document, and quantitative literacy. Correlations of the selected predictors and literacy scores were checked, and those predictors with negative or zero correlations were deleted. Then several models were compared in terms of how the descriptors could be further combined. The final set of predictors was determined on the basis of the published O*NET factor model, and is presented in Table A.1.

Table A.1: O*NET descriptors identified to predict NAAL literacy scores

Prose	Document	Quantitative
Basic Skills	Basic Skills	Complex Problem Solving
English Language	English Language	English Language
Getting Information	Getting Information	Computers and Electronics
Interacting With Others	Performing Administrative Activities	Cognitive Abilities
Cognitive Abilities	Cognitive Abilities	

The results of the multiple regression analyses are presented in Table A.2. Two coefficients in the models are negative, which is contrary to what would be expected. This does not mean that those two variables are negatively related to the criterion; rather,

this is very likely due to the effect of multicollinearity[13] (LaPolice, Carter, & Johnson, 2008). The regression coefficients were then applied to the models described above to estimate the literacy scores of the 50 selected occupations.

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[13] Multicollinearity is a problem in multiple regression that occurs when variables are so highly correlated with each other that it is difficult to separate the effects of two (or more) variables on an outcome variable and produce reliable estimates of their individual regression coefficients.

Table A.2: Regression coefficients for each regression model

Literacy scale	Predictors	Regression coefficients		Standardized Regression coefficients			Adjusted R square
		B	Std. Error	Beta	t	p	
Prose	(Constant)	170	6.2		27.5	0	0.8
	Basic Skills P	12.5	2.7	0.4	4.7	0	
	English Language	6.7	2.0	0.2	3.4	0	
	Getting Information	−4.9	2.2	−0.1	−2.2	0	
	Interacting With Others	7.6	2.2	0.2	3.5	0	
	Cognitive Abilities P	9.5	3.3	0.2	2.9	0	
Document	(Constant)	184.9	5.7		32.6	0	0.7
	Basic Skills D	7.5	2.2	0.3	3.4	0	
	English Language	8.8	1.7	0.4	5.3	0	
	Getting Information	−4.3	2.0	−0.2	−2.2	0	
	Performing Administrative Activities	5.0	1.4	0.2	3.5	0	
	Cognitive Abilities D	10.0	3.0	0.2	3.4	0	
Quantitative	(Constant)	185.1	5.3		34.9	0	0.8
	Complex Problem Solving	5.9	1.4	0.2	4.2	0	
	English Language	9.1	1.5	0.3	6.1	0	
	Computers and Electronics	3.6	1.3	0.1	2.8	0	