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ABSTRACT

The Job Literacy Analysis (JLA) was developed in response to the need for analyzing the literacy requirements of various occupations in an effort to match the instruction to the job and to enhance the job relatedness of curricula. It is a systematic, comprehensive process for identifying the important literacy skills needed by workers to function effectively in their current job. JLA is a result from an attempt to synthesize and augment the work in job-related reading conducted by Sticht, Mikulecky, Kirsch, and others. The five steps in the process are as follows: (1) personal interviews of job incumbents across settings; (2) content analysis of materials gathered during interviews; (3) review of materials and tasks by advisory committee that identifies important and representative materials and tasks; (4) development and distribution of survey and data analysis of results; and (5) skills identification using final job literacy description. The jobs of food service worker, entry-level secretary, and mid-to-executive level secretary have been analyzed. Important differences have been identified between JLA and Literacy Task Analysis (LTA), with the main difference being the focus in JLA on the most literacy skills, tasks, and materials as compared with the focus in LTA on areas with which workers have difficulty. The two approaches may fill different needs. (Appendixes include references, tables, and a diagram.) (YLB)

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Job Literacy Analysis: A Practical Methodology for Use in Identifying Job-Related Literacy Skills

Approaches to Job-Related Reading

A common theme of the adult literacy literature in recent years is an emphasis on the need for analyzing the literacy requirements of various occupations in an effort to match the instruction to the job and to enhance the job-relatedness of curricula (Barton & Kirsch, 1990; Keeley, 1990; Nurss & Chase, 1989; Galin, 1990; Chase, 1990; Taylor & Lewe, 1990). The "skills employees need to function effectively" (Lund & McGuire, 1990, p. 21) need to be clearly identified in order for companies to start to assess and treat job-related literacy problems. One Office of Educational Research and Improvement report (1990) concluded that "Literacy assessments should take into account that different... workplace tasks require varying levels of competency." Once the tasks and skills required for effective job functioning are identified, the tailoring of literacy testing and training to the job or set of jobs can occur.

The Job Literacy Analysis (JLA) process described below was developed in response to this need. It is a systematic and comprehensive process for identifying the important literacy skills needed by workers to function effectively in their current job. The purpose of this paper is to describe the steps of the Job Literacy Analysis methodology and to provide examples of the results of the process.

The Job Literacy Analysis process resulted from an attempt to synthesize and supplement the progress already made in workplace literacy research by Sticht, Mikulecky, Kirsch, and their colleagues. Their research will be summarized below.

Over the last decade, research has shown that job-related reading is different from the reading required in a school setting. For example, Sticht criticized the use of children's reading tests for adults, pointing out that they contained academically-oriented text. He also pointed out that the tests were normed on school children. Sticht found, for instance, that "adult literacy

students who scored at the 5th grade level on a standardized reading test normed on children were not as effective processors of oral and written language as were typical 5th grade children like those on whom the reading tests were normed" (p. 5, Sticht, 1982). The use of reading tests normed on school children for marginally literate adults thus provided misinformation about the literacy levels of the adults.

The research of Mikulecky and his colleagues drew from and expanded upon the groundbreaking work done by Sticht and his colleagues. Several of their studies indicated that the type of reading done at school was quite different from on-the-job reading. For example, reading at work occurred not for hours at a time, as in school, but usually for a few minutes at a time (Diehl & Mikulecky, 1980; Mikulecky, 1982). And textbooks were the main reading material of students, while job incumbents tended to use many types of materials that often ranged in level from 9th to 12th grade (Mikulecky, 1982; Sticht & Mikulecky, 1984; Mikulecky, 1985; Rush, Moe & Storlie, 1986). In the workplace, many activities involving literacy skills were required to complete job tasks--for example, reading, writing, and "doing," such as checking references and organizing notes (Mikulecky & Winchester, 1983). Overall, the complexity of reading at work--both in the types of materials used and the type of task performed--was much greater than the complexity of reading in a school setting.

Researchers have also shown that much job-related reading is specific to the job. For example, Sticht pointed out that different levels of reading are required in different jobs. For instance, a higher level of reading was required of Army repair personnel than of Army cooks (Sticht, Caylor, Kern & Fox, 1972). Sticht also found repeatedly a sizeable disparity between the reading level of Army personnel and the reading level of job-related materials (Sticht, 1973, 1974). This held true even for the less complex jobs. The readability levels of the materials ranged from 10th to 12th grade while the reading level of the average soldier was 9th grade. A

decade later, Kirsch and Guthrie (1984) reported that the nature of the content read on the job varied significantly across jobs such as manager, technician, or electrical worker.

Based on these research findings, it seems clear that generic reading instruction cannot be depended upon to ameliorate job-related reading problems. Job-related training, though, should be more useful.

Sticht stressed the importance of focused, job-related literacy testing and training (Sticht, 1975; Sticht, 1973, 1982; Fox & Sticht, 1974; Sticht & Beck, 1976). In military occupational specialties (MOSs), Sticht found that general literacy training programs for marginally literate adults "consistently show from one-half to one year's gain in RGL [reading grade level] for from 50 to 100 hours of general reading instruction" (p. 115, Sticht, 1975). In contrast, adults in a job related reading program made twice the progress in job related reading as compared to general reading (Sticht 1982). Sticht questioned the effectiveness of using the initial stages of the GED (high school equivalency) as Army job training: "Why would this arrangement occur? Clearly there would not be an attempt to teach automotive mechanics by offering students an introductory chemistry course--though certainly there are overlapping aspects...[such as] principles of combustion, combining of gases, etc." (Sticht, 1975, p. 1750).

Sticht and his colleagues suggested redesigning literacy materials used on the job and using audio materials in place of reading materials (Sticht, Caylor, Kern & Fox, 1972). Sticht found that when the materials were simple enough, incumbents used them; otherwise they used listening, not reading skills to perform their job functions (Sticht & Kern, 1970). Sticht stressed the idea of utilizing materials actually used by job incumbents in job-related literacy testing and instruction. This led to a focus on training being presented in a "functional context" or in a setting which is meaningful to the persons taking the training (Sticht & Mikulecky, 1984).

Sticht's research resulted in many Job Reading Task Tests (JRTTs) in which some of the materials actually used by job incumbents were included in the assessment. A potential shortcoming, as Sticht (p. 359, 1973) pointed out, was that the JRTTs may not have "adequately sampled the critical job reading materials", and that tests and instruction have to be modified whenever the materials were revised (Sticht, 1975; Sticht, Caylor, Kern & Fox, 1972; Sticht, Caylor & James, 1978). This problem was addressed by later research (Philippi, 1988, 1991) in which the analysis of reading requirements of a job was not considered complete once the literacy tasks and materials were identified. In Literacy Task Analysis, a process developed by Mikulecky and colleagues that will be described in depth below, the analysis continues through the identification of metacognitions, or thought processes which competent workers utilize in making decisions related to literacy materials. The extension of the process to a metacognitive or skill level resulted in the ability to build tests and training that did not need to be modified whenever the literacy materials changed. The training or test would need revision only if new or different metacognitions were required of workers in the job.

Other research by Sticht and Mikulecky (1984) and Mikulecky (1988) revealed that the effectiveness of literacy or basic skills training is enhanced when literacy training is integrated with job training. In such instruction, the risk of "mistakenly assuming transfer," or mistakenly counting on general literacy skills being applied to job tasks is avoided (Mikulecky, 1988).

Although job-related literacy training is known to be more effective for remedying job-related literacy skill deficits than generic literacy training, it is still unclear just how specific the job-related training needs to be. A cost-effective methodology for determining the literacy requirements of different jobs would help companies deal with the literacy problems they are now facing.

One contribution made by Mikulecky and his colleagues was a clear description of a process that could be utilized to analyze the reading, computation, and problem-solving required in various jobs (Drew, Mikulecky & Pershing, 1988; Philippi, 1991; and Mikulecky, 1985). The process is called Literacy Task Analysis (LTA). It focuses on the job tasks relating to literacy that are performed by job incumbents. In LTA, job tasks which are considered critical for performance and those with which workers are having difficulty or make frequent mistakes are the focus of study. The job incumbents who are interviewed and observed to gather information about the tasks are model workers or "master performers" (Drew, Mikulecky & Pershing, 1988) who are highly skilled and very experienced job incumbents. The goal of LTA is the understanding of the "metacognitions" which, as described earlier, are the thought processes that competent workers utilize when making decisions relating to printed materials.

The process of LTA involves the following steps. First, at a particular site or sites, professional staff, such as the personnel director and union officials, are interviewed to determine areas in which employees are having difficulty with literacy tasks. Then a site tour is completed. This step provides the investigator with a better overview of the workings of the company and allows him or her to formulate better questions for the interviews conducted in the following step. The third step involves interviewing direct supervisors about the jobs to be chosen for study. This again involves identifying areas in which employees have weak basic skills. Step four consists of interviews with and observations of actual job incumbents--preferably "master performers." Interviewers observe employees performing the tasks identified in prior steps and ask employees questions about how each task is performed. In the next step literacy materials that relate to the tasks are collected and copied. Interviewees are asked to provide all materials used to perform the task. Finally, the process is documented by photographing, tape recording, or videotaping the worker in the process of performing the tasks and by documenting

in writing exactly how the materials are used (interviewers obtain a clean copy of the form and one which is filled in as described by the incumbent).

In LTA, a skills definition step occurs next. The metacognitive skills used by the model workers, or the methods used by the workers to make literacy-related decisions, are defined based on the information and materials collected from the interviews. Details describing this process are lacking in the Mikulecky literature. It is suggested that analysts group the tasks in "skill clusters," such as locating information, writing summaries, problem-solving, or using multiple sources of information (Philippi, 1988, 1991) and/or "on-the-job reading processes," such as literal comprehension or comparing and contrasting (Philippi, 1988, 1991). The broader skills are utilized to build instruction so that the instruction will be more generalizable, i.e., it will not need to be modified every time there is a change in the task and accompanying materials.

Mikulecky and his colleagues described a process which could be used to analyze job-related reading, calculating, and problem-solving. In a separate effort, Kirsch and Guthrie (1984) were among the first to describe the variety of materials involved in on-the-job reading. They identified forms, some prose, directions, labels, computer programs, and notices among the literacy materials used in the workplace. This conception of the broader range of reading contributed to the development of the three literacy scales used in the National Assessment of Educational Progress (NAEP) in 1986 by Kirsch and Jungeblut.

The NAEP model consists of three scales that were designed to represent distinct and important aspects of literacy: prose literacy, which includes prose materials such as newspaper articles, magazines and books; document literacy, which covers the identification and use of materials found in tables, charts, forms, or indexes; and quantitative literacy, in which arithmetic

operations are applied to information in printed form, for example, order forms, menus, or advertisements.

The ETS Job Literacy Project

Purpose

The ETS Job Literacy Project applied the NAEP framework to the workplace. The purpose of the project was to see if the new methodology called Job Literacy Analysis (JLA) is useful in determining the literacy requirements of several jobs. The JLA approach centers on skills needed in the job context rather than on the broader range of skills assessed in NAEP. The results of the project were expected to be used in the design and development of job-specific or industry-specific training and testing.

One goal of the project was to ensure that the results could apply across settings, such as business, health care, and government. To accomplish this, a cross section of job incumbents in the same job were interviewed and a sizeable number of job incumbents (25 to 35 per job) were interviewed. The total number of job incumbents interviewed for the project (25 to 35 per job, 190 total) is substantially larger than the interview samples in most other major workplace literacy projects.

Method

The jobs selected for study were positions that were among the highest-volume, fastest-growing jobs from 1986 to 2000, according to Department of Labor (Bureau of Labor Statistics, 1987) projections. The occupations were representative of three different clusters defined by the Bureau of Labor Statistics and were expected to require prose, document, and quantitative literacy. The occupations chosen for study were:

Service Cluster:

1. food service worker

2. nurse assistant

Administrative Support Cluster:

3. secretary (entry-level and higher-level)

4. word processor

Mechanics, Installers, Repairers Cluster:

5. data processing equipment repairer

In this paper the results of analyzing three of the jobs: food service worker, entry-level secretary, and mid-to-executive level secretary, will be discussed.

The new Job Literacy Analysis methodology used during this project comprises five basic steps and results in a job literacy description, which includes a representative collection of the most important materials required for competent performance of the job, and the relevant tasks associated with those materials. An overview of the steps in Job Literacy Analysis is shown in Figure 1.

Insert Figure 1 about here

The data collected included:

- the actual literacy materials used on each job. Literacy materials are examples of printed matter which can be mapped onto the prose, document or quantitative literacy scales.

- a description of the tasks for which the materials are used. The tasks describe how the materials are used, and are necessary to mapping the materials onto the prose, document and quantitative scales.
- importance ratings of the literacy materials by job incumbents. The materials were rated on a scale ranging from 1 to 5 (1=of little importance, 2=moderately important, 3=important, 4=very important, 5=extremely important).

Companies were contacted through The Human Resource Division or the President's office. The project was described and permission was asked to interview a cross-section of employees on site. Volunteers were solicited for participation in the study.

Procedure.

The following analyses began with the personal interviews of job incumbents.

Personal Interviews of Job Incumbents. The job incumbent volunteers were contacted by telephone. In a 15-minute conversation, the interviewer described the project and asked the interviewee to think about the most important literacy materials used in completing his or her job functions. The interviewer described manuals, memos, and letters (prose literacy), forms, charts, or tables of any sort (document literacy), and materials that are used for calculations of any kind, such as a summary charts or travel vouchers (quantitative literacy). The job incumbent was asked to set aside, before the personal interview occurred, copies of ten important materials, representing prose, document and quantitative literacy, that he or she used at work. The one-hour personal interview had two parts. First, the job incumbent was asked for background information, including experience, educational background, position title, and title of next lower and next higher positions. Then the job incumbent and interviewer reviewed each material. A standard set of questions was asked regarding each material, although interviewers are encouraged to ask additional questions when appropriate. Questions covered in the

interview included the following: "What is this (material) called?" "What is this (material) used for?" "Where did this (material) come from?/who created it?" "What do you do with this (material)?/What action do you take on this?" and "How important is this (material) to your job?" As mentioned previously, a scale of 1 to 5 (with points ranging from 1-of little importance, to 5-extremely important) was used as a check for the question regarding importance. The interviewer left the interview with a completed background information sheet, the ten literacy materials, and a completed questionnaire relating to each material.

The interviewers, who were ETS full time staff and temporary staff hired for this particular project, were trained in a half-day training session that included review of examples of materials gathered in preliminary interviews in each job studied. Discussion included suggestions on how to approach and put at ease the interviewees in the different jobs. Food service workers, for example, seemed more comfortable answering questions about their main responsibilities before answering questions about their background, e.g., their level of education. Quality control checks were performed by experienced staff on each interviewer's initial interview. Any errors or inaccuracies were discussed promptly with the new interviewer so he or she could make necessary changes.

A total of 96 personal interviews with job incumbents [63 secretaries (entry and mid-to-executive level) and 33 food service workers] were then conducted in 25 settings. The interviews were spread across business, government, and health care settings in the greater New York and Philadelphia area. A cross-section of job incumbents representing a broad range of experience, competence, and educational background were interviewed.

Content Analysis of Materials Gathered During Interviews. The information gathered in the personal interviews was analyzed using a content analysis procedure. In the content analysis procedure, a) materials were categorized, b) materials were reduced in number by sampling if

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the domain was too large to work with (i.e., if there were more than about 50 materials), c) the tasks performed with the materials were grouped into dimensions, and then d) a report was produced which summarized the tasks which related to each material. A draft job literacy description was developed that included a representative collection of the most important literacy materials required on the job, linked to the tasks for which they were judged to be relevant. The four steps in the content analysis procedure are described below.

a. All materials gathered during the interviews were inventoried. The materials were sorted and organized into logical groupings or categories based on similarity in their format (e.g., prose versus lists versus tables) and function (i.e., the materials all being used to the same end, or all being used as part of the same process). For example, reservation, meeting, and registration forms were all forms which had to be processed as part of scheduling or attending a meeting. Examples of the categories used for the jobs of food service worker and secretary are shown in Table 1.

Insert Table 1 about here

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b. For some jobs, such as food service worker, the domain of materials did not need to be reduced in order to become manageable: food service workers provided interviewers with 16 different materials.

However, in the secretary jobs, interviewers were given 562 different materials. The materials were first classified into those relating to the job of entry-level secretary and those relating to the job of mid-to-executive secretary by using the following six criteria: current job title, job title of next-higher position,

job title of next-lower position, job tasks performed, amount of experience, and specific tasks related to individual interview materials. Then a maximum of two of the most important materials were selected to represent each material category. (There were 42 categories for entry-level and 38 for mid-to-executive). The materials were chosen based on the mean importance rating provided by the interviewees and the number of interviewees providing the material.

c. The tasks related to the materials were organized into qualitatively separate dimensions. The dimensions represented different work activities and/or work performed in different settings and reflected the major literacy-related parts of the job. For example, in the analysis of entry-level secretary, tasks relating to processing mail, including attachments, photocopying materials, telefaxing materials, obtaining appropriate signatures, and transferring information from handwritten copy to standardized forms were classified under the category of "clerical." Tasks relating to formatting, merging files, retrieving files, printing out data, and typing were included under "word/information processing and typing."

d. Finally, since some materials were provided by more than one interviewee, the tasks for which the materials were used, which often differed by interviewee, were summarized across interviewees. This was done by entering the data into a DBase IV database. Examples from the report generated from the database are shown in Tables 2 and 3, for food service worker and entry-level secretary, respectively.

Insert Tables 2 and 3 about here

Advisory Committee Convened to Review Draft Job Literacy Description. An Advisory Committee of experienced job supervisors for the jobs in question, was then convened to review and modify, if necessary, the draft job literacy description. The committee was selected so as to have representation by gender, racial/ethnic background, work setting, and geographical region. The committee members reviewed each material in the job literacy description to see if it was actually used on the job in their setting and to decide if it was important enough to remain part of the description. The tasks relating to each material were also reviewed to see whether some should be edited for clarity, deleted, or added. Committee members then discussed whether any important materials or categories of materials were missing from the draft job literacy description. When there was consensus that a certain material was missing, it was added to the job literacy description along with the tasks for which it was used, and a committee member was asked to send ETS staff an example of the material.

When Advisory Committee meetings were held for the jobs of food service worker, entry-level secretary and higher-level secretary, several important materials were added to the draft job literacy description. Most of the job literacy description remained intact.

Survey Developed and Distributed to Corroborate Committee's Judgments. Once Advisory Committee review of the draft job literacy descriptions were complete, surveys were developed and distributed to a broader national sample of job incumbents or supervisors in order to corroborate the judgment of the Advisory Committees. Each survey included the job literacy description endorsed by the committee. Questions on the survey covered the actual use of the materials by job incumbents, the actual performance of the related tasks, and the importance of the tasks for which the materials are used. A survey was developed for the job of food service worker, entry-level secretary, and mid-to-executive secretary.

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The survey of food service managers was distributed to confirm the literacy requirements of the food service worker job in large food service contractors, hotel firms, and restaurants. Cover letters requesting participation by the managers were signed by a senior officer of each firm. Eight hundred and one survey forms were sent out; 560, or 70 percent, of the forms were returned completed. For mail surveys of this type, a 70 percent response rate is considered good.

Data analyses were performed to indicate the demographic characteristics of survey respondents. The analyses revealed that 63 percent of survey respondents were male and 37 percent were female. The vast majority (92 percent) of respondents were White/non-Hispanic. The age of respondents ranged from less than 20 years to over 55 years, with 77 percent being 25 to 44 years old. The number of individuals employed by the food service managers ranged from less than 50 to 300 or more with the vast majority (85.3 percent) employing less than 100 workers. Different work settings were represented by survey respondents: 34.8 percent worked in a business setting, 34.5 percent in a school or university setting, and 17.6 percent in a health care setting. Hotels and restaurants were also represented (5.4 percent and 1.8 percent, respectively).

Analyses were also conducted to determine whether the materials were actually used and their importance to competent performance of the job. For each material, the following data were summarized:

- the number and percent of respondents who reported using the material
- for each related task, the number and percent of respondents who reported performing the task

- for respondents performing the task, the mean importance rating for each task.[1]

Analyses were reported for the total group of respondents as well as by gender and work setting (health care, school/university, business).

All of the materials in the food service worker survey except one (the special diet tag or plan) were rated as being used by approximately 50 percent or more of the survey respondents. The materials ranged in use from 46.5 percent for the hazardous material sheet to 96.8 percent for the food scale. The special diet tag or plan was used by only 18 percent of the respondents overall. However, 90 percent of the respondents in the health care setting used the materials and rated the tasks for which the materials were used as being extremely important. On this basis it was decided that the special diet tag or plan should be included in the domain of most important literacy materials used by a food service worker on his or her job. Therefore, the survey confirmed the expert opinion of the Advisory Committee regarding the job literacy description: the materials on the survey were used on the job and the tasks related to them were important.

The secretary surveys, due to length, were developed in two forms for each of the secretary jobs. A total of 2,000 survey forms (1,000 for each job; 500 for each survey form) was distributed to the Presidents of member companies of the Society for Human Resource Management (SHRM). Cover letters requested that the survey form be given to the secretary recruiter. The number of survey forms returned completed were: 18 percent and 24 percent for the two forms of the entry-level survey; 18 percent and 19 percent for the two forms of the mid-to-executive survey. The implications of these response rates for the issue of generalizability will be covered in the Discussion section.

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[1]The detailed results of the data analyses for each of the three jobs are currently being prepared for publication.

Similar data analysis to those described for food service worker were computed. Analyses regarding the demographic characteristics of respondents showed that 80 percent of the survey respondents were females and 18 percent were males. The majority (89 percent) of the respondents reported themselves as White/non-Hispanic. The number of individuals employed in the survey respondent's company ranged from less than 100 to 5,000 or more, with approximately half of the companies employing 1,000 or more people. Different types of businesses were represented by survey respondents,[2] including: 26 percent in finance, insurance and real estate; 19 percent in manufacturing, transportation, and communication; 17 percent in service businesses; 6 percent in public administration; 5 percent in wholesale and retail trade; and 27 percent in other types of businesses.

Results regarding the amount of usage for each material revealed that for only one material category in entry-level secretary (pamphlets, brochures, and presentation materials) was usage by company secretaries rated as less than 50 percent. For all other categories in that job, usage ranged from 50 percent to 99 percent (telephone messages). Therefore, the one material category was dropped from the job literacy description for entry-level secretary.

In the mid-to-executive secretary job, all of the material categories were rated as being used by about 50 percent or more of the company's secretaries. The materials ranged in use from 58 percent for time sheets and records to 97 percent for diaries, appointment books, calendars, and tickler files. Therefore, the survey confirmed the expert opinion of the Advisory Committee regarding the job literacy description.

Skills Identification Step. The final step in Job Literacy Analysis is the skills definition step. The purpose of this step is the description of the skills required to use the materials in the

[2]These businesses represent the type of company the food service workers served.

final job literacy description for the related tasks. Literacy skills are the cognitive processes (e.g., locating, comparing, matching) brought to bear when the literacy material is used to perform the related task. It is important to conduct the skills analysis using terminology familiar to the individuals who will use the results to develop training and testing. To this end, as the skills step was conducted feedback was obtained from trainers and supervisors about the vocabulary used in the skills that were described. The trainers and supervisors who were consulted all agreed that the terminology used was appropriate, clear, and useful.

To define each skill, each task and related material was reviewed. For example, for the job of food service worker, the skills that were identified as being required for reading a work schedule included: recognizing the meaning of integers, telling time using a clock, recognizing printed time, recognizing and using a calendar, reading and understanding common words, reading and understanding job-specific words, reading and understanding abbreviations, and locating and extracting information from a two-column table. The skills relating to obtaining an approval or a signature on the work schedule were: locating the space on a form where data must be entered and entering data into the appropriate spaces on a form.

For the job of entry-level secretary, some of the literacy-related tasks involved non-literacy related skills such as word processing, typing, or photocopying. In these instances, only the literacy-related skills necessary for the activity were described. For example, typing form letters from manuscripts required the skills of reading and using common words, job-specific words, contractions, and abbreviations. Proofreading form letters and memos required the following skills: reading and understanding common and job-specific words, contractions, and abbreviations; spelling common and job-specific words accurately, understanding the meaning of a word based on its context, identifying words needing capitalization, using references to check

and correct spelling errors, applying the rules of grammar, and applying rules for commas, periods, and apostrophes.

Two reports were produced for each job regarding the literacy skills needed for the job. The first report was the prescriptive Skills-Tasks-Materials report, which listed the literacy skills, the tasks which related to the skills and the materials with which the tasks were associated. The second type of report generated for each job analyzed was the Skills Summary Report. This report summarizes the literacy skills by category[3] across all tasks and materials required for each job.

For the job of entry-level secretary, a portion of the prescriptive report is shown in Table 4. The prescriptive report serves as a blueprint for training or testing development.

Each skill that is defined is linked back to the material(s) and task(s) to which it relates so examples of materials actually utilized by job incumbents and the tasks for which they are used can be included in the assessment or instruction. The use of actual job materials and tasks enhances the functional context or meaningfulness of the test and/or training. Also, the training or assessment should not need modification every time reading materials change, but only when the literacy skills of the job change. Secondly, if the number of tasks and materials is too large for each of them to appear on the test, the skills list is especially useful in selecting a sample of the materials and tasks. Materials and tasks should be selected that represent each skill area.

The Skills Summary Report for the entry-level secretary job is shown in Table 5. The 71 literacy skills identified in the entry-level secretary job, which fall under 12 skills categories, are included in the report.

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[3]A skills category is a logical grouping of skills based on operations performed (e.g., adding and subtracting, numbers and counting) or by materials processed (e.g., forms; tables, charts and graphs).

Insert Tables 4 and 5 about here

For the job of food service worker, a portion of the prescriptive report is included in Table 6. This report would be used in a manner similar to the prescriptive entry-level secretary report presented in Table 4. In Table 7 appears the Skills Summary Report for food service worker. The 48 literacy skills identified in the food service worker job fall under 14 different skills categories.

Insert Tables 6 and 7 about here

More research would help to further clarify the process involved in the skills identification step and the use of the skills report in generating testing and/or training.

Discussion

The Job Literacy Analysis approach has been described, and the central JLA constructs (material category, material, task, skill, skill category) have been defined. Results have been presented indicating that JLA is a promising practical methodology for determining the important materials, tasks, and literacy skills needed for various jobs.

Job Literacy Analysis provides descriptions of literacy requirements at three levels, as shown in Diagram 1. The context level focuses on the activities or tasks performed in a real environment. It represents literacy materials and the tasks job incumbents perform with them. This level grounds the analysis in reality, which is important in order to enhance the content-related evidence of validity of resulting training or tests. The second, construct level involves the definition, interpretation, identification or description of the constructs of the first level. In the case of JLA, the level represents the identification of the skills required to perform the literacy tasks using the literacy materials from level one. Conceptualizing the skills and the task and

material combinations as being on two different levels may help to clarify the inter-relations of the skills, tasks, and materials. The third level, application, involves the development of job-related literacy assessment and training using the list of skills from level two. For the development of training, the tasks and material combinations can be sampled by skill. The skills and skill categories of level two provide a framework that can be useful in sampling the tasks and material combinations of level one. The segments of the training or the items on the test developed from the Job Literacy Analysis would include examples of the materials and tasks from level one.

Insert Diagram 1 about here

Job Literacy Analysis is an evolving approach that may change somewhat as it is applied more widely. For example, the order of the steps may change, or a step may be added. The approach needs to be flexible enough to apply in various conditions. In the results described in this paper, it w s pointed out that the 562 secretarial materials collected represented great diversity; content analysis procedures were developed to reduce the number of materials. As a result of applying JLA to the secretarial positions it is suggested that an initial step be added to the approach: telephone interviews with supervisors and/or job incumbents to provide an overview of the job literacy requirements, or to identify the potential domain of literacy materials, for specific jobs. The supervisor/job incumbent would be asked to discuss the range and nature of the types of important literacy materials that are read and used by job incumbents in completing job functions. The list of material categories is expected to help shape and focus the personal interviews conducted with job incumbents and result in a more efficient

Job Literacy Analysis process. Work is currently underway that is designed to reveal whether the addition of this step will be useful.

Job Literacy Analysis is in some ways similar and in some ways different from the Literacy Task Analysis process developed by Mikulecky and his colleagues. As mentioned previously, JLA focuses on the important materials, tasks, and literacy skills needed for effective functioning in a particular job or set of jobs. In contrast, Literacy Task Analysis focuses on critical tasks and materials representing areas in which incumbents have weak basic skills, i.e., areas in which workers have difficulty or make frequent mistakes. Observation is used in Literacy Task Analysis, while in Job Literacy Analysis, in contrast, additional steps involving feedback from supervisors and incumbents (the Advisory Committee and the survey) are included. Both approaches identify the skills needed to perform literacy tasks using the related materials. In Job Literacy Analysis, the skills are worded in the terminology of jobs. In Literacy Task Analysis, the skills are referred to as metacognitions or the thought processes used by model workers to make decisions relating to printed materials.

The Job Literacy Analysis approach and the Literacy Task Analysis approach may very well fill different needs. Job Literacy Analysis provides a comprehensive list of skills upon which to base training or testing while Literacy Task Analysis provides a list of metacognitions which could be utilized to build training to ameliorate a particular literacy skills deficit in a certain set of employees in particular areas.

Three jobs were analyzed using the new Job Literacy Analysis process. The literacy demands of the jobs were identified in terms of literacy materials, literacy material categories, literacy tasks, literacy skills, and literacy skill categories. As a result of the analysis, the 48 literacy skills required for the reading and math performed by food service workers were identified. To laypersons, the food service job may appear to require few literacy skills. The

Job Literacy Analysis process identifies 48 skills, thereby painting a different picture of the skills needed.

Seventy-one literacy skills were identified as being required by entry-level secretaries in performing their jobs. The impression of the secretary job to the layperson tends to be quite complex. It is interesting to note that only 23 more literacy skills are required for this job, as contrasted with the job of food service worker. Is the entry-level secretary job simpler, in terms of required reading and math skills, than it appears, or is the food service job more complex? Or are there other additional variables that reflect the relative complexity of job literacy requirements?

In many workplace settings, on-the-job training is still administered via the buddy system. But it is not clear that the content of the training is as consistent and complete as it might be. The results of the Job Literacy Analyses can be provided to workers who are currently training new hires so they can be sure to cover all of the necessary skills. The results can also be used to develop formal training for the job which builds on the skills, tasks, and materials identified in the Job Literacy Analysis. The Skills Summary Report lists all of the literacy skills required for the job. It is recommended that these be included in training. In the Skills-Tasks-Materials Report, the particular material and task combinations which require each skill are listed. Formal training could include the demonstration of several of the task-material combinations which require each skill. The JLA process results in specifications for training development.

Other possible uses for the Job Literacy Analysis results include the development of procedure manuals for the various positions and the inclusion of the literacy skills in the performance appraisal process for the jobs. A supervisor could indicate the skills on the Skills-Tasks-Materials report in which the worker needs practice. The job incumbent would then know

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exactly which task-material combinations they need to practice. JLA results may also be used by recruiters for the job to focus more effectively on qualified job candidates. They could use the Skills Summary Report to ask questions about the candidate's experience which relates to each required literacy skill. JLA results can be useful in informing supervisors and upper level management of the specific reading and math skills required for a job. This may enhance the status of some entry-level positions. Use of JLA results is expected to increase productivity and lower error rates on jobs as well as increasing the knowledge of and compliance with safety procedures. And finally, the results of the Job Literacy Analyses can be utilized to identify job aids, for example, tools to decrease the need for memorization of verbal instructions.

If researchers wanted to generalize from the findings described in this paper, several questions would need to be addressed. First, what can be learned from the current sample? Second, can we generalize from the sample to the population? The findings described earlier relating to the secretary surveys can be thought of in a descriptive but not inferential sense as a set of observations based on real people. However, it is possible that the results may change. This is much less likely with the return rate of 70 percent on the food service worker survey than with the return rates of 18 to 24 percent on the two secretarial surveys. In the latter case, questions which can be posed which are still not answered are:

- will all the material categories still be included?
- will all of the related tasks still be included?
- if not, will the resulting skills list be the same or not?

While there is no evidence of nonresponse bias in the sample (see the earlier discussion of demographic data for each survey), some differences could result from a study aimed at generalizability. But the practical implications of the results will be very much the same.

Materials resulting from a Job Literacy Analysis can also be used to identify the most common vocabulary words for a particular job. Multiple examples of the most important types of materials identified in the job literacy description can be scanned and frequency counts computed on the words from the materials. Once the list is reviewed by a panel of experts, a list of the common lexicon to the job would result. Future research might also help determine how literacy skills compare across jobs or job families. Are there clusters of job-related literacy skills? Is there a common or core set of skills for most or many entry-level jobs? What principles underlie the organization of the skills so that, once identified, researchers might be enabled to extrapolate from the jobs already studied to those not yet analyzed? The answers to these issues and others will hopefully become clear as future research is conducted using the JLA process.

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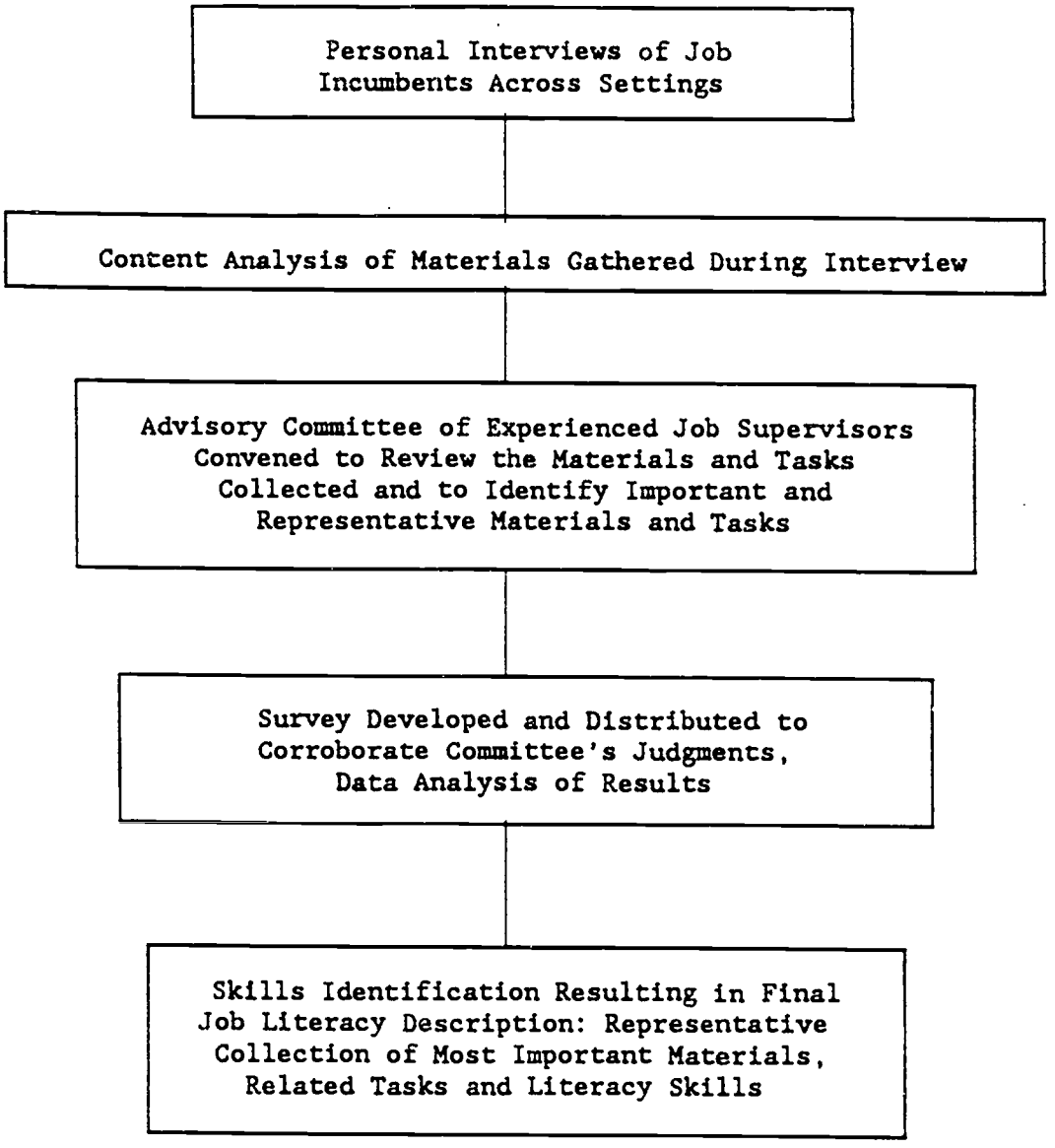

Figure 1. Job Literacy Analysis Methodology

Table 1

Examples of Literacy-Related Material Categories for Food Service Worker and Secretary

Food Service Worker Literacy-Related Material Categories
1. Sandwich Lists
2. Special Diet Tag or Plans
3. Food Scales
4. Chart or Job Description
5. Hazardous Material Sheets
6. Work Schedules
Secretary Literacy-Related Material Categories
1. Form Letters/Form Memos
2. Memos Typed From Manuscripts, Drafts, and Dictation
3. Computer and Other Instructions, Manuals, Help Screen
4. Directories and Bibliographies
5. Company Guidelines, Policies, and Procedures
6. Schedules and Agendas
7. Telephone Messages/Logs
8. Checklists, Worksheets, and Time Records
9. Travel Forms, Expense Reports, Petty Cash Vouchers
10. Requisitions and Invoices
11. Reservation, Meeting, Registration Forms
12. Tables and Statistical Typing
13. Text Charts
14. Reports and Newsletters
15. Contracts, Agreements, and Proposals
16. Pamphlets, Brochures, and Presentation Materials

Table 2

Examples from the Draft Job Literacy Description for Food Service Worker

Material	Related Tasks
Sandwich Lists	1. Count or weigh food portions or read scale
	2. Label meat or cheese after slicing and wrapping
	3. Mark price code or label on wrapped sandwiches
Recipes	1. Read and follow directions to prepare items
	2. Modify recipe if needed (to accommodate more or fewer people)
	3. Perform taste tests
	4. Label meat or cheese after slicing and wrapping

Table 3

Examples from the Draft Job Literacy Description for Entry-level Secretary

Material	Related Tasks
Computer and Other Instructions, Manuals, Help Screens	1. Format letters, tables, articles, and other materials
	2. Layout/create/alter charts, graphs, tables, and other materials
	3. Print out hard copy of letter, memo, or document
	4. Send mail/distribute to appropriate department/ parties, internal or external
	5. Read instrcutions from computer menu/screen (e.g., available options, help screens)
	6. Read instructional manuals (e.g., word processing or other software package)
	7. Use standard reference materials (e.g., dictionaries, directories, schedules, catalogs, lists)
	8. Call up a program and issue commands to retrieve/ update data or generate a report (data retrieval programs)
	9. Maintain existing files (e.g., file papers in the correct folders, electronically file)
Telephone Message/Logs	1. Send mail/distribute to appropriate department/ parties, internal or external
	2. Process forms/reports (e.g., fill out/update, attach documentation, distribute)
	3. Answer phones: direct, screen calls, write down messages, substitute for switchboard as needed
	4. maintain logs (e.g., mail log, log of phone calls)

Table 4
Examples from Skills - Tasks - Materials Report (Entry-Level Secretary)

Skill #1: Add and subtract integers		
	Task	Material
1.	Perform calculations	Checklists, Worksheets, and Time Records Travel Forms, Itineraries, Expense Reports, Petty Cash Vouchers and Receipts Requisitions and Invoices
2.	Check calculations of forms (e.g., travel vouchers, purchase orders, tables in reports)	Diaries, Appointment Books, Calendars and Tickler Files
Skill #2: Add and subtract fractions		
1.	Perform calculations	Checklists, Worksheets, and Time Records Travel Forms, Itineraries, Expense Reports, Petty Cash Vouchers and Receipts Requisitions and Invoices
Skill #3: Use addition and subtraction to solve problems involving integers, mixed numbers, fractions, and/or decimals		
1.	Perform calculations	Checklists, Worksheets, and Time Records Travel Forms, Itineraries, Expense Reports, Petty Cash Vouchers and Receipts Requisitions and Invoices
2.	Check calculations of forms (e.g., travel vouchers, purchase orders, tables in reports)	Diaries, Appointment Books, Calendars and Tickler Files
3.	Make initial check for correctness and completeness	Travel Forms, Itineraries, Expense Reports, Petty Cash Vouchers and Receipts

Table 4 (cont'd)

Skill #4: Enter data into the appropriate spaces on a form		
	Task	Material
1.	Type information into the blanks of a letter or form	Schedule and Agendas Checklists, Worksheets and Time Records
2.	Telefax	Schedules and Agendas Checklists, Worksheets and Time Records
3.	Maintain logs	Logs
Skill #5: Determine the main idea of a paragraph		
1.	Read instructions from computer menu/screen (e.g., available options, help screens)	Computer and Other Instructions, Manuals, and Help Screens
2.	Use standard reference materials (e.g., directions, dictionaries, directories, schedules, catalogs, lists)	Computer and Other Instructions, Manuals, and Help Screens Directories and Organization Charts Company Guidelines, Policies, and Procedures Schedules and Agendas
Skill #6: Locate and extract information from a two-column table or chart		
1.	Revise charts, graphs, tables, and other material	Tables and Charts Reports and Newsletters
2.	Layout or alter charts, graphs, tables, and other materials	Pamphlets, Brochures, and Presentation Materials
Skill #7: Locate and extract information from a graph		
1.	Revise charts, graphs, tables, and other material	Tables and Charts Reports and Newsletters
2.	Layout or alter charts, graphs, tables, and other materials	Pamphlets, Brochures and Presentation Materials

TABLE 5: SKILLS SUMMARY LIST FOR ENTRY LEVEL SECRETARIES

	ENTRY LEVEL SECRETARY SKILLS SUMMARY LIST
	1. VOCABULARY (V)
1.	Read and understand common words
2.	Read and understand job-specific words
3.	Read and understand abbreviations, contractions, and acronyms
4.	Read and understand symbols and codes
5.	Determine a word's meaning from the context of a sentence
	2. GRAMMAR, EDITING, AND SPELLING (GES)
1.	Apply rules of grammar
2.	Recognize words needing capitalization
3.	Apply rules for punctuation (e.g., commas, periods, apostrophes, semicolons)
4.	Make wording changes to improve clarity
5.	Spell common words correctly
6.	Spell job-specific words correctly
7.	Use references to check and correct spelling errors
	3. TELLING TIME (TT)
1.	Read and understand printed time
2.	Read and understand the relationship of time on a clock to printed time
3.	Read and understand dates and/or printed times on a calendar
	4. FORMS (F)
1.	Locate the space on a form to enter data
2.	Transfer or copy exact data from other sources onto appropriate section of a form (e.g., copy data from intersection of table columns and rows)

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ENTRY LEVEL SECRETARY SKILLS SUMMARY LIST (continued)

	4. FORMS (F) continued
3.	Enter data (created/generated) into the appropriate spaces on a form
4.	Write a description of an activity or transaction in appropriate section of a form
5.	Locate or compare information using a completed form
	5. FOLLOWING DIRECTIONS (FD)
1.	Follow directions to complete a task that includes reading, identifying, observing and/or comparing
2.	Identify and use appropriate sections of text and visual materials to complete a task
3.	Follow very specific step-by-step directions to perform a sequence of tasks
4.	Read and understand the main idea of job-specific material
5.	Determine appropriate course of action in a particular situation
6.	Synthesize information from more than one source (e.g., written, pictorial, oral) to complete a task
	6. READING AND REFERENCE SKILLS (RS)
1.	Use alphabetic and alphanumeric filing system (e.g., locating files, filing information)
2.	Find information by using a table of contents, index, appendix, and glossary
3.	Find appropriate section of reference source (e.g., sentence, paragraph, heading, table) to answer a specific question
4.	Find information by skimming or scanning text
5.	Find information by cross-referencing sources
6.	Synthesize/summarize information from more than one section of a reference source to answer a specific question

ENTRY LEVEL SECRETARY SKILLS SUMMARY LIST (continued)	
	6. READING AND REFERENCE SKILLS (RS) continued
7.	Synthesize/summarize information from more than one reference source to answer a specific question
8.	Determine the main idea of a paragraph
9.	Determine the main idea of reference material (e.g., passages, letters, articles)
	7. NUMBERING AND COUNTING (NC)
1.	Match numbers with words used as codes or labels
2.	Read or write numbers in sequence
3.	Read and understand telephone and telefax numbers
	8. TABLES, CHARTS, AND GRAPHS (TCG)
1.	Locate and extract information from a two-column table or chart
2.	Locate and extract information from an intersection of a row-by-column table or chart
3.	Utilize information from the intersection of a complex table or chart to compare data within the table or chart
4.	Utilize information from the intersection of a complex table or chart to compare data with text, document materials or objects outside the table or chart
5.	Utilize information from tables, charts, or graphs to choose a course of action or solve a math problem
6.	Locate and extract information from a graph
7.	Locate and extract information from a pie chart
8.	Locate and extract information from a bar graph
	9. ADD AND SUBTRACT (AS)
1.	Add and subtract integers
2.	Add and subtract decimals

ENTRY LEVEL SECRETARY SKILLS SUMMARY LIST (continued)

	9. ADD AND SUBTRACT (AS) continued
3.	Add and subtract fractions
4.	Add and subtract mixed numbers (integers and fractions)
5.	Add and subtract printed time (hours and minutes)
6.	Add and subtract linear, weight and volume measures (e.g , liquid, dry, degree)
7.	Determine an estimate of a sum or difference (integers, fractions or decimals)
8.	Use addition and subtraction to solve problems involving integers, mixed numbers, fractions, and/or decimals
	10. MULTIPLY AND DIVIDE (MD)
1.	Multiply and divide integers
2.	Multiply and divide decimals
3.	Multiply and divide fractions
4.	Multiply and divide mixed numbers (integers and fractions)
5.	Multiply and divide linear, weight and volume measures (e.g., liquid, dry, degree)
6.	Determine an estimate of a product or quotient (integers, fractions or decimals)
7.	Use multiplication and division to solve problems involving integers, mixed numbers, fractions, and/or decimals
	11. OTHER ARITHMETIC PROCESSES (OAP)
1.	Reduce fractions to lower terms
2.	Determine averages
3.	Solve problems that combine more than one process (e.g., addition and multiplication, multiplication and division)

ENTRY LEVEL SECRETARY SKILLS SUMMARY LIST (continued)	
	11. OTHER ARITHMETIC PROCESSES (OAP) continued
4.	Solve problems involving units of measurement that combine more than one process (e.g., addition and multiplication, multiplication and division)
5.	Solve problems that require conversion
6.	Solve ratio and proportion problems
7.	Read and understand information from scales to solve math problems
	12. RECOGNITION
1.	Identify and label objects
2.	Identify objects by particular physical characteristics (e.g., size, shape, color)
3.	Select appropriate course of action by using taste, touch, sight, or hearing

Table 6

Skills - Tasks - Materials Report (Examples from Food Service Worker)

Task	Material
Skill #F2: Transfer data from other sources onto appropriate section of a form	
1. Read and fill out order forms or requisitions for food and supplies	Order Sheet
2. Read special diet meal plans, menus or recipes/fill out patient dinner tags	Special Diet Tag or Plan
Skill #FD1: Follow directions to complete a task that includes reading, identifying, observing, and/or comparing	
1. Read and follow directions for setup	Diagram
2. Read and follow directions on production sheets	Food Production Order
3. Read and follow directions on recipes, boxes, cans to prepare items	Food Production Order
4. Read and follow directions to prepare food	Recipe
5. Read and follow instructions on chart or job description	Chart or Job Description
6. Read memos and employee notices	Memos or Notices
7. Read menus	Reservation/confirmation Form
8. Read safety sheets	Safety Material
9. Read the instructional manual	Operational Instructions
Skill #G1: Read and interpret the markings on a scale	
1. Count or weigh food portions or read scale	Food Scale
Skill #I1: Locate and use parts of an illustration (e.g., labels, numbers)	
1. Read labels	Label
2. Read safety sheets	Safety Material
3. Read the instructional manual	Operational Instructions

Table 6 (cont'd)

Skill #MD7: Use multiplication and division to solve problems involving integers, mixed numbers, fractions and/or decimals	
Task	Material
1. Modify recipe if needed (to accommodate more or less people)	Recipe
Skill #TCG1: Locate and extract information from a two-column table or chart	
1. Read and fill out order forms or requisitions for food and supplies	Order Sheet
2. Read and follow instructions on chart or job description	Chart or Job Description Reservation/confirmation Form
Skill #TT1: Tell time using a clock	
1. Read and follow instructions on chart or job description	Chart or Job Description
2. Read the work schedule	Schedule

TABLE 7: SKILLS SUMMARY LIST FOR FOOD SERVICE WORKER

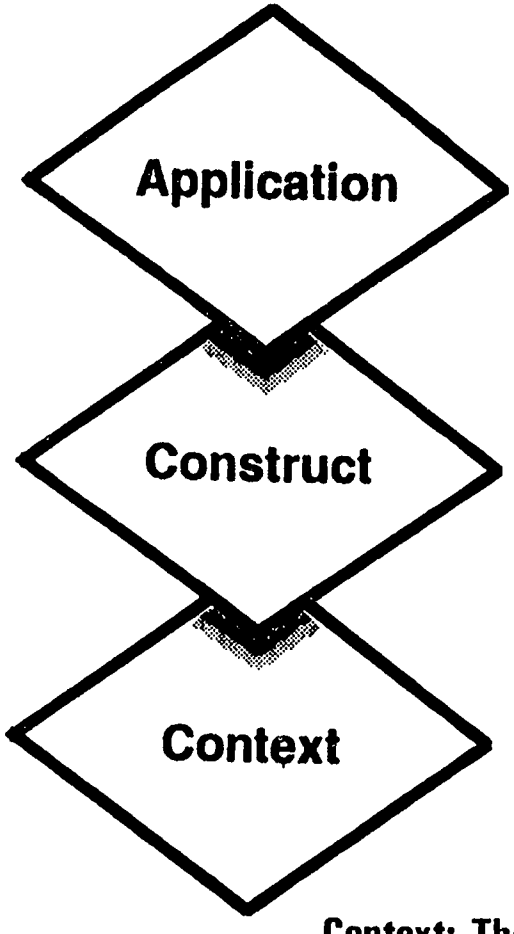
	FOOD SERVICE SKILLS SUMMARY LIST
	1. ADD AND SUBTRACT (AS)
1.	Add and subtract integers
2.	Add and subtract fractions
3.	Add and subtract linear, weight and volume measures (e.g., liquid, dry, degree)
4.	Use addition and subtraction to solve problems involving integers, mixed numbers, fractions, and/or decimals
	2. FORMS (F)
1.	Locate the space on a form to enter data
2.	Transfer or copy exact data from other sources onto appropriate section of a form (e.g., copy data from intersection of table columns and rows)
3.	Enter data (created/generated) into the appropriate spaces on a form
4.	Locate or compare information using a completed form.
	3. FOLLOWING DIRECTIONS (FD)
1.	Follow directions to complete a task that includes reading, identifying, observing and/or comparing
2.	Identify and use appropriate sections of text and visual materials to complete a task
3.	Follow very specific step-by-step directions to perform a sequence of tasks
4.	Read and understand the main idea of job-specific material
5.	Determine appropriate course of action in a particular situation
	4. SCALES AND OTHER GAUGE MEASURES (G)
1.	Read and interpret the markings on a scale

FOOD SERVICE SKILLS SUMMARY LIST (continued)	
	5. GRAMMAR, EDITING AND SPELLING (GES)
1.	Spell common words correctly
2.	Spell job-specific words correctly
	6. ILLUSTRATIONS (I)
1.	Locate and use parts of an illustration (e.g., labels, numbers)
2.	Follow directions using a single illustration or a sequence of illustrations
	7. LINEAR, WEIGHT, AND VOLUME MEASURES (LWV)
1.	Read and understand units of measure (e.g., U.S. standard, metric system)
2.	Read and understand measures of weight (e.g., ounces, pounds, grams)
3.	Read and understand measures of volume (e.g., pints, quarts, liters)
4.	Read and interpret a linear scale (e.g., a ruler)
	8. MULTIPLY AND DIVIDE (MD)
1.	Multiply and divide decimals
2.	Use multiplication and division to solve problems involving integers, mixed numbers, fractions, and/or decimals
	9. NUMBERING AND COUNTING (NC)
1.	Match numbers with words used as codes or labels
2.	Read or write a number (digits, integers, and decimals)
3.	Read or recognize the meaning of integers
4.	Read or recognize the meaning of percentages

	FOOD SERVICE SKILLS SUMMARY LIST (continued)
	9. NUMBERING AND COUNTING (NC) continued
5.	Count by intervals of ones, twos, fives or tens
6.	Match numbers (i.e., number lines) or intervals on scales
	10. OTHER ARITHMETIC PROCESSES (OAP)
1.	Solve problems involving units of measurement that combine more than one process (e.g., addition and multiplication, multiplication and division)
2.	Solve problems that require conversion
	11. RECOGNITION (R)
1.	Identify and label objects
2.	Identify objects by particular physical characteristics (e.g., size, shape, color)
3.	Select appropriate course of action by using taste, touch, sight, or hearing
	12. TABLES, CHARTS AND GRAPHS (TCG)
1.	Locate and extract information from a two-column table or chart
2.	Locate and extract information from an intersection of a row-by-column table or chart
3.	Utilize information from the intersection of a complex table or chart to compare data within the table or chart
4.	Utilize information from the intersection of a complex table or chart to compare data with text, document materials or objects outside the table or chart
5.	Utilize information from tables, charts, or graphs to choose a course of action or solve a math problem

FOOD SERVICE SKILLS SUMMARY LIST (continued)	
	13. TELLING TIME (TT)
1.	Tell time using a clock
2.	Read and understand printed time
3.	Read and understand dates and/or printed times on a calendar
	14. VOCABULARY (V)
1.	Read and understand common words
2.	Read and understand job-specific words
3.	Read and understand abbreviations, contractions, and acronyms
4.	Read and understand symbols and codes
5.	Determine a word's meaning from the context of a sentence

Tri-Level System Analysis



Context: The Environment

Construct: Interpretation of the context; chunking the context data so it can be used in application, e.g., building a taxonomy

Application: Test or Training Development

Diagram 1.