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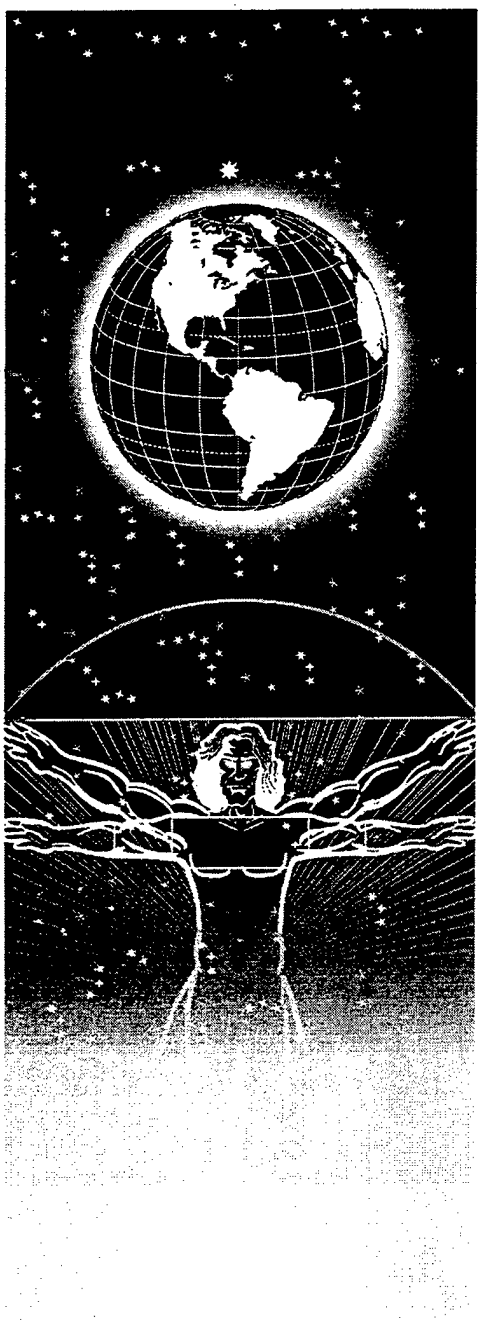

UNITED STATES AIR FORCE RESEARCH LABORATORY

BASIC RESEARCH TO SUPPORT DEVELOPMENT OF A CAREER GUIDANCE SYSTEM FOR DISPLACED AIR FORCE WORKERS

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13. ABSTRACT (Maximum 200 words)

This report describes research to explore the feasibility of developing a computer-based career guidance system for displaced workers. The initial system was designed for displaced civilian workers associated with the air force. The project began with a needs assessment using focus groups of a representative sample of workers. The proposed system capitalizes on the capabilities of the Occupational Information Network (O*NET). The project focused on aspects of the proposed system not currently available in existing career information systems. These included the development of worker assessment tools and advanced person-job matching algorithms. Regarding worker assessment, a skill self-assessment inventory was developed and tested along with a taxonomy of non-work activities linked to O*NET skills. A computer demo was developed to demonstrate how these components could be incorporated into a complete career guidance system.

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Preface

This report describes the development of a computerized career guidance system created to assist displaced workers in finding new jobs. The work summarized in this report was performed by Personnel Decisions Research Institutes, Inc. for the Air Force with funds provided through the Department of Defense Small Business Innovative Research (SBIR) program. This SBIR Phase I effort, Multimedia Career Guidance and Transition System for Displaced Workers (Contract Number F41624-97-C-5019), was conducted for the Job Systems Branch of the Armstrong Laboratory, Human Resources Directorate, Manpower & Personnel Research Division (AL/HRD).

Dr. Thomas W. Watson was the laboratory project manager. We would like to express our appreciation to Dr. Watson for his contribution to the conceptualization of this research and for his guidance and assistance throughout the project. We also express our appreciation to Mr. Larry Looper for his guidance on person-job matching issues and to other laboratory managers for their guidance and support. Appreciation is also expressed to the staff of the Kelly AFB transition office who arranged for participants for the needs assessment, and to the participants themselves. Thanks especially go to Mr. Denver McClendon, Ms. Linda Patterson Ms. Doddie Tunches and Ms. Dora Trevino who were instrumental in arranging for Kelly AFB participation.

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Background

Military and Civilian Downsizing

The end of the cold-war era, the enormous expense of the defense budget, and increasing Federal deficits have set the stage for widespread military downsizing. The 1990 Base Closure and Realignment Act established a process for this downsizing. Many facilities have begun the closure process, and it has been estimated that several hundred defense installations will be closed in the next few years. Base closures will not only affect military personnel, but also the communities in which the facilities are located. Enlisted personnel and officers will be forced to seek other employment, as will civilians whose jobs are directly or indirectly dependent on the military facility. Identification of appropriate occupations for these displaced workers is complicated by difficulties in identifying civilian counterparts for many military jobs.

Issues related to downsizing and displaced workers are not confined to the military. Recent changes in the commercial workplace, including rapid technological advances and highly competitive international markets, have led to changes in how businesses function and adapt. In order to survive in a highly competitive marketplace, many companies have downsized, restructured, and streamlined their workforces. In addition to displacing workers, restructuring has often made entire occupations obsolete. Thus, workers are more and more often not only changing jobs, but changing occupations and careers as well.

Employers have been criticized for not caring about their employees' futures and for providing little or no "outplacement" service to assist them. Displaced workers find themselves unemployed at various stages of their careers, and finding jobs in the same or similar occupations can be very difficult, especially for workers who are unwilling or unable to relocate. Workers need information concerning how the knowledges and skills they have acquired in their jobs might transfer to another occupation, and the extent to which other skills and abilities that they did not use in their previous job might help them in identifying an appropriate occupation. Civilian and military downsizing has created a need for highly accessible career information, as workers in the middle of their careers attempt to identify new occupations for which they are qualified, or training to prepare them for new careers.

The Occupational Information Network (O*NET)

Until recently, high quality information concerning the skills, abilities and other worker characteristics relevant for various occupations has not been available. The Dictionary of Occupational Titles (DOT), the nation's primary source of occupational information, contains narrative descriptions of occupations, including some worker requirements. However, the DOT does not provide the kind of systematic, standardized information necessary to identify occupations with similar worker requirements or identify occupations appropriate for a worker with a particular pattern of skills and abilities.

A project currently being sponsored by the U. S. Department of Labor (DOL) will for the first time provides comprehensive, standardized occupational information for all jobs in the U.S. economy. The DOL has recognized the limits of the current DOT and is in the process of replacing it with a state-of-the-art database of occupational information (the Occupational

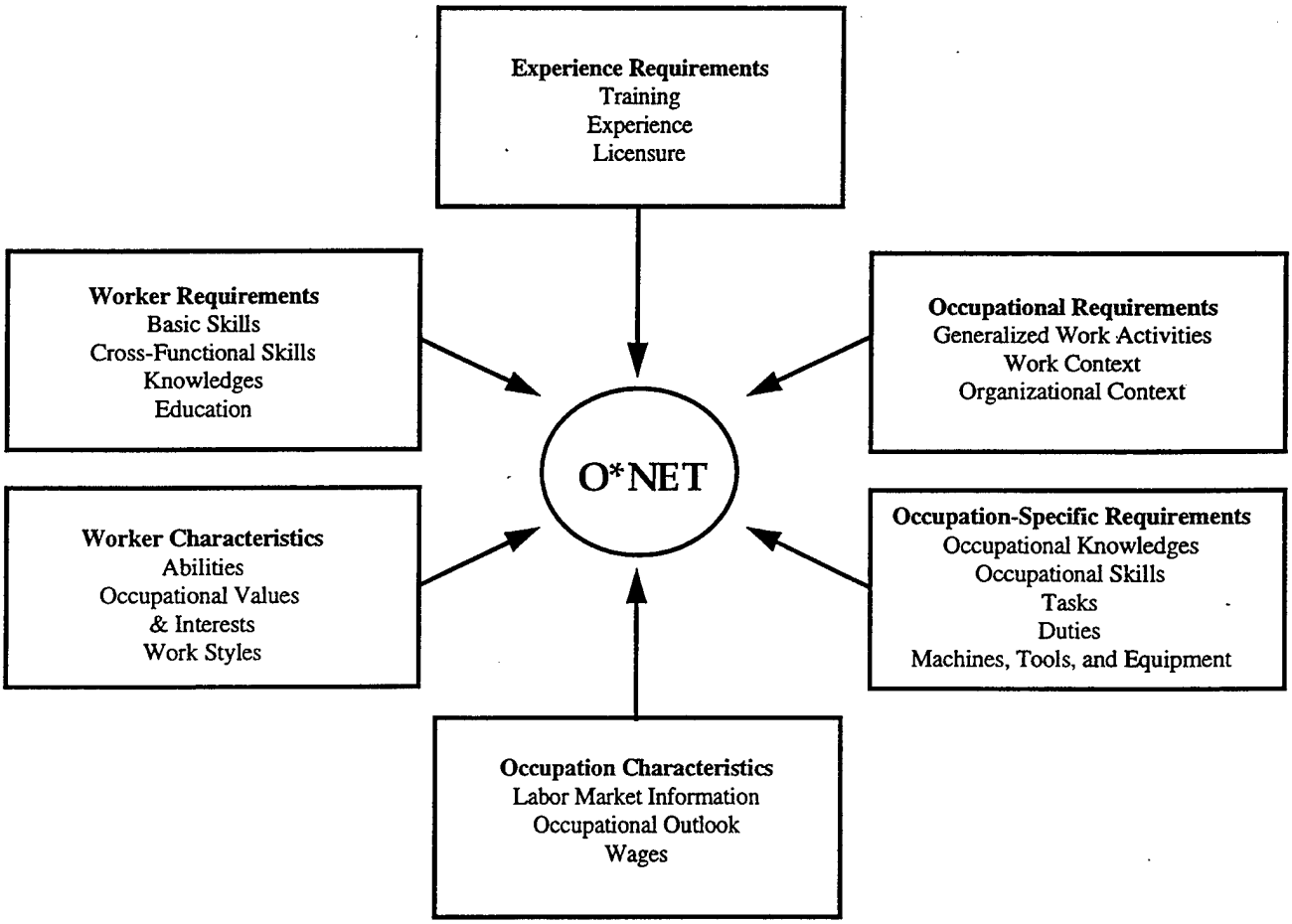
Information Network or "O*NET"). The goal of this project is to provide a comprehensive occupational information system that will be sufficiently flexible to serve a variety of purposes.

Development of this Occupational Information Network (O*NET) began with the creation of a content model, which identifies the types of occupational information to be collected and provides the framework for the system. This content model is based on available literature and theory in each of the selected domains and is shown in Figure 1. A complete description of the content model and a review of the supporting literature can be found in Peterson, Mumford, Borman, Jeanneret, and Fleishman (1995). This content model was used to develop a set of job description questionnaires, and these questionnaires were then used to collect information from job incumbents and supervisors. Ultimately, data collected using these questionnaires will be used to build the final O*NET system, and the questionnaires will be used to continually update and expand the system as existing jobs change and new jobs are created.

Within each of the nine O*NET content domains -- skills; knowledges; training, experience and licensure/certification; generalized work activities (GWAs); work context; organizational context; abilities; occupational interests and values; and work styles (i.e., personality) -- the O*NET occupational descriptors are organized into hierarchical taxonomies. Measures of each descriptor are collected using one or more numerical scales. For example, for the GWAs each descriptor is rated in terms of the level of performance required, it's importance, and the frequency with which it is performed. The actual scales used to collect ratings vary somewhat across content domains. Taken together, these descriptors provide a comprehensive, detailed picture of each occupation. In addition, because this information is collected using a standardized set of descriptors, it is ideal for making systematic comparisons across occupations and for matching workers with appropriate occupations. The O*NET incorporates a broad array of job analysis information, and the extent to which this information can be used to identify appropriate occupations for displaced workers is limited only by the amount of worker assessment data that can be gathered.

The initial O*NET "prototype" data collection has recently been completed (Peterson, Mumford, Borman, Jeanneret, & Fleishman, 1996). Results of these analyses show that data collected using the O*NET descriptors are generally very reliable and have meaningful underlying structure within each content domain, and that the patterns of correlations between content domains are highly interpretable. These analyses also provide preliminary evidence that the O*NET descriptors discriminate between occupations in a sensible manner. These prototype data include only 29 occupations, and data concerning the remaining occupations in the U.S. still need to be collected. To provide usable occupational information during the interim, occupation analysts rated the full set of 1122 occupations using a subset of the O*NET descriptors, including GWAs, skills, and abilities. Results of these analyses show that the analyst data share the favorable characteristics of the incumbent data described above. Further, for the 29 occupations for which incumbent data are available, the incumbent and analyst data are very much comparable. These analyst O*NET data can be used as a source of occupational information until the incumbent dataset is complete. The descriptors are identical for the two datasets, so the transition to the incumbent dataset, when it is complete, should be relatively straightforward.

Figure 1
The O*NET Content Model



The type of information provided by the O*NET allows career information systems, for the first time, to efficiently and accurately identify jobs that require similar skills, abilities, and other worker requirements, even when the actual tasks performed by workers in the jobs differ. This will be a critical capability for helping displaced workers make the most of their previous work experience, non-work experience (e.g. leisure or volunteer activities), skills and abilities in their new careers. Particularly relevant for military applications, this will allow workers to identify civilian jobs that involve the same skills, abilities and other worker characteristics as military jobs.

Career Information Delivery Systems

A variety of career information delivery systems (CIDS) currently exist and are widely used (e.g., Career Information System, University of Oregon, 1994; CHOICES, Careerware, ISM Corporation, 1994; Vance & Day, 1995). These systems present information about occupation characteristics, labor market information, training and education opportunities, and much more. For the most part, these systems have been designed to deliver information that is available in large national databases and they provide high quality occupational information of various types. Many of these databases are generated and maintained by government agencies, such as the U.S. Department of Labor (DOL) and the Office of Personnel Management (OPM). Some information is collected and compiled by private companies and is available for purchase.

It should also be noted that most currently available CIDS have been designed for high school and college students. Many, but not necessarily all, features of these systems will be relevant for displaced workers. For example, some systems use information about students' abilities to identify lists of appropriate jobs, and this could be useful for displaced workers as well. Many systems also identify a high school curriculum for each job or career field, and this is not likely to be useful for displaced workers. Similarly, these systems generally include extensive information about post-secondary education. While training opportunities are likely to be relevant for displaced workers, the types of training opportunities included and the emphasis they are given is likely to differ.

The majority of the occupational information presented in most CIDS is limited, to some extent, by the quality of available information collected and maintained by government agencies. Nearly all of them use information from the Dictionary of Occupational Titles (DOT); none have yet incorporated O*NET data. Thus, the development of procedures to take advantage of the O*NET's capabilities, rather than simply plugging O*NET data into existing systems, is likely to significantly improve the quality of available information.

Watson and Scott (1994) outline the features that would be required in an automated career counseling and exploration system for displaced Air Force workers. They describe a highly accessible and flexible career information and exploration system that is extremely "user-friendly." Much of the available occupational information is highly relevant to displaced workers and can be incorporated into a career information system for the Air Force.

Before the career counseling applications can take full advantage of the O*NET's capabilities, procedures for collecting relevant, high quality information about the characteristics of individual job seekers are required. In order to match individuals with jobs for which they are qualified, this information will need to tap the same constructs (e.g., worker requirements) as the O*NET descriptors. Tests and inventories are available to measure many of these

characteristics, but these are generally time consuming to administer and sometimes threatening to counselees. A more efficient approach to measuring relevant individual differences would greatly enhance the practicality of a career counseling system based on the O*NET. In addition, algorithms for matching individuals with occupations need to be identified that provide the most appropriate list of potential occupations for each job seeker.

Approach

The research described in this report represents the first steps in the development of a career information delivery system that takes advantage of available career information and includes accurate and efficient worker assessment capabilities and state-of-the-art person-job matching features. This section begins by describing our vision of the career guidance system that will ultimately be developed, and then describes the research and development activities that were undertaken to support the creation of such a system.

The Proposed Career Guidance System

On the job side, the system will incorporate the O*NET job description information as well as information from other national and regional databases. On the worker side, estimates of worker characteristics can be made based on the workers' current jobs, based on their activities outside of work, or more directly through self-assessments of skills, abilities, interests, etc. The system will then use state-of-the-art matching algorithms to identify occupations appropriate for each user. Each of these aspects of the proposed system is described in more detail below.

Occupational Information

The O*NET transitional, or analyst, dataset will be the heart of the occupational information in this system. This includes data concerning the Generalized Work Activities (GWAs) involved in each occupation, and the skill and ability requirements. The O*NET data is available for 1122 occupational units (OUs), and these OUs have been linked to a variety of other occupational classification systems. These links make it possible to incorporate virtually any occupational information into the career information system. While the exact nature of this information will depend on the results of the needs assessment focus groups, it is likely to include information concerning salary, training needed, and occupational outlook.

Worker Assessment

As mentioned previously, accurate and efficient assessment of worker skills, abilities and other work relevant characteristics will be a critical aspect of a career information and counseling system that takes advantage of the O*NET's capabilities. A variety of approaches have been used in the past to assess worker characteristics. Perhaps best known are tests and inventories, which are based on sampling trait relevant behavior. Tests and inventories designed to tap many of the O*NET worker characteristics are available, and these measures have generally shown good reliability and validity (e.g., expected patterns of correlations with scores on other measures). However, tests and inventories are time consuming to administer, and the O*NET contains a wide variety of worker characteristics. For most applications, it will not be feasible to use tests and inventories as the primary measure of worker characteristics. Further, many people find tests threatening, and tests are deficient in tapping information about individuals'

past experiences and behavior, both work and non-work. We envision three general approaches to worker assessment in the career guidance system, and each of these is described below.

Current Job. Previous efforts have successfully used work experiences (e.g., job titles) to identify worker knowledges and skills (e.g., ISM Corporation, 1994; Vance & Day, 1995). A program for workers displaced by the closing of the Philadelphia Naval Shipyard (Vance & Day, 1995) took the approach of estimating worker knowledges, skills and abilities (KSAs) based on their previous job titles. KSAs for the military jobs were coded based on position descriptions. KSAs for available civilian jobs in the Philadelphia area were coded based on DOT job descriptions. With some additional input from the displaced workers, these KSAs were used to match military and civilian occupations. This approach is also taken in the widely used CHOICES (Careerware, ISM Corporation, 1994) career information system. Both of these systems provide users with an opportunity to modify the list of skills, etc. based on their self-perceived strengths, weaknesses, and preferences. In the proposed career information system, asking users about their current job and/or their work history will be a relatively straightforward process. The O*NET would then be an excellent source of information concerning the skill requirements of workers' current jobs, and it seems reasonable to assume workers possess skills at least at the levels required in their current jobs.

Self Assessments. Another promising approach to the assessment of worker characteristics is to simply ask for self descriptions, and such self assessments are often used in career information delivery systems. However, the literature on the accuracy of self assessments is mixed. Mabe and West (1982) conducted a meta-analysis of this literature, and concluded that the mean correlation between self assessments and other measures of the same characteristics (e.g., test scores, ratings by others) is only .29, but the variability across studies is very high (SD = .25). In addition, the size of the correlations were related systematically to certain characteristics of the studies. For example, correlations were higher when participants (a) expected their self assessments would be compared with other sources, (b) were asked to make evaluations relative to others (e.g., "better than average"), (c) had experience in self evaluation, and (d) were told that their ratings would be anonymous. These results suggest that carefully developed self assessments have good potential for validity. In addition, the instructions provided to participants appear critical. Self assessments will be an important aspect of the proposed system, and one challenge will be designing the self assessment rating scales so that the assessments are as accurate as possible.

Based on Leisure Activities. A great deal of research is available on the topic of leisure, including descriptions of how people spend their leisure time, the psychological benefits of leisure activities, the interests and values associated with various leisure activities, and the relationships between leisure and work (Greenberg & Frank, 1983; Holmberg, Rosen, & Holland, 1990; Liptak, 1994; O'Brien, 1988; Taylor, Kelso, Cox, Alloway, & Matthews, 1979; Tinsley & Eldridge, 1995; Tinsley & Johnson, 1984). McDaniels (1989) notes that people learn and use a variety of work-related skills while participating in both leisure and volunteer activities. A few assessment inventories have been developed to collect information concerning leisure activities, and some provide information about the interests involved (e.g., Holmberg et al., 1990; Liptak, 1994). However, little is currently known about how to best use non-work experiences to identify work relevant skills and abilities. The proposed system will include a hierarchical taxonomy of leisure activities, and these activities will be linked to the O*NET skills.

Person-Job Matching

Another critical component of a career information and counseling system for displaced workers is an appropriate algorithm for matching people with jobs and comparing occupations in meaningful ways. Many automated career information systems exist that incorporate some type of matching function (e.g., Career Information System, University of Oregon, 1994; CHOICES, Careerware, ISM Corporation, 1994; Vance & Day, 1995). These systems generally use straightforward matching algorithms, often simply a percent match, based on the presence or absence of skills in the jobs and in the workers' profiles.

More sophisticated approaches to matching individuals with jobs are possible when ratings of the importance or level of the worker characteristics required are available for jobs (rather than simply a dichotomous indication of the relevance of each characteristic), and when the relevant worker traits are quantified (as opposed to simply coded present or absent). This more detailed information, such as that available in the O*NET, allows systems to quantify the degree of fit. For example, distance measures (e.g., D^2, Cronbach & Gleser, 1953; Tatsuoka, 1974) can be used to gauge the similarity between two profiles of scores. The proposed system will capitalize on the capabilities of the quantitative O*NET data, and use matching algorithms that are state of the art.

Focus of the Current Research

As mentioned, the research described here represents the first steps in developing the system described above. This research focuses on the aspects of the career information system not currently available, particularly those needed to take full advantage of the new O*NET occupational information. In addition, the skills domain is arguably the most relevant to the particular needs of displaced workers, so this research focuses on the skills domain. Finally, in order to better target the needs of likely users of the system, workers at a facility scheduled for closure were chosen as the initial target population.

Develop Aspects of the System not Currently Available

The plethora of available occupational information systems clearly demonstrates that the development of such a system is feasible, but less is known about how to efficiently collect high quality information concerning worker traits (e.g., skills and abilities) and the matching algorithms necessary to identify appropriate alternatives for displaced workers.

Thus, one objective in the present research was to develop and evaluate innovative measures of workers' skills, abilities, and other work-relevant traits that have promise for providing more reliable, accurate and comprehensive assessment than is currently available. Two approaches to the measurement of worker characteristics were explored. First, we developed a taxonomy of non-work experiences likely to provide information about work-relevant traits and used this taxonomy to link non-work experiences to the worker skills. Second, we conducted a thorough review of research on self assessments, and used this information to develop a self assessment instrument with good potential for collecting reliable and accurate information concerning work-relevant traits.

Another objective was to explore alternative approaches to matching worker traits with occupational requirements. We reviewed and integrated literature relevant to the person-job

matching problem, and conducted a preliminary tryout of several of the approaches identified in this review.

Focus on Skills

The O*NET includes a wide variety of worker characteristics and worker requirements. In order to keep the scope of the present research manageable, we chose to focus on a subset of these descriptors from a single O*NET content domain. Procedures developed for worker assessment and for person-job matching for one domain are likely to apply to the other O*NET content domains as well. As mentioned, skills are particularly relevant for individuals with job experience, so this project focused on the skills domain.

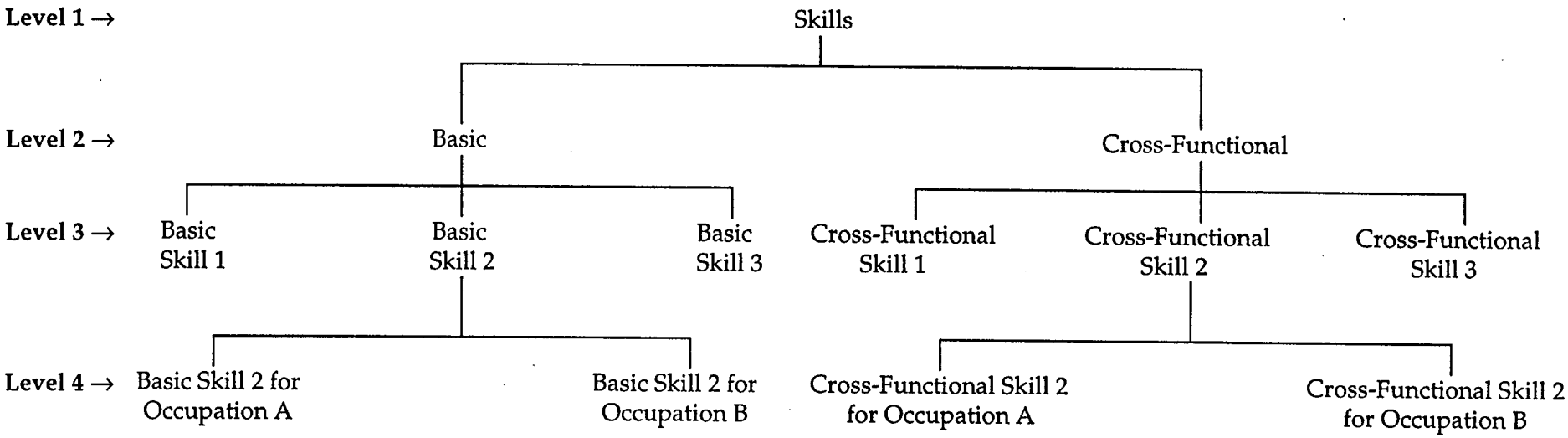
Throughout the literature, skills are defined in various and often inconsistent ways. Harvey (1994) notes that these definitions range from relatively specific to behaviorally abstract. He stresses the importance of clearly defining the term, because the definition has important implications for how skill data are measured and used. Mumford and Peterson (1996) define skills as "a general set of procedures that underlie the effective acquisition and application of knowledge in various domains of endeavor."

Based on the above definition, one cannot outline specific skills without first specifying the major performance domains of interest (Mumford & Peterson, 1996). For instance, Hackett, Betz, and Doty (1985) developed a taxonomy of skills within the "women's career development" domain. With regard to the O*NET, three general performance domains are relevant: those requiring basic skills, cross-functional skills, and occupation-specific skills. Basic skills represent activities needed to *learn* different tasks, cross-functional skills reflect general activities or procedures required in domains that extend across occupations, and occupation-specific skills reflect general activities (e.g., installation, repair) as applied to a similar set of tasks requiring related procedures (Mumford, Sager, Baughman, & Childs, 1996). The relationships among basic, cross-functional, and occupation-specific skills are depicted in Figure 2 (Mumford & Peterson, 1996). As can be seen, basic and cross-functional skills can be subdivided into their component skill categories (level 3). Once such a taxonomy is developed, each component of the taxonomy can be addressed with respect to various occupations (level 4).

Mumford et al. (1996) suggest that it may be difficult and not particularly useful to include occupation-specific (level 4) skills in the O*NET. Thus, at least in the short run, the O*NET data are restricted to those skills that have broad applicability across occupations (i.e., various basic and cross-functional skills).

Following this rationale, Mumford and Peterson (1996) reviewed the skills literature and derived a hierarchical taxonomy of work place skills to be included in the O*NET. This taxonomy is listed in Table 1. Basic and cross-functional skills reside at the more general level of the hierarchy. Basic skills are subdivided into operations, content, and learning process categories, while cross-functional skills are subdivided into social, problem solving, technology, system, and resource management categories. These eight categories are further subdivided into more specific categories of skills. In seven of the eight categories, Mumford and Peterson (1996) determined that the lowest level of the hierarchy should be used to collect job data for the O*NET. The resource management category is the exception because, as the authors note, many

Figure 2
The O*NET Model of Skill Relationships



of the lowest level skills contained in this category are too occupation-specific to generalize across many different jobs. Thus, 46 skills emerged as the O*NET descriptors, and the O*NET transitional dataset contains ratings of occupational requirements for each of these 46 skills. These skills are shown in the shaded areas of Table 1.

Target Kelly AFB Civilian Personnel

The career information needs of displaced workers coming from different jobs and different geographic regions will not be exactly the same. Information about job openings will need to be tailored for different populations. For example, workers in San Antonio are more likely to be interested in jobs in that geographic region. Similarly, if the users of the system are primarily high school graduates, it may be more efficient to focus on jobs and careers that do not require a college degree. The present research and development effort focused on a single geographic region and a single military facility in order to develop a prototype system, which can later be tailored for other applications. Kelly Air Force Base (AFB), in San Antonio, Texas, is scheduled for closure, so this base was chosen as an initial focus. When a base closes, Air Force enlisted personnel and officers are likely to be transferred to a different base. However, civilian workers are much more likely to remain in a single geographic location for their entire careers, so base closure is likely to have a more immediate impact on these individuals. Therefore, within the Kelly AFB population, our immediate focus was the civilian workers.

Develop a Software Demo

A final step in the research and development program described here was to develop a software prototype that demonstrates how the tools developed in this research can be used as part of a multimedia career guidance and transition system for displaced workers. This demo is based on software previously developed by the Center on Education and Work at the University of Wisconsin at Madison, and demonstrates how worker assessment and person-job matching capabilities can be incorporated into such a system.

Relevant Literature

As mentioned previously, a first step in this research was to review and integrate literature on two key topics. The first is self assessments, and this review focuses on literature that provides insights concerning the accuracy of self assessments and how they can be improved. The second topic is person-job matching. The results of these literature reviews guided the research described in later sections of this report.

Self Assessment

This section provides a review of key findings in the self assessment literature, specifically addressing issues related to accuracy. The career guidance system proposed here includes self assessment of worker traits, such as skills, abilities and interests. However, much of the self assessment research actually involves assessments of job or task performance. Lessons learned from self assessments of performance are likely to apply to self assessments of skills and abilities, so this literature is included here as well. Important methodological considerations for improving the accuracy of self assessments are also discussed.

Table 1
The O*NET Hierarchical Skill Taxonomy[1]

Basic	Operations	Written Communications	Reading Comprehension
			Writing
		Oral Communications	Active Listening
			Speaking
	Content	Math and Science	Mathematics
			Science
	Learning Process	Critical Thinking	Critical Thinking
		Learning to Learn	Active Learning
			Learning Strategies
			Monitoring
Cross-Functional	Social	Social Perceptiveness	Social Perceptiveness
		Response Coordination	Coordination
		Persuasion/Negotiation	Persuasion
			Negotiation
		Coaching/Service	Instructing
			Service Orientation
	Problem Solving	Problem Identification	Problem Identification
		Knowledge Acquisition	Information Gathering
			Information Organization
		Idea Generation	Synthesis/Reorganization
			Idea Generation
		Idea Evaluation	Idea Evaluation
			Implementation Planning
			Solution Appraisal
	Technology	Design	Operations Analysis
			Technology Design
			Equipment Selection

[1]The highest level of the taxonomy is listed at the leftmost side of the table. The levels become increasingly specific toward the right side of the table. Shaded areas represent components of the final 46-skill O*NET taxonomy.

Table 1 (Continued)
The O*NET Hierarchical Skill Taxonomy

Cross-Functional (continued)	Technology (continued)	Set Up	Installation
			Programming
			Testing
		Operate	Operation Monitoring
			Operation and Control
			Product Inspection
			Equipment Maintenance
		Corrects	Troubleshooting
			Repairing
	System	Systems Understanding	Visioning
			Systems Perception
		Systems Operations	Identification of Downstream Consequences
			Identification of Key Causes
		Judgment and Evaluation	Judgment and Decision Making
			Systems Evaluation
	Resource Management	Time Management	Timeframe Estimation
			Identification of Critical Periods
			Allocation of Time
			Prioritizing
		Management of Financial Resources	Financing
			Accounting
			Budgeting
		Management of Material Resources	Obtaining and Allocating Material Resources
			Maintaining Material Resources
			Monitoring and Utilizing Material Resources
		Management of Personnel Resources	Obtaining and Allocating Personnel Resources
			Motivating Personnel
			Developing Personnel
			Monitoring and Utilizing Personnel

Criteria for Accuracy of Self Ratings

One criterion often used for evaluating the accuracy of self ratings is ratings provided by others, usually peers or supervisors. A meta-analysis conducted by Harris and Schaubroeck (1988) found a higher correlation between peer and supervisor ratings (r = .62) than between either self and peer ratings (r = .36) or between self and supervisor ratings (r = .35). Some researchers have criticized the use of peer and supervisor ratings as criteria for evaluating self ratings, because relationships between self and other ratings are attenuated by error in both rating sources (e.g., Dunnette, 1993; VanVelsor, Taylor, & Leslie, 1993). Borman (1997) and others suggest that self ratings appear to be tapping into a separate domain of the criterion space.

Ashford (1989) suggests that stronger relationships may be obtained when explicit and objective criteria are used for assessing the accuracy of self ratings rather than another set of ratings. Mabe and West (1982) note that much of the research on self assessments has used test scores as the criterion for evaluating the validity of self assessments. However, test scores are actually a small and arguably narrow sample of trait relevant behavior. It would probably be more appropriate to compare both self assessments and test scores with some external criterion (e.g., job performance).

Factors Affecting Accuracy of Self Ratings

Harris and Schaubroeck (1988) found that job type moderated the relationship between self and other ratings of job performance. Specifically, they found that the relationship between self and other ratings was particularly low for managerial/professional workers, even though the relationship between peer and supervisor ratings was not any lower for these jobs.

Several studies have shown that the accuracy of self assessments is related to the dimension or characteristic being rated. For example, Mihal and Graumenz (1984) found that there was more agreement between self and supervisor ratings for more concrete dimensions (e.g., written communication) and less agreement as abilities become more abstract (e.g., sensitivity). Socially desirable dimensions, such as motivation and ambition, tended to have high self-supervisor discrepancies. Nilson and Campbell (1993) found that for rankings of leaderless group discussions, self raters tended to be lenient on some dimensions (e.g., credible, considerate, flexible and empowering) and more harsh on others (e.g., entertaining and thrifty).

Lowman and Williams (1987) found at best a moderate correlation between self and other ratings of competencies and abilities related to Holland's (1985) six occupational types. The least ambiguous pattern of results was found for the artistic measures. The authors speculated that it may be easier to rate oneself accurately in an area perceived to be narrowly distributed in the population and in areas that are not related to the individual's self esteem. Harrington and Schafer (1996) came to a related conclusion. They had individuals select their top four abilities/aptitudes from a list of the following fourteen: artistic, musical, communication, mathematical, scientific, language, mechanical, spatial, social, teaching, persuasive, leadership, clerical and managing. Across all occupations, individuals selected social skill as being very important. The authors concluded that it is important to consider the base rates of specific aptitudes or abilities when obtaining self assessments of ability.

Several studies are available showing that accountability tends to enhance the accuracy of self ratings. For example, Bauman and Dent (1982) found that performance estimates were more accurate when individuals knew that their estimates could be verified with objective measures.

Boyle and Klimoski (in preparation) found that accountability for self ratings decreased leniency, but had no effect on the accuracy of the ratings. However, the accountability manipulation did not occur until after the group had performed the task to be rated, which may have affected the results.

Investigating the effects of feedback on self-rating accuracy, Radhakrishnan, Arrow and Sniezek (1996) found that leniency in self evaluations was tempered by both performance feedback and experience with the task. Mabe and West (1982) conclude in their review that expectation of feedback and validation of ratings are both likely to increase accuracy.

Self esteem has been investigated as a moderator of accuracy, as well. For example, Shrauger and Terbovic (1976) found that self esteem moderated self perceptions when no actual differences existed. That is, low self esteem participants did not underestimate their absolute level of performance, but rather they underestimated their performance relative to others. In addition, high self esteem participants tended to overestimate both their performance and the performance of their peers. Baird (1977) found a larger discrepancy between self and supervisor ratings when the worker exhibited low job performance and high self esteem. Swanson and Lease (1988) also found significant relationships between self ratings of skills and abilities and self esteem scores. Specifically, self esteem was related to skills of language usage, meeting people and leadership/management for both men and women. For women only, there was also a significant relationship between self esteem and both social and enterprising skills. They concluded that self esteem will affect self assessments for some skills and abilities, but not for others. For example, it is not likely that estimates of manual dexterity will be affected by an individual's level of self esteem, provided that manual dexterity is not central to one's self concept.

Also worth noting, John and Robins (1994) found narcissism to be significantly related to self enhancement and self diminishment. Their results suggest a general tendency for individual self enhancement. However, interestingly, only 35% of respondents demonstrated unrealistically positive self images, while 15% demonstrated unrealistically negative self images. Thus, fifty percent of the respondents were fairly accurate in their self perceptions. The authors caution that these results were not likely to be due to self esteem because of the typically small relationship usually found between self esteem and narcissism.

There is also some evidence that self awareness affects the accuracy of self assessments. VanVelsor et al. (1993) found a relationship between self awareness and rating accuracy. Specifically, they found that underestimators of leadership effectiveness had higher self awareness than overestimators and that over raters were perceived by others as the lowest in leadership effectiveness. Atwater and Yammarino (1992) argued that self aware individuals are more accurate in self evaluations because of their ability to assess others' evaluations of themselves and to incorporate that feedback into their self perception.

A different perspective on accuracy in self ratings is presented by Nilson and Campbell (1993), who argued that accuracy in self perceptions is a stable individual difference. They found that individuals exhibited a tendency to be consistent over-, under-, or accurate estimators of managerial skill and personality over time. However, the time lag used in their study was only one month and may not have been sufficient to detect individual differences in patterns of estimation.

Finally, Farh and Dobbins (1989) conducted a laboratory study to examine how social comparison information affects the accuracy of self ratings and how it affects the agreement between self and supervisor ratings. The social comparison group was given an opportunity to review other participants' work, and their self ratings correlated more highly with both objective measures (.51 versus .29) and with supervisor ratings (.42 versus .13) than did those of the control group. There was also a larger discrepancy between self and supervisor ratings in the control group than in the social comparison group. Relatedly, Swanson and Lease (1988), based on their findings discussed earlier, suggest that the differences existing between males and females are probably due to differences in the participants' internal norm or comparison groups. These results are also consistent with guidelines for accurate ratings put forth by Mabe and West (1982).

Methodological Considerations

Aspects of rating scale format and rating instructions have both been shown to impact leniency and accuracy in self evaluations. Lin, Dobbins, Farh, Doyle, and Spalding (1992) conducted a comparison of the effects of relative versus absolute and symmetrical versus skewed rating scale formats on the self assessments of ability. Using a fully crossed design, they found that both relative and skewed rating formats reduced leniency and increased variability; however, neither format had an effect on the accuracy of self assessments. In addition, the interaction of the rating formats was not significant. This conclusion is similar to that of Murphy and Balzer (1989), that leniency is not directly related to accuracy.

Using rating instructions to manipulate comparison standards, Schrader and Steiner (1996) found that more explicit and objective comparison standards produced higher levels of interrater (self-supervisor) agreement. Specifically, they assessed five different standards of comparison for their effects on interrater agreement. The comparison standards included: (1) ambiguous - no instructions given; (2) internal - comparison to self; (3) absolute - comparison with some objective criteria; (4) relative - comparison with others in a work group; (5) multiple - comparison standard incorporating internal, absolute and relative.

Using a within subjects design, they found that ratings differed depending upon which social comparison instructions were given to the participants. They found the strongest interrater agreement for absolute and multiple comparison standards. In addition, both self raters and supervisors indicated a preference for the absolute and multiple comparison standards.

These conclusions differed from those of Mabe and West (1982) and Lin, et al. (1992). However, the difference could be due to the fact that Schrader and Steiner used only objectively quantifiable dimensions. Thus, participants had the greatest amount of information to base ratings on when using the absolute scale. The findings may have been different for more qualitative dimensions. In addition, Lin et al. (1992) manipulated the rating anchors to obtain a relative scale, whereas Schrader and Steiner (1996) manipulated the rating instructions. Given this, the discrepancy in the results is less surprising.

A few additional factors affecting rating accuracy bear mention. First, anonymity of ratings has been found to increase accuracy of ratings (e.g., Mabe & West, 1982; Radhakrishnan et al., 1996). Second, ratings of maximal performance have been generally found to result in more valid predictions of future actions than ratings of typical performance (e.g., Turner, 1978, cited in Shrauger & Osberg, 1981). Finally, Lowman and Williams (1987) proposed that separate instrumentation should be developed for interest and ability estimations, because they are separate domains.

Self Assessment of Skill Proficiency

As mentioned above, the present research focuses on skills. The ability to accurately assess one's own skill level is important for successful career transitions. When surveyed, 1,121 career counselors judged "the ability to identify one's skills" as the second most important knowledge/awareness/ability (out of 95 total items) critical to career decision making and job hunting (Helwig, 1987). While it is recognized that individual differences (e.g., self esteem, narcissism) affect the accuracy of skill self assessments, this section focuses primarily on characteristics of the self assessment task itself, because these characteristics can be controlled and manipulated to improve the accuracy of self assessments.

The research reviewed above demonstrates that different aspects of a rating task can encourage or discourage rating accuracy during self assessment. These include characteristics of the rating scale presented to individuals who are assessing their proficiency with respect to various skills. Because variations in these rating task characteristics have been shown to affect accuracy, these issues should be carefully considered when designing the skill self assessment aspect of the proposed career guidance system. In the context of skill self assessments, one additional factor is the level of specificity at which skills are assessed.

Various researchers note the need for specificity when rating skill levels. Harvey (1994) suggests that, from a measurement standpoint, it is increasingly difficult to collect reliable and valid ratings as the degree of abstraction of rated occupational skills increases. It should be noted that Harvey (1994) discussed this issue in the context of subject matter experts rating the degree of various skills required on the job. However, it is likely that these measurement issues extend to workers who are rating their own proficiency with regard to different skills. As discussed previously, the proposed career guidance system should assess skills at a level at least as specific as the 46 lower order O*NET skills. The question remains, are these O*NET descriptors specific enough to yield accurate self assessments?

On a related note, Mihal and Graumenz (1984) found that workers' self ratings are more likely to correspond to supervisors' ratings when concrete, as opposed to abstract, worker abilities are rated. It is likely that this research extends to skill ratings, and it could be argued that skills become more concrete as their specificity increases, thereby suggesting that self and supervisor ratings will exhibit greater rating agreement as the skills to be rated increase in specificity. This suggestion should be interpreted in light of the argument that interrater agreement across sources (e.g., self-supervisor agreement) does not necessarily correspond with rating accuracy (Borman, 1991).

The notion that more specific skill cues yield more accurate self assessment is consistent with two of Shrauger and Osberg's (1981) four suggestions for improving the validity of self assessment. (1) Make the decisions to be made explicit. Certainly, a specific skill cue is more explicit than a general one. (2) Phrase questions to maximize accuracy. That is, use the rating format that matches the criteria used and specify whether ratings are of maximal or typical performance. (3) Facilitate recall of relevant previous experiences (e.g., self evaluations improve to the extent that an individual has had experience with the cue to be rated and to the extent that recall of and attention to relevant information occurs). And finally, (4) evaluate and encourage the self assessor's motivation for accuracy. Assessments are less likely to be invalidated by impression management if the assessor truly desires accurate results.

Although few authors precisely define their usage of the terms "general" and "specific," it could be argued that the preceding literature is relevant in the context of Mumford and Peterson's (1996) hierarchy in Figure 2, where the broadest two categories of basic and cross-functional skills are viewed as extremely general, and occupation-specific skills are considered highly precise. Based on Mumford and Peterson's (1996) framework, the concern with skill specificity and accuracy can be illustrated by an example using the more general category "management of financial resources" in place of the more specific skills subsumed within that category (i.e., financing, accounting, and budgeting). Suppose a person with excellent budgeting skills is asked to rate his proficiency on the management of financial resources. If this individual does not recognize that budgeting skills are related to the management of financial resources, then he or she may disregard those budgeting skills when self rating financial resource management proficiency. Alternatively, suppose an individual with excellent budgeting skills and virtually no experience in financing and accounting does recognize the relationship between budgeting skills and the management of financial resources. How will this person with acquired proficiency on only one of the category components rate himself in terms of the more global category? Would this rating differ from the rating assigned by a person who is highly proficient in terms of both budgeting and accounting? Clearly, these examples provide conceptual support for the contention that more specific skill cues will facilitate more accurate self assessment.

While the literature reviewed supports the argument that skill cue specificity is related to rating accuracy, this literature generally fails to prescribe an optimal level of specificity. There remains the possibility of a point of diminishing returns, where increased specificity may not yield increasingly valid data. This possibility is rarely (if ever) addressed in the skills literature. Thus, there is no clear answer to the question of whether the 46 O*NET descriptors are specific enough to yield accurate self assessments. Certainly, advantages and disadvantages are associated with both the assessment of skills at the established O*NET level and the assessment of skills at a more specific level. These advantages and disadvantages are addressed below.

Skill self assessments at the current O*NET level of specificity would involve relatively few resources, since the 46-skill taxonomy and corresponding rating scales have already been established. Furthermore, preliminary research on the 46 O*NET skills provides some evidence that these descriptors are capable of eliciting accurate ratings. More specifically, research has shown that job analysts and job incumbents can successfully rate jobs in terms of the 46 O*NET descriptors, providing data that are quite reliable, have meaningful underlying structures within content domains, and discriminate among occupations in a logical manner. It should be emphasized that these results refer to ratings of jobs and the degree to which they require each of the 46 O*NET skills. Because there are differences between a job skill assessment task and a skill self assessment task, these preliminary data have only indirect implications for the utility of the 46-skill taxonomy for the purpose of self assessment. Thus, the primary advantages of assessing worker skills in terms of the 46-component O*NET taxonomy relate to convenience and the possibility that this taxonomy is capable of yielding accurate self assessment data. On the other hand, if there is a continuous, linear relationship between specificity and accuracy, then this taxonomy would yield less accurate data than a more specific alternative.

Although skill assessment at a more specific level could potentially yield more accurate data, it would also require significantly more time and resources. A number of steps are implicated in the process of assessing more specific skills. The first step requires a judgment about the most

appropriate level of specificity at which to assess skills. The second step requires the specification of a taxonomy of skills at the level chosen in step one. These first two steps involve some critical decisions that are addressed below. Third, rating scales to assess skills listed in the new taxonomy must be created. Finally, a method for combining specific skill ratings must be established, so that these ratings can be generalized up to the level at which the work skills required for different occupations are described. This final step places work and worker skills on a common metric, thereby enabling the skills matching process required for career guidance.

As mentioned, the first two steps for increasing skill specificity are particularly critical. In the text of Figure 2, the first step (selecting the desired level of specificity) involves choosing the most appropriate level of the skills hierarchy. Presumably, one would either select a level between levels 3 and 4 (still applicable across occupations, yet more specific than the 46-component O*NET taxonomy highlighted in Table 1), or one would choose to assess skills at the occupation-specific level (level 4).

While the current 46-component, level 3 taxonomy was based on prior theory and a thorough review of the skills literature, little additional research exists to support or refute the content of a lower order cross-occupational taxonomy. Thus, the development of such a taxonomy would be accompanied by all of the challenges typically associated with researching "uncharted territory." Namely, little empirical guidance would be available, and most of the taxonomic components would largely depend upon the fruits of a single research project. In contrast, choosing to assess skills at the occupation-specific level would present a different set of issues. Here, research is available to guide the development of such a taxonomy. Indeed, Mumford et al. (1996) devote an entire chapter to the topic of occupation-specific descriptors. These authors prescribe a four-step procedure for deriving occupation-specific skills. These steps are as follows: (1) identify tasks; (2) organize tasks into basic and cross-functional skills; (3) group tasks within basic and cross-functional skills into occupation-specific skills based on transfer; and (4) identify knowledges or principles underlying skill application (Mumford et al., 1996). The main problem with skill self assessment at the occupation-specific level is that developing unique descriptors for every occupation would be a cumbersome and time-consuming task (Mumford et al., 1996).

Person-Job Matching

Matching potential job holders with those occupations or positions most suited to their abilities, skills, and preferences is a critical concern for researchers and practitioners in several domains. Research in selection and classification is the most obvious example of person-job matching, but vocational psychologists and career counselors address this same problem from a slightly different point of view. At the very broadest level, all of these fields are working toward the same outcome: placing people in jobs in which they will be most successful and most satisfied. The relative importance of these two outcomes differs across applications, but many of the issues addressed by selection researchers and vocational psychologists are similar.

Approaches to person-job matching can be divided into two broad categories, those based on profile matching and those based on regression or prediction. Each of these general approaches is discussed in the sections that follow. Unfortunately, neither approach offers complete answers to the problems that arise in matching worker characteristics with O*NET occupational data. Finally, we discuss the importance of rational considerations in this area, in which there is apparently no purely empirical solution.

Profile Matching

An overall pattern of scores (e.g., across a set of skills or abilities) is a profile. Profiles can be developed for individuals or for jobs. These latter profiles can represent worker requirements (e.g., skill and ability requirements) or be made up of elements of the job itself (e.g., tasks or work activities). Thus, one can compare profiles across people, compare profiles across jobs or make comparisons between jobs and people. These comparisons can also be used to form clusters of similar occupations or clusters of similar people. That is, by identifying those jobs and/or people that are most similar to each other and most dissimilar to others in terms of some critical attributes, clusters can be formed. Our focus in the present discussion is on comparing jobs with people, but much of the available research in this area focuses on the use of profile similarity for clustering occupations. Colihan and Burger (1995) provide a comparison of various techniques for clustering jobs. Cluster analysis can be useful in forming job families for a variety of purposes (e.g., selection, compensation, etc.). Owens and Schoenfeldt (1979) used similar techniques to cluster people. They argue that clustering people based on biographical information can be useful, because those individuals who are similar in previous experiences can be expected to engage in similar future behaviors.

Profiles have three primary characteristics -- shape, level, and scatter -- and different approaches to comparing or matching profiles focus on different subsets of these characteristics. A profile similarity index is a single score that represents the congruence between two profiles. There are two main types of profile similarity indices: (1) difference measures; and (2) correlational measures (Edwards, 1993).

Differences between elements of two profiles can be calculated in several ways. The squared Euclidean distance (D^2) is one commonly used measure. It represents the squared differences between the elements of an individual's profile and the corresponding elements of the job profile, summed across the elements. However, D^2 has some known problems; for example, it exaggerates large distances between profile elements. As a result, its square root, the Euclidean distance, has become popular. The absolute difference between profile elements places less importance on large distances between profile elements and is also used in some congruence research. The absolute difference indicates the cumulative distance between two entities along *k*-axes (Edwards, 1993). If the direction of the difference is important, it might be more appropriate to use D^1, which sums the algebraic differences between two profiles, recognizing the positive and negative differences and resulting in a net difference. Distance measures simultaneously incorporate aspects of the shape, the level and the scatter in comparing profiles.

Correlational measures assess the rank ordering of profile elements (Edwards, 1993; Hamer & Cunningham, 1981; O'Reilly, Chatman, & Caldwell, 1991), and thus focus on profile shape. Profiles can be made up of different types of data (e.g., interval or Q-sort), and different types of correlational similarity measures are appropriate for these different data. Correlations computed from Q-sort data or rank orderings are actually extensions of the distance measures based on D^2 . One advantage of profile shape measures is that they are not influenced greatly by tendencies in individual profiles (e.g., leniency in the ratings that make up one of the profiles). Hamer and Cunningham (1981) compared the use of proximity (i.e., distance) measures with the use of correlational measures for conducting cluster analysis and found that the correlational measures produced cluster solutions that correlated more highly with a criterion matrix than did the proximity-measure cluster solutions. In their research, correlational measures were also superior to other measures in terms of the number of jobs

correctly classified. It is important to note, however, that correlational measures are not sensitive to differences in level across two profiles and may thus be inappropriate when level differences are of interest. In the person-job matching application, it is also worth noting that distance measures assume that the person and job information is on the same metric. Correlational measures are appropriate whether or not the person and job data are on the same metric.

It is also possible to remove level information from distance measures by first standardizing scores on each element across each person's (or each job's) profile and then computing the distance measure. Some researchers have argued that these standardized scores will result in better clusters than those developed using standard difference scores (Colihan & Burger, 1995; Norris, Baughman, Cooke, Peterson, & Mumford, 1996). This information can be viewed as easier to interpret, because it does not confound profile shape information with level information.

In an attempt to minimize the effects of error in profiles on clustering, Colihan and Burger (1995) introduced a hybrid approach to clustering that combines factor analysis with cluster analysis. This Q-type factor analysis essentially identifies those factors that do not contribute to the clustering so they can be removed in order to reduce measurement error. They showed that this clustering method was superior to several others, especially when there was a fair amount of error in the ratings used to develop the profiles.

Davison, Gasser, and Ding (1996) suggest that multidimensional scaling (MDS) offers an alternative statistical approach to clustering. MDS analyzes proximity data and is built on distance models, similar to cluster analysis. However, MDS is based on the spatial distances between coordinates and these distances are expressed as linear functions. MDS is advantageous in that, unlike most cluster analysis techniques, it is not limited to discrete clusters.

Edwards (1993) provides a detailed discussion of the limitations of profile similarity indices. An important limitation is that most of these indices assume that all profile elements are weighted equally. However, it is possible to take the relative importance of different elements into account by using a weighted Euclidean distance measure (e.g., Mahalanobis' D; Davison, 1983).

Edwards (1993) also points out that profile similarity indices are theoretically ambiguous when computation involves summing over conceptually distinct elements. He suggests that profiles representing conceptually similar elements be developed and that conceptually distinct elements be used to create separate profiles. Further, he recommends using factor analysis to determine which elements are sufficiently similar to form a profile. Finally, ambiguity can also occur when profiles from entities representing different sources are combined (Edwards, 1993; Hamer & Cunningham, 1981).

As mentioned previously, many uses of profile similarity measures involve clustering occupations or people. Interestingly, in clustering research, the similarity itself is a criterion of interest. In many applications, homogeneous clusters of occupations or homogeneous clusters of people are useful (e.g., forming job families).

Research comparing the profiles of people with the profiles of jobs or the profiles of organizations is most relevant to the present discussion of person-job matching. In this latter case, similarity is ***not*** the criterion of interest. Rather, it is typically believed that similarity between the person and the job is related to some other important criterion (e.g., job performance). In this way, the difference score actually becomes a prediction equation or a part of a prediction equation. There are several areas of research in which profile differences are expected to be related to an important criterion, such as person-organization fit (e.g., Chatman, 1991), person-environment fit and satisfaction (e.g., Rounds, Dawis, & Lofquist, 1987), and agreement across rating sources in 360 degree feedback (e.g., Nilsen & Campbell, 1993; London & Wohlers, 1991).

It is important to note that difference scores and squared difference scores are technically a subset of many possible regression equations for predicting the criterion of interest (Brutus, Fleenor, & Tisak, 1997). Essentially, the difference score implies a regression equation where the beta weights applied to the elements of the two profiles have the same weight but opposite signs. The use of this particular prediction equation is based on certain, often unstated, assumptions about the criterion of interest and the relationships between the person profile, the job profile and this criterion. It is possible that examining these assumptions would lead to a different set of prediction equations. For example, if a person's profile of ability scores is being compared with the ability requirements of a job, the Squared Euclidean distance would be the same whether he/she scored two points above or two points below the job requirement. It seems likely that a person would be better off placed in a job for which he/she was slightly overqualified than in a job for which he/she was slightly underqualified.

In the case of person-job match in the O*NET database, the criterion is not measured, and it is not all that clear what the criterion is. The most proximal criterion might be the acceptability or usefulness of the obtained occupational information to the user. The ultimate criterion is whether the user is satisfied and successful in the occupation identified. Because the O*NET contains information concerning a variety of jobs, the goal is to identify the occupation(s) in which the user would be ***most*** successful and satisfied. Thus, in order to obtain a complete measure of this ultimate criterion, the O*NET user would have to try out ***all*** of the O*NET jobs to make sure there is not another job in which he/she would be more successful or satisfied. Clearly, this is not feasible. Even tracking O*NET users and measuring their performance and satisfaction in the suggested occupations is a daunting task. Thus, there is a need to make some assumptions in generating the appropriate prediction equations.

Classification

One source of information that can aid in identifying the appropriate prediction equations/procedures for the O*NET is the literature on the prediction of job performance. The question of interest in an occupational search is placement, rather than selection, so the literature on classification is the most relevant. Most research on classification has been conducted by the Armed Services (e.g., Zeidner & Johnson, 1991; Hendrix, Ward, Pina & Haney, 1979; Roberts & Ward, 1982). Briefly, classification procedures typically involve estimating each person's predicted performance in all jobs and then using this information to make placement decisions that maximize performance across all jobs. Other considerations are

sometimes included in these placement decisions as well, such as the importance of jobs or the difficulty of filling these jobs. For example, Pina (1974) describes an algorithm developed by the Air Force that iteratively optimizes person-job fit and job fill, such that the final result takes both outcomes into account.

More generally, the goal in classification is to assign persons to jobs in a manner that produces maximum organizational benefit. The goal in career counseling could be stated in similar terms, that is, to assign persons to jobs in a manner that produces maximal benefit to the individuals. Note that this is likely to be facilitated by placing persons in jobs in which they are more likely to be successful, so many of the considerations will be identical to those in classification.

The starting point for most classification research is validity data. If we are to predict how well people will perform in jobs based on their standing on relevant traits (e.g., abilities), we need to know the relationships between scores on those traits and job performance. This information can be used to identify classification decisions that maximize the mean predicted performance (MPP; Brogden, 1951) across all persons classified or to identify and weight a battery of tests in a manner that maximizes differential validity (Horst, 1954). Johnson and Zeidner (1991) have integrated these two approaches in their Differential Assignment Theory (DAT). They have shown, using Army data, that the use of longer test batteries and Horst's differential validity index can increase classification efficiency (i.e., MPP), beyond that obtained using simple validity approaches. In other words, selecting tests in a manner that maximizes differential validity and weighting the predictor battery differently (i.e., optimally) for each job results in higher expected performance across all of the placement decisions. The alternative involves simply using a single prediction equation for all jobs and placing the highest scoring individuals in the most complex or difficult jobs.

Criterion and validity data are not available to inform person-job match decisions in most career counseling applications, so the procedures used in this classification research have limited applicability. Still, the general principals certainly apply, as it can be argued that vocational/occupational guidance is perhaps the only real world situation in which classification models are directly relevant (Campbell, 1990). Johnson and Zeidner's research has shown that the predicted performance space can be multidimensional. That is, a single general factor does not account for all of the variance in predicted performance. Rather, different patterns of traits (e.g., abilities) are likely to be better for different jobs.

As mentioned, the fact that the criterion is not measured in career counseling person-job match decisions does not make it any less important. Whatever "prediction" equation is used should be based on the criteria of success and satisfaction in the occupations identified, and not simply convenience. Simple difference scores or correlations between profiles are not the only approach to matching, but rather a subset of the possible prediction equations. Thus, it is likely that these prediction equations will initially be rational. Classification research may inform these prediction equations, because differential validity across jobs is one of many considerations that could be included.

Conclusions Regarding Matching

Some clustering research has focused on shape information (e.g., used standardized difference scores or correlational measures of similarity) rather than distance measures that include both level and shape information. There is reason to believe, however, that level information will be

relatively important in the person-job matching situation. Consider, for example, an individual who has an ability profile with a shape identical to that of the job Rocket Scientist, but scores exactly 4 points lower on each ability (on a 7-point scale). This individual is probably not well suited to the Rocket Scientist job. When correlational measures are used, it would be desirable to develop procedures for taking this sort of level issue into account.

As discussed previously, profile similarity measures are arguably inadequate for addressing career counseling matching needs, because the goal is actually prediction and not just matching. Even so, one could envision "prediction" equations that use distance measures as a starting point. For example, we could assign more importance to those skill requirements for which the user is slightly overqualified than those for which he/she is slightly underqualified in identifying appropriate occupations. More generally, rational "prediction" equations could be generated based on this type of rational consideration, perhaps in combination with validity and/or classification information from the literature, to predict success and satisfaction in each of the O*NET occupations. Careful attention to the criteria of interest is likely to lead to better results than simply adopting available approaches and their accompanying assumptions concerning these criteria (e.g., distance measures).

Issues Specific to Skills

Different purposes for skill data demand different levels of specificity, and Harvey (1994) suggests that placing skilled workers in new occupations due to downsizing requires the "most specific kind of occupational data." Thus, a system for matching worker skills with job skill requirements should assess worker skills at a level that is as specific as possible. A more precise matching between workers and jobs will occur, for example, when workers are assessed in terms of the lower order O*NET skills listed in Table 1, such as reading comprehension, social perceptiveness, and information gathering, as opposed to more general skills, such as operations, social, and problem solving skills. Since O*NET job profiles are based on 46 specific types of basic and cross-functional skills, the proposed career guidance system should measure workers in terms that are at least as specific as these lower order O*NET skills, in order to maximize the precision with which workers are matched to jobs.

Wooten (1993) notes that it may be important to classify job skill requirements as selection versus training criteria before matching workers to jobs. Selection skills are those which (1) are important for job performance, (2) must be acquired prior to job entry, and (3) have little or no opportunity for development after entering the job. Alternatively, training skills are those which (1) are important for job performance, (2) are typically acquired after job entry, and (3) have plenty of opportunity for development after entering the job. Wooten empirically demonstrated different degrees of overlap between managerial and secretarial jobs, depending on whether KSAs were separated according to selection versus training criteria. He argues that, when identifying career paths, worker skills should be matched only to the (selection) skills required at the point of entry into various jobs. The rationale is that when identifying career paths, worker-job matching should provide workers with a list of jobs that they are qualified to enter, rather than a (more narrow) list of jobs that they have essentially already mastered.

For the purpose of outplacement, it may also be important to distinguish between training and selection skills. Displaced workers who already possess training skills may have a competitive edge over younger, less experienced workers. Thus, it could be useful to provide workers with information on the degree to which they have already mastered both the selection and the

training skills associated with each of the jobs to which they have been matched. Further, separating skills in this manner would make it possible to provide information about the amount of additional training required for each potential job on a given list of worker-job "matches."

Method

In order to better target the career guidance tools to the needs of displaced workers, we conducted a set of needs assessment focus groups with civilian workers at Kelly AFB. We then conducted three research and development activities, focused on developing those aspects of the career guidance system that are unique and not available in existing occupational information systems. First, we developed and pilot tested a self assessment instrument for skills assessment. Second, we developed a taxonomy of leisure activities and linked these activities to skills. Third, we conducted a preliminary evaluation of several person-job matching algorithms. Finally, we developed a demonstration program to illustrate the features of the proposed career guidance system.

Needs Assessment

As mentioned previously, we chose to focus initially on civilian workers at Kelly AFB, located in San Antonio, Texas, which is scheduled for closure. Early in the project, we conducted a needs assessment to determine what information would be of most use to workers who may be displaced and to determine what characteristics of a career information system would make it most accessible and useful to such workers. Participants were Air Force civilian personnel who are likely users of a career guidance and transition system or at least similar to such users. An attempt was also made to identify participants who had a fair amount of work experience and represented a wide variety of occupations in which Kelly AFB workers are employed.

This needs assessment involved conducting small "focus groups" to get workers' reactions to an existing career counseling software demo and their thoughts about what a career counseling system should be like if it is to meet their needs. There was a total of 24 focus group participants. Participants had an average tenure of 17.75 years in the Air Force, and they represented positions such as machinist, supply technician, electrical engineer, and department division chief. Participants were scheduled in small groups, with about six per group. There was a total of four sessions, and each lasted about three hours.

Focus groups began with a review of the most relevant portions of the Career Visions and Career Ways software demos, developed by the Center on Education and Work at the University of Wisconsin. These programs were used as the starting point for the software demo developed as part of the current project. Participants were then led in a discussion of the strengths and weaknesses of the demos and the features they or others like them would find most useful in a career information system.

Worker Assessment Tools

Self Assessments

In order to assess the feasibility of collecting accurate self assessments of worker skills, we developed and pilot tested an inventory to collect such assessments. In developing this

inventory, we carefully considered the level of specificity of the skills assessed and the characteristics of the rating task. The literature review, discussed previously, supports the argument that skill cue specificity is related to rating accuracy, but this literature generally fails to prescribe an optimal level of specificity. There is very likely a point of diminishing returns, where increased specificity will not yield incrementally more valid data. This possibility is rarely (if ever) addressed in the skills literature. Thus, there is no clear answer to the question of whether the 46 O*NET descriptors are specific enough to yield accurate self assessments. A reasonable first step toward addressing these issues would be to develop self assessments of the 46 O*NET skills and assess the reliability and validity of these rating scales.

Rating scales corresponding to the 46-skill O*NET taxonomy have already been created by the O*NET developers for the purpose of rating jobs in terms of the 46 skills (see Peterson, Mumford, Borman, Jeanneret, & Fleishman; 1995). These scales employ a Behaviorally Anchored Rating Scale (BARS) format, or behavioral statements, to anchor various scale points. Appendix A provides an example of the scale used to rate the writing skills required on the job. With slight modifications, these O*NET rating scales can be used for the purpose of skill self assessment as well. As can be seen in Appendix A, the behavioral anchors associated with different O*NET scale levels describe activities performed by workers in different occupations. For instance, for the *writing* scale listed in Appendix A, the highest anchor describes a writing behavior performed by a novelist, the middle anchor describes a behavior performed by a manager, and the lowest anchor describes a behavior performed by a secretary. Therefore, while the skills assessed by the rating scales are not occupation-specific, the anchors used to describe different levels of each skill tend to be specific to different occupations. Most displaced workers are not likely to be familiar with the types of skills, abilities and other worker characteristics often used in career counseling, so it is likely that careful definition of the skills, such as that provided by the O*NET scales, will increase rating accuracy.

However, the concerns typically associated with the BARS format apply to the current O*NET rating scales. A rater using a BARS scale may have difficulty discerning behavioral similarity between his own skill proficiency and the highly specific behavioral examples used to anchor the scale (Borman, 1979;1986). This is especially true in the context of skill self assessment for the proposed career guidance system, because it is quite likely that the rater will not have worked in any of the occupational areas used to provide behavioral anchors for the scale. On a related note, Borman (1979;1986) suggests that BARS forces a rater to make an awkward judgment about where his behavior fits on a scale consisting of behavioral examples that he has not exhibited.

In addition to the concerns typically associated with BARS, there are some unique problems with the use of the O*NET scales for skill self assessment. In the instance where a rater has performed a job behavior used to anchor the low end of the scale, inaccuracies will occur to the extent that the rater simply matches his skill proficiency with the anchor that best describes his job. Using the example of writing skills, suppose a secretary, who is also an excellent writer, uses the scale provided in Appendix A to rate his writing skills. It seems possible that he would rate himself on the low end of the scale, regardless of his true writing proficiency, because he typically exhibits the job behavior used to anchor the low end of the scale. In short, the work-related anchors provided by the O*NET scales may prevent self raters from considering their

non-work skills during self assessment. This is a problem because skill self assessments will likely be biased, and therefore less accurate, when individuals only regard those skills exhibited on the job.

Borman (1979;1986) advocates the use of Behavior Summary Scales (BSS) as a means of overcoming many of the problems often associated with BARS. Although a comparison study pitting BARS against BSS did not reveal consistent differences between the two format types with respect to psychometric error or accuracy, the BSS has some advantages, conceptually at least (Borman, 1979;1986). Briefly, the BSS format is characterized by more general, abstract behavioral anchors. Compared to BARS anchors, BSS anchors typically represent a wider range of behavior that is representative of and common to several ways of behaving at each scale level (Borman, 1986). Thus, one way to try to increase the accuracy of skill self assessment would be to change the current skill rating scales from the BARS to a BSS format. The new BSS self assessment scales could incorporate both work and non-work related examples in order to facilitate the consideration of skills developed in various settings. Furthermore, this new rating format could help overcome one of the problems associated with skill self assessment at the 46-component cross-occupational level. As previously mentioned, self raters may not recognize their own skills when those skills are couched in unfamiliar, cross-occupational terms. A BSS format could allow raters to view how each skill is exhibited in a variety of situations. This may increase the likelihood that raters will realize how a relevant skill is exhibited in their own lives.

Research on self assessments during vocational career exploration has shown that the relationship between self-rated and actual ability is no stronger than the relationship between self-rated ability and interests (Lunneborg, 1982). It is quite possible that this finding would extend to self ratings of skills. While the reason for this finding is not certain, it can be speculated that individuals might self rate skills differently, depending on whether they are interested in using those skills at work. For example, suppose a displaced worker who is a very good writer has no desire to use his writing skills on the job. This individual might rate his writing skills at a low level, in order to direct a computerized job search away from jobs requiring writing skills. Such an approach, which would yield research findings similar to those obtained by Lunneborg (1982), would ultimately reduce the accuracy of self assessments. One way to overcome this potential source of inaccuracy is to allow raters the opportunity to express their desire to use each of the 46 O*NET skills on the job. This approach would require individuals to separately rate their skill proficiency and their interest in using each skill.

Several concerns are associated with changes in the current O*NET rating scales. First, changing the BARS format to a BSS format would require the development and scaling of numerous work and non-work related behavioral examples for each of the 46 skills. Undoubtedly, this process would require extensive time and effort. Second, the BSS format is typically longer than the BARS format, and therefore requires more reading (and more time) on the part of the rater. Third, there is a conceptual advantage to using the current O*NET scales for self assessment. Using the same scale to assess worker skills and job skill requirements would help to ensure that a similar "definition" of each skill is used when characterizing both workers and jobs according to the 46 O*NET skills.

Adding a scale that assesses an individual's interest in using each of the 46 skills would require a formula that would appropriately combine the "interest" information with the "proficiency" information prior to worker-job matching. This point must be addressed if the proposed career

guidance system is to utilize this "interest" information. However, it should be emphasized that the mere presence of the "interest" scale may increase the accuracy of skill self assessments, regardless of whether the "interest" information is actually used during worker-job matching.

Based on all of the issues discussed here, we decided to develop a skill self assessment instrument that focuses on the 46 O*NET skills and draws heavily from these scales. We used the BARS from the O*NET scales, mindful of the caveats mentioned above, and developed instructions for administering these scales to collect self assessments of skills. We also developed a second scale to collect information concerning respondents' desires to use these skills on the job. This skill self assessment inventory was pilot tested with a convenience sample of 18 people, including psychology graduate students, coworkers and spouses of the authors. We obtained feedback concerning the usability of these scales and made modifications as necessary.

Leisure Activities

In order to link non-work experiences to worker skills, we began by developing a comprehensive taxonomy of leisure activities. This was done by examining the leisure and volunteer literature. Based on this literature, we developed a comprehensive list of non-work activities and organized it into a hierarchical taxonomy. Finally, expert raters linked these activities to work-related skills. This section describes this process, and also describes how these non-work activities were clustered for the demonstration program.

First, we began with a search of the leisure literature with two goals in mind. One goal was to develop a comprehensive list of leisure activities, and the other was to organize this list into a taxonomy. The concept of leisure has been defined in several ways in contemporary literature: as time, activities, and as a state of mind. The "leisure as activity" approach was the most pragmatic for the purposes of providing information about skills developed in these activities.

There were several sources of lists or taxonomies of leisure activities available in the literature; however, none of the sources provided a comprehensive list of activities. Most researchers have focused on a subset of leisure activities in order to examine a particular hypothesis. Few have attempted to compile a comprehensive list of leisure activities for the purpose of building a leisure taxonomy based on the activities themselves. However, we were able to gather lists of activities from various sources and some of these same sources provided broad categories of leisure activities that we were able to use to build a taxonomy.

Ultimately, our list of leisure activities came primarily from several sources with relatively complete lists of activities (Greenberg & Frank, 1983; Holmberg, Rosen & Holland, 1990; O'Brien, 1988; Tinsley & Eldridge, 1995). Each source provided some unique activities allowing us to compile a comprehensive list. For instance, Tinsley & Eldridge (1995) provided a list of 82 different leisure activities that served as our initial collection of activities. O'Brien (1988) provided a particularly complete list of games, sports, and outdoor activities. In addition, Greenberg & Frank (1983) offered a short but broad list of activities ranging from skiing to investment to modern dance. Finally, the Leisure Activities Finder (Holmberg et al., 1990) provided the most complete list of activities, although many of the activities were very specific (e.g., collecting matchbook covers). We used this source primarily to fill in any activities that had not been included after examination of the other lists of leisure activities. Other leisure

literature was used to add activities that had not been included thus far (Liptak, 1994; Taylor, Kelso, Cox Alloway & Matthews, 1979; Tinsley & Johnson, 1984).

Once the list of leisure activities was complete, the activities were organized into hierarchical taxonomies. Two separate hierarchical frameworks were developed. The first was developed for the rating task, wherein activities were organized according to similarities in the skills required. The second was developed for collecting leisure activities from users of the career information system, and this latter list was organized according to the interests involved. The goal in this latter taxonomy was to organize the activities such that users would be able to easily locate those activities in which they participate.

Several classification schemes from the literature were used to develop these two taxonomies of leisure activities. Most of the literature classifies leisure activities empirically based on the frequency, level of interest in or importance of the activity (Beatty, Jeon, Albaum & Murphy, 1994; Fink & Wild, 1995; Floyd, Shinew, McGuire & Noe, 1994; Greenberg & Frank, 1983). Each of these classifications offers different levels of detail, yielding from five to thirteen major categories of leisure activities. However, none of the sources above offered a taxonomy that was completely appropriate for our purposes, because they often began with a limited number of leisure activities when building their classification systems. The leisure taxonomy for the rating task was developed using portions of the categorization schemes above, as well as by simply grouping activities based on their similarity to each other (e.g., sports and outdoor activities were classified under the broader heading of "action activities") and based on similar skill requirements (e.g., attending sports club meetings and attending religious club meetings). The first level in the leisure taxonomy included four categories: action activities (including sports, outdoor, and health/exercise activities), creative activities (including arts and music, and hobbies and crafts), mechanical and home improvement activities, and indoor activities (including entertaining and socializing, games, cooking/food, reading, household activities, personal finance, and computer-related activities). The complete hierarchical taxonomy used for the rating task can be found in Appendix B, which shows the basic structure of the form raters used to link leisure activities to skills. We organized the activities according to skill and general activity similarity in order to help the raters link these activities to work-related skills more efficiently.

Participating in volunteer activities or social organizations is likely to involve somewhat different skills than other leisure activities. In many instances these activities may be more likely to involve job-related skills. For example, a clerical volunteer for a religious organization would likely use the same skills as a clerical worker in a business setting. In addition, these activities often occur within organizations that are similar to work organizations, perhaps requiring the same managerial, interpersonal, and even task-specific skills. Therefore, along with the leisure literature, we explored the volunteer literature to identify additional non-work activities that are likely to require work-related skills. Several sources were used to develop a list of volunteer and social activities. Ellis and Noyes (1978) outline a comprehensive list of volunteer activities associated with 16 different fields (e.g., social welfare, the arts). In addition, some of the same sources that provided lists of leisure activities also included social and volunteer activities (O'Brien, 1988; Tinsley & Eldridge, 1995). For instance, Taylor, Kelso, Cox, Alloway and Matthew (1979) included volunteer activities like fundraising, scouting, and committee membership as well as social activities like planning parties. These sources provided a broad spectrum of activities from which we developed a list of volunteer and social activities.

The list of possible volunteer and social activities grew very large. Many of the activities were organization-specific. For instance, volunteering in a soup kitchen is a different activity than volunteering to serve meals at a senior center. However, the skills involved in each activity are very similar. The skills demonstrated or developed in these social and volunteer activities are arguably related to the roles or functions people serve in these organizations. A particular role, such as supervising, could be carried out in many different organizations. In addition, a single individual could play multiple roles or serve several different functions in a single organization. Instead of developing an enormous list of social and volunteer activities, we abstracted definitions of 22 roles involved in these volunteer and social activities. Several researchers provided categories from which we were able to develop this list. For example, Smith (1972) identified and classified types of volunteers (e.g., social club members, fundraising volunteers). Janey, Tuckwiller, and Lonnquist (1991) listed 32 skills gained through volunteer work (e.g., group leadership, counseling). In addition, Park (1983) offered several categories of volunteer roles including direct service roles (e.g., child care provider, counselor), advocacy (e.g., promoting public awareness of a cause), and organizational maintenance activities (e.g., clerical work, training volunteers, fundraising). Because there were only 22 of them, we did not organize the social and volunteer roles into a hierarchical taxonomy.

We asked thirteen industrial/organizational psychologists and graduate students to complete a rating task to link non-work activities to work-related skills. The rating instructions and an abridged version of the rating sheets are attached in Appendix B. These raters actually completed three separate rating tasks: leisure activities ratings, unskilled activity ratings, and social and volunteer role ratings. The ratings were separated into three tasks for several reasons. First, in our original list of leisure activities, there were some activities (e.g., listening to music) that seemed to involve very little, if any, skill. Given the large number of ratings to be made, we decided to move these leisure activities into a separate rating task that required fewer ratings, so that completing the entire set would be less time consuming. Second, the volunteer and social roles rating task was separated from the other rating tasks because it involved different rating instructions.

The first rating task involved raters making judgments about the extent to which each of the 46 O*NET skills are required to perform each of 92 leisure activities. The level of skill required to perform each activity was rated separately for novice, intermediate, and expert levels. We expected that different levels of skill might be associated with different levels of expertise in an activity. For instance, an expert coach would most likely have a different level of instructing skill than a novice coach. Therefore, raters made skill ratings for each level of expertise. In addition, raters indicated how familiar they were with each activity. This latter rating was included in case some raters were so unfamiliar with some activities that they were unable to make reasonable ratings.

In the second rating task, 46 leisure activities were listed that had been classified as potentially "unskilled" (e.g., watching television). Rather than asking the raters to spend additional time rating each of these activities on all 46 O*NET skills, raters were asked to simply decide if the activities were indeed unskilled, or if the activities involved any of the 46 O*NET skills. If an activity was rated as "skilled," raters were asked to make the 46 O*NET skill ratings for the activity. Note that raters completed this task after they had rated all of the other leisure activities, so they were familiar with the definitions of the skills, and this put them in a better position to determine whether these activities were truly unskilled.

Finally, the social and volunteer role ratings were included in a single rating task because these are all activities that occur in formal organizations and thus have a great deal in common. These ratings were separate from the other activity ratings primarily because there were lengthy definitions and examples given for each social or volunteer role. In addition, only one rating was made for each role/skill combination; there were no novice through expert levels for the roles. The novice-expert distinction was omitted primarily because in the context of roles, level of expertise required more definition. For example, what does it mean to be an expert manager? The social and volunteer role rating form included 22 different roles or functions. Raters judged the level of each of the 46 O*NET skills involved in each of these 22 roles.

For both the leisure activities and the social and volunteer roles rating tasks we computed the interrater reliability across the 13 judges for each of the 46 O*NET skills. Reliabilities were computed using Shrout and Fleiss (1979) Case 3, because each skill-activity pair was rated by the same 13 judges. For the leisure ratings, the interrater reliability was calculated separately for the novice, average and expert level. We then used these data to assign an over all skill level rating to each leisure activity-skill pair for each level of expertise, and to each volunteer/social role-skill pair. Details concerning these linkages are presented in the results section.

Finally, as mentioned previously, a hierarchical approach was used also to organize the leisure, social and volunteer activities for use in the proposed career information system. For this taxonomy, the activities were arranged hierarchically in terms of interests, rather than skill similarity. The groupings were based on interests so that users could move quickly through the program, selecting those activities in which they participated. While this led to a taxonomy very similar to the rating task taxonomy, there were some differences. For example, clustering activities based on interests resulted in the groupings of some leisure and social activities under the same category. Painting and visiting art galleries were clustered together under the same "arts" category. In the skill rating task taxonomy, these two activities had been separated, because they seemed to involve very different skills. Also, there were fewer levels in the interest-based hierarchy, in order to minimize the number of levels that system users will need to navigate in order to locate specific activities. For example, the first level of the hierarchy for the career information system contains 16 choices of activities instead of just 4, as in the first level of the hierarchy for the skill rating task. The taxonomy we recommend using for career guidance applications is shown in Appendix C. This taxonomy is actually slightly different than the taxonomy contained in the demonstration program, because this demo was created before the taxonomy was finalized.

Person-Job Matching

The goal in the person-job matching analyses was to conduct a preliminary evaluation of some of the most promising statistical approaches to matching workers with jobs that were identified in the literature review. As discussed previously, we chose to focus on skills. This was done in part to limit the number of descriptors to be considered, and in part because the skills domain is particularly relevant to displaced workers.

Simple distance measures have been used extensively in past research and applications, so we included the squared Euclidean distance (D^2) as one approach to matching. However, job clustering research has generally found the use of distance measures inferior to clustering based on profiles, so D^2 was not expected to be the most useful approach. Rather, it was viewed as a baseline against which to compare other approaches.

Because distance measures are sensitive to both level and profile information, we were concerned that D^2 would be unduly affected by any overall level differences between the worker and the job information. For example, research suggests that self ratings tend to be inflated (e.g., Meyer, 1980; Kraiger, 1986), so it is likely that worker assessments based on self ratings will be systematically higher than the analogous occupational information (e.g., ratings of skill requirements), even if the same or similar rating scales are used. In order to determine the extent to which this affects matching, the second method explored was to compute D^2 using percentile scores. That is, we first standardized scores within jobs and within workers and then computed D^2 using these standardized scores.

The third method explored was to correlate profiles. This method ignores level information entirely and matches workers with jobs based on profile similarity. In an attempt to reintroduce level information, we developed a fourth procedure that uses profile correlation as a starting point and then further screens the occupations identified based on an overall skill level (i.e., the mean across all skills). Finally, we conducted one last set of analyses to determine the extent to which including a smaller number of descriptors would affect the matching outcomes.

We faced two formidable obstacles in conducting these analyses. First, we needed worker data. The O*NET transitional dataset provides skill data for all 46 skills for the 1122 occupational units, but data concerning workers' standings on these same skills were not available. A second issue was how to evaluate the outcome of these matching algorithms. In an attempt to address both of these problems, we created five hypothetical people, where each "person" was assigned scores on each of the 46 skills. These people were designed to be very different from each other, but to have realistic patterns of skills. Further, each person was intended to be well suited for one O*NET occupation. The occupations we had in mind when creating these people were: (1) an Industrial/Organizational Psychologist, (2) a Computer Programmer, (3) an Assembly Line Worker, (4) an Air Conditioning System Technician, and (5) a Sales Representative.

Each of the five matching algorithms described previously was used to assess the match of each of the five hypothetical people to each of the 1122 occupations in the O*NET transitional data set. First, for each of the hypothetical people, we calculated D^2 for each of the 1122 occupations. That is, for each of the 46 skills, we calculated a distance or difference score between the person and the job. These difference scores were then squared and summed across the 46 skills for each person/job combination. Thus, for each of the five people, we have one D^2 for each job, and these jobs can be organized according to distance.

As mentioned above, two of the primary features of score profiles that impact matching are the shape of the profile, and the overall level. The overall level of the skill ratings for the O*NET analyst or transitional (i.e., job) data ($M = 2.05$) is lower than that for the five hypothetical people ($M = 3.89$). Therefore, we also calculated percentile scores for use in place of the raw data in computing a second set of D^2 statistics. In the analyst dataset, we computed each occupation's percentile for each skill, relative to all 1122 occupations in this dataset. However, there were only five "workers," so computing percentile data on the person side was not as straightforward. The O*NET incumbent data has a higher mean skill level than the analyst data, so those data were used to compute percentile data for the workers. Incumbent data were available for 29 occupations, and these data were grouped with the five hypothetical people and used to assign percentile scores for each skill. The incumbent data is actually job description data, but until we have worker data for a larger group of people, this is probably the best approximation to worker data currently available. In addition, although the use of

percentile scores does help mitigate the effects of the level discrepancy, it is a compromise in that it forces the distribution of the skill levels.

To compute the correlations, we calculated the correlation of each hypothetical person's skill scores, across all 46 skills, with the skill requirements of each of the 1122 occupations, yielding 1122 correlations for each person. High, positive correlations can be interpreted as good matches. Note that correlation takes into account the shape of the profile only. As mentioned previously, we developed a fourth procedure that begins with profile correlations and then reintroduces level information. This was done by first retaining, for each of the five hypothetical people, a subset of the occupations that had the highest, positive correlations. Then, to incorporate skill level information into the matching procedure, we compared the overall percentile score for each of these occupations with the percentile score for the hypothetical workers. This was done by computing the mean, across all 46 skills, for each job and using this mean to assign each of the 1122 occupations a percentile score. Similarly, the hypothetical people were assigned overall level percentiles relative to the 29 occupations in the incumbent dataset. If an occupation and a person are close in terms of overall level percentage and also have profiles that correlate highly, they are considered a match.

Note that this approach to matching is flexible. If we set a very high cut-off for the correlations and allow a relatively large range of level scores, the procedure will emphasize profile more than level. If, however, we set a lower cut-off for correlations but allow a relatively small range of overall level scores, the resulting list of occupations will emphasize level rather than profile match. For the present analyses, we chose the top 100 correlations for each hypothetical worker, and then identified the subset of these occupations for which the level percentile was within ten points of the worker percentile.

This methodology is flexible in that the range of skill levels considered a match can be adjusted. Further, because it is usually more productive to match a person to a job for which they are slightly over-qualified than one for which they are under-qualified, the range could be set such that the upper and lower bounds are not symmetrical. In other words, the upper bound of the range can be set to a level only slightly above the person's skill level, but the lower bound can be set somewhat lower to include more occupations.

Finally, in an effort to streamline data collection and minimize the amount of worker assessment information needed to perform the matching, we attempted to identify a smaller number of skills scores that could be used in place of the 46 skills descriptors. Information concerning the formation of aggregate scores based on O*NET descriptors is available in Hanson, Borman, Kubisiak, Arad, and Horgen (in press). These authors developed a set of clusters of O*NET skill descriptors that reflect the structure of the O*NET job analysis data, and procedures for forming aggregate scores. In the present research, we believed that one of the advantages of using a smaller number of descriptors is to minimize the amount of worker skill data that needs to be collected. Thus, rather than computing aggregate scores based on all descriptors included, for each aggregate we selected a single descriptor that appeared to be central to the definition of the aggregate. The aggregates and their component descriptors are in Table 2. The descriptor chosen to represent each aggregate is highlighted. We then compared matching outcomes based on just these 16 skills with the matching outcomes based on all 46 skills for the final, two stage matching procedure described above.

Table 2
Rational/Empirical Aggregates for the O*NET Skills with Selected Skills Highlighted

I. Communication skills
- A. Written
  - 1. Reading comprehension
  - ***3. Writing***
- B. Oral
  - ***2. Active listening***
  - 4. Speaking

II. Social skills
- C. Interpersonal skill
  - ***13. Persuasion***
  - 14. Negotiation
- D. Interpersonal sensitivity
  - ***11. Social perceptiveness***
  - 16. Service orientation
- E. Teaching/learning skills
  - 9. Learning strategies
  - 15. Instructing
  - 7. Critical thinking
  - ***8. Active learning***

III. Technology skills
- F. Technology design
  - 25. Operations analysis
  - ***26. Technology design***
  - 27. Equipment selection
  - 33. Product inspection
- G. Programming
  - ***29. Programming***
- H. Installation and repair
  - 28. Installation
  - 30. Testing
  - 34. Equipment maintenance
  - ***35. Troubleshooting***
  - 36. Repairing
- I. Operating equipment
  - ***31. Operation monitoring***
  - 32. Operation and control

IV. Problem solving/systems skills
- J. Problem solving/solution implementation
  - 17. Problem identification
  - 21. Idea generation
  - ***22. Idea evaluation***
  - 23. Implementation planning
  - 10. Monitoring
  - 24. Solution appraisal
- K. Information gathering/ organization
  - 18. Information gathering
  - ***19. Information organization***
  - 20. Synthesis/reorganization
- L. Understanding systems
  - 37. Visioning
  - ***38. Systems perceptions***
  - 39. Ident. of downstream consequences
  - 41. Judgment/decision making
  - 40. Identification of key causes
  - 42. Systems evaluation

IV. Resource/time management skills
- M. Time management/coordination
  - 12. Coordination
  - ***43. Time management***
  - 46. Managing personnel resources
- N. Resource management
  - ***44. Financial***
  - 45. Material

VI. Math and science skills
- O. Math
  - ***5. Mathematics***
- P. Science
  - ***6. Science***

Note. Skills selected to represent each aggregate are highlighted in bold.

Software Demo

As mentioned previously, a great deal of work has already been accomplished in the area of computerized career information systems. Many such systems are currently available, so the development of a system to meet the Air Force's needs does not have to begin from scratch. In fact, the first computerized career information system was initially developed over 25 years ago (Career Information System, University of Oregon, 1994).

We used the Career Visions and Career Ways systems developed by the Center on Education and Work at the University of Wisconsin at Madison as the starting point for the present effort. These systems have several features that are particularly appropriate for application with displaced workers. These programs are Windows-based with a "point-and-click" user interface, thus avoiding awkward typed commands that sometimes cause problems in other systems. These programs are also multimedia, and include 43 "skills" videos to help users understand the definitions of the skills included. These videos are approximately 35 seconds in length, and each demonstrates the use of a single skill in three or more occupations. There are also 62 occupational videos (about 30 seconds each) to familiarize users with the activities involved in 62 different occupations. This multimedia capability is an excellent starting point for the kind of system that would be ideal for displaced Air Force workers. In fact, the Career Ways system was awarded a "Certificate of Excellence" by the U.S. DOL for being an exemplary and innovative application of technology to workforce development.

In all, the Career Visions and Career Ways systems currently provide information on 635 occupations, including the activities involved, the occupational outlook, and information about relevant education and training. In addition, these systems include capabilities that are not immediately relevant to the current effort, but could be useful to displaced workers and possibly incorporated into future versions of the software. These features include a resume writing module, a budgeting module, and, in Career Ways, a class planning module for students. Career Visions is currently the official career information system for the State of Wisconsin, and the State of Texas (the State Occupational Information Coordinating Committee [SOICC]) has also recently purchased a license for this system and is adapting it for use statewide.

In the present effort, the University of Wisconsin software was used as a starting point to develop a demonstration program that illustrates the capabilities of the proposed career guidance system. In addition to incorporating features of this available software in the demo, we also incorporated features of the proposed software that are not available in current systems. This included an assessment of leisure activities, self assessments of O*NET skills, and access to occupational information on the internet.

Results

Needs Assessment

Participants in the needs assessment focus groups were very open about the challenges they are facing and the types of information that they would find useful in a career guidance system. The feedback we received was excellent, and it guided our efforts during the remainder of the project.

When asked what types of information they would like concerning jobs, participants gave a variety of answers. Nearly everyone wanted to know about job opportunities or availability (i.e., not just more general information about alternative careers). Most wanted to know about opportunities in the San Antonio area, but a substantial number were also interested in a broader geographic region (e.g., the region around the San Antonio area or southern Texas). A few also said they would be interested in national information, because they would be willing to relocate for a good job. A few people also said that regional information about regions other than their own (e.g., Alabama) would be helpful.

A number of participants indicated that they would like the information to be available in a manner such that they could access listings of positions across industries. That is, a person who is currently a medical laboratory technician may want to see opportunities for laboratory technicians in chemical engineering or research-oriented industries. Assessing the degree of overlap between positions with different titles or in different industries is something for which the O*NET data is ideally suited.

Not surprisingly, everyone was interested in salary. In addition to starting salary, most wanted to know more about the salary potential (e.g. the range of salaries) in an occupation. Other information participants suggested incorporating included the presence/absence of a union, whether there would be shift work, benefits, advancement opportunities, training opportunities (e.g., apprenticeships, internships, OJT, etc.), and safety information (e.g., hazards). Some of this information is likely to be available only for specific jobs or positions, but it may be possible to make some occupation-wide generalizations as well (e.g., nurses generally have excellent health care benefits, etc.)

We asked participants whether they would be willing to relocate and/or retrain and the extent to which they thought Kelly workers in general would be willing to relocate/retrain. Nearly everyone said they would be willing to spend some time retraining, but the amount of time people were willing to spend varied. Some would spend only a few weeks (e.g., seven), others were willing to spend up to a year, others two years, and still others were willing to spend "as long as it takes." The amount of time people were willing to spend training also depended on the probability that this training will result in a job, or in a higher paying job.

Participants generally thought that a large percentage of people at Kelly were interested in changing careers and/or in retraining, with many estimates as high as about 75% of the workers. Apparently these workers view the transition as an opportunity to try something new. Many of the Kelly workers have been in the work force a long time, and although some expressed concern about going back to school, they seemed generally very interested in

continuing education opportunities. For workers concerned about their ability to succeed in a classroom setting, on-the-job training is likely to be a much more appealing and practical alternative.

There was no clear consensus on how many Kelly workers would be willing to relocate, but there are some who are very willing and some who would definitely not, so information is needed for both situations. Apparently there are excellent training programs and funding available for Kelly workers. However, some expressed concern about the "Demand Occupations" list. Many workers found the list limiting, and several expressed interest in obtaining training for occupations not on this list. Others thought the list focused too much on entry level occupations. In general, less restriction on funds for retraining was strongly supported by all of the groups.

The portions of the computer programs that were demonstrated for these workers focused on skills, particularly skills that might generalize across occupations. The idea is that they may not have to start from scratch if occupations can be identified for which they already have relevant skills. Participants were enthusiastic about identifying occupations with skill requirements similar to their current occupations. A few expressed concerns that this would only apply to workers leaving the government, because of the red tape and paperwork involved in qualifying for government jobs. Such a skills-based assessment would be more useful to workers remaining in the government if more flexibility could be built into the system.

Most of the participants said they would like to work on their own with a career information system such as ours, but would like to have a counselor available on an "as needed" basis. They indicated that they would likely use the system for about an hour, but estimates varied from ten minutes to "as long as it takes."

Age is a very salient issue with this group. Any information about the extent to which older workers are being hired in general, or the companies/industries with a good track record in this area would be extremely useful. Interestingly, when asked about whether formalized testing (i.e., ability tests) should be built into the system, virtually all of the focus group participants said they would not want to know what occupations their test scores indicated would be appropriate. This seemed to reflect a general resistance to formal testing.

Unfortunately, most participants were of the opinion that our system would not be available soon enough to help them personally, but most thought that if it could be available in a little over a year it could still help many Kelly workers (e.g., those who have not made decisions concerning their future yet and/or are among the last to be laid off). However, their interest and enthusiasm led us to believe that the project could yield some very promising results.

Worker Assessment

Self Assessments

In general, our pilot test sample found the instructions and scales for collecting skill self assessments to be straightforward and usable. We made several changes based on feedback received. The final skills self assessment instrument can be found in Appendix D. We also used the self assessments made by this pilot test sample as a starting point for developing the hypothetical people that were used in the person-job matching analyses.

Leisure Activities

The interrater reliability results for the leisure rating task are shown in Table 3. The average interrater reliability across all the skills was .75 for the novice level of participation (range, .36-.99), .87 for the average level (range, .74-.98) and .89 for the expert level (range, .78-.97). Lower interrater reliabilities were found at the novice level for several skills (e.g., Skill 39, Identification of Downstream Consequences). This occurred when several raters rated *all* of the leisure activities as requiring a zero level of that particular skill. That is, these raters agreed that the activities did not require any of that skill. This resulted in no variance in those raters' ratings on that skill, so the interrater reliabilities had to be calculated based on fewer than the thirteen raters. So while the interrater reliability is lower for certain skills at the novice activity level, this does not necessarily reflect a lack of agreement among the raters. When raters agree and rate all the activities as requiring no skill, agreement is high even though the interrater reliability statistic is low. Overall, the interrater reliabilities were fairly high, indicating that the raters were able to reliably link skills to leisure activities.

Raters also provided ratings of how familiar they were with each of the leisure activities. Most raters indicated that they were reasonably familiar with the activities they were rating; they indicated that they had trouble making only 4.5% ratings (i.e., they were unsure about what the activity involved). The interrater reliabilities were recalculated after taking out those rater-activity pairs associated with these low familiarity ratings. There was no appreciable difference in the interrater reliability after deleting these ratings. For example, the interrater reliability for Active Listening for novice level participation was .8579 with all of the ratings included. The interrater reliability after the very lowest familiarity ratings were deleted was .8578. Therefore, all the ratings were included in the analyses, regardless of the familiarity rating.

The next step was to determine how to summarize the ratings, across raters, to assign skill level ratings to each activity. The summary statistics for the leisure activity ratings were examined in order to determine the best method for linking leisure activities with skills. The modal rating was selected as the best indicator of the level of skill involved in each activity. The mean skill rating was sometimes skewed by one rating, and it seems reasonable to expect that one rater may have focused on different aspects of the activity or perhaps didn't consider what the activity involved quite as thoroughly as other raters. The modal rating arguably reflects raters' agreement about the level of skill involved in an activity.

A set of rules was developed to guide the selection of the modal skill rating for each skill-activity pair. If more than half the raters (i.e., at least 7 of the 13 raters) agreed on the rating of the skill level involved in an activity, then this rating was the level of skill assigned to that activity. When less than 7 raters agreed on a single rating, then if at least three-quarters of the raters (at least 10 of the 13 raters) scored the activity within one consecutive score, the average of these two skill levels was used to link the activity to a skill level. For example, if 5 raters rated the activity as requiring a skill level of 3 and 5 raters rated the activity as requiring a skill level of 4, then the activity would be assigned a skill rating of 3.5 for that skill. If neither of these conditions were met, then the activity was labeled "unscorable". These stringent guidelines were used so that the skill level assigned to activities would reflect strong agreement between raters about the level of skill involved in the activity. Of the 12,880 leisure activity-skill

Table 3
Interrater Reliabilities for Ratings of Skill Level Required in Leisure Activities

	Reliabilities[1] for Each Level of Expertise		
Skill	Novice	Average	Expert
1. Reading Comprehension	.91	.93	.93
2. Active Listening	.86	.91	.91
3. Writing	.93	.93	.94
4. Speaking	.88	.92	.93
5. Mathematics	.84	.89	.90
6. Science	.50	.74	.80
7. Critical Thinking	.77	.86	.86
8. Active Learning	.67	.81	.82
9. Learning Strategies	.58	.77	.80
10. Monitoring	.68	.78	.79
11. Social Perception	.79	.91	.92
12. Coordinating	.90	.94	.95
13. Persuasion	.62	.88	.89
14. Negotiation	.84	.83	.88
15. Instructing	.90	.88	.88
16. Service Orientation	.86	.87	.88
17. Problem Identification	.79	.89	.87
18. Information Gathering	.76	.84	.89
19. Information Organization	.72	.86	.89
20. Synthesis/Reorganization	.60	.82	.87
21. Idea Generation	.58	.80	.85
22. Idea Evaluation	.65	.84	.86
23. Implementation Planning	.67	.85	.88
24. Solution Appraisal	.66	.84	.78
25. Operation Analysis	.62	.82	.87
26. Technical Design	.66	.78	.82
27. Equipment Selection	.72	.87	.93
28. Installation	.77	.92	.93
29. Programming	.99	.98	.96
30. Testing	.75	.86	.88
31. Operation Monitoring	.83	.91	.94
32. Operation and Control	.85	.92	.93
33. Product Inspection	.61	.89	.92
34. Equipment Maintenance	.75	.89	.92
35. Troubleshooting	.85	.91	.92
36. Repairing	.96	.96	.96
37. Visioning	.65	.79	.82
38. Systems Perception	.81	.88	.90
39. Ident of Downstream Conseq	.48	.81	.83

[1]This estimate of reliability was obtained by calculating the intraclass correlation for 13 judges across leisure activities: $ICC(3,k) = (BMS-EMS)/BMS$ (Shrout & Fleiss, 1979).

Table 3 (Continued)
Interrater Reliabilities for Ratings of Skill Level Required in Leisure Activities

	Reliabilities for Each Level of Expertise		
Skill	Novice	Average	Expert
40. Ident of Key Causes	.36	.88	.89
41. Judgment & Decision Making	.74	.89	.88
42. Systems Evaluation	.71	.87	.87
43. Time Management	.81	.90	.90
44. Mgmt of Financial Resources	.84	.92	.94
45. Mgmt of Material Resources	.68	.85	.84
46. Mgmt of Personnel Resources	.90	.96	.97
Avg. Interrater Reliability	.75	.87	.89

pairs, 1083 (8%) were unscorable. All unscorable ratings were assigned a skill level of zero unless the skill level for a lower level of expertise for that same activity was greater than zero. In that case, the unscorable rating was assigned the same score as that for the lower level of expertise. For example, flying was scored as requiring a low level (rating = 2) of critical thinking at the novice level. It was unscorable at the average and expert level. Since the novice level of flying was scored, it was assumed that an average or expert in flying would require at least this low level of critical thinking skill and so the average and expert levels of this activity were also assigned a low level of critical thinking skill. Most of the unscorable ratings occurred in the expert level ratings, with very few unscorable ratings at the average or novice level: 19.7% of the expert level ratings, 3.4% of the average level ratings, and .2% of the novice level ratings were unscorable. Table 4 shows the number of unscorable ratings by activity and Table 5 shows the number of unscorable ratings by skill. Film and video making (activity 41) and performing arts manager (activity 39) were the activities with the largest number of unscorable ratings. The instructing skill (skill 15) had the largest number of unscorable ratings.

The modal ratings for the novice level of participation in activities were usually very low. In the rating instructions, raters were asked to think about the level of skill *required* to participate in the activity. As shown in Table 6, novice participation in an activity usually requires very little skill, with the exception of some activities like flying. Average and expert level participation generally requires higher levels of the 46 O*NET skills. Finally, for two skills, Instructing and Learning Strategies, raters were also asked to judge how much skill would be involved in instructing each of the leisure activities. As expected, there were higher skill ratings for instructing many of the leisure activities than for participating, even at the expert level.

Table 7 shows the average skill level assigned to leisure activities, for each level of expertise across all the leisure activities for each of the 46 skills. Some of the basic thinking skills had somewhat higher average ratings. For example, problem solving (skill 17) had the highest average level across all the activities. Critical thinking (skill 7) and judgment and decision making (skill 41) also had higher average levels.

Table 4
Number of Unscorable Leisure Activity-Skill Linkages for Each Leisure Activity

Leisure Activity	Number Unscorable	Leisure Activity	Number Unscorable
1. Individual Shooting/Throwing Sports	2	31. Travel	14
2. Individual Physical Sports	5	32. Acting	11
3. Riding Sports	5	33. Performing Arts Crew	19
4. Individual Vehicle Sports	2	34. Dancing	4
5. Motor Racing Sports: Driving	5	35. Singing With a Group	5
6. Motor Racing Sports: Pit Crew/Repair	29	36. Singing Alone	2
7. Adventure Sports	14	37. Clowning: Juggling, Magic	5
8. Combative Individual Sports	2	38. Clowning: Comic	7
9. Golf	8	39. Performing Arts Manager/Director	40
10. Competitive Team/Group Sports	15	40. Drawing, Painting, Sculpture	6
11. Team Yacht Racing	24	41. Film/Video Making	48
12. Coaching	13	42. Playing a Musical Instrument Alone	3
13. Umpire or Referee	7	43. Playing an Instrument in a Band, Orchestra or Other Group	6
14. Astronomy	15	44. Directing a Musical Group	30
15. Camping, Hiking	1	45. Composing Music; Song Writing	13
16. Fishing/Hunting	3	46. Writing for Publication	27
17. Outdoor Adventure	11	47. Writing for Pleasure	10
18. Beekeeping	4	48. Writing Letters to Friends and Family	1
19. Bird Watching	0	49. Animal Racing	3
20. Power Boat	7	50. Animal Training	15
21. Sailing	14	51. Animal Showing	4
22. Flying; Ultralight flying	36	52. Breeding Pets/Animals	15
23. Hot-air Ballooning	24	53. Collecting	7
24. Motorcycle Riding	4	54. Candle Making; Ceramics; Pottery Making	6
25. Gardening: Vegetable Garden, Trees, Landscaping	5	55. Clock Making/Repair; Doll-House Construction	16
26. Gardening: Houseplants	0	56. Flower Arranging	2
27. Plant/Flower Breeding	12	57. Jewelry Making; Leather Working	8
28. Aerobics	2	58. Sewing/Needle Crafts	3
29. Meditation, Yoga	2	59. Model Building, Model Racing	16
30. Weight Lifting, Body Building	3	60. Metal Working	13

Table 4 (Continued)
Number of Unscorable Leisure Activity-Skill Linkages for Each Leisure Activity

Activity	Number Unscorable	Activity	Number Unscorable
61. Photography	14	75. Games of Skill	23
62. Short-Wave Radio Listening, Ham/CB Radio	3	76. Skilled Casino Gambling	5
63. Furniture Refinishing	7	77. Card Games	12
64. Carpentry	17	78. Gourmet Cooking; Canning/Preserving Food	14
65. Wood Carving; Toy Making	10	79. Beer/Wine Making/Distilling	16
66. Upholstering	5	80. Reading Technical or Scientific Books, Journals, or Papers	10
67. Home Improvement/Repair: Major	27	85. Balance Checkbook, Pay Bills	5
68. Home Improvement/Repair: Minor	6	86. Tax Return Preparation	14
69. Electrical/Appliance Repair	20	87. Make Investments, Oversee Investments	31
70. Mechanical Device Maintenance/Repair	28	88. Programming	37
71. Mechanical Device Restoration	28	89. Surfing the Internet	16
72. Planning and Giving Parties; Catering	21	90. Desktop Publishing	10
73. Computer Games	14	91. Other Computer Use	7
74. Word Games	7	92. Research Family History/Genealogy	10

Table 5
Number of Unscorable Leisure Activity-Skill Linkages for Each Skill

Skill	Number Unscorable	Skill	Number Unscorable
1. Reading Comprehension	28	24. Solution Appraisal	29
2. Active Listening	26	25. Operation Analysis	20
3. Writing	9	26. Technical Design	10
4. Speaking	18	27. Equipment Selection	36
5. Mathematics	14	28. Installation	12
6. Science	4	29. Programming	6
7. Critical Thinking	59	30. Testing	17
8. Active Learning	46	31. Operation Monitoring	10
9. Learning Strategies	58	32. Operation and Control	33
10. Monitoring	49	33. Product Inspection	29
11. Social Perception	10	34. Equipment Maintenance	11
12. Coordinating	20	35. Troubleshooting	18
13. Persuasion	6	36. Repairing	8
14. Negotiation	8	37. Visioning	17
15. Instructing	67	38. Systems Perception	22
16. Service Orientation	10	39. Ident of Downstrm Conseq	20
17. Problem Identification	33	40. Ident of Key Causes	31
18. Information Gathering	21	41. Judgment & Decision Making	28
19. Information Organization	26	42. Systems Evaluation	18
20. Synthesis/Reorganization	21	43. Time Management	4
21. Idea Generation	55	44. Mgmt of Financial Resources	12
22. Idea Evaluation	36	45. Mgmt of Material Resources	35
23. Implementation Planning	28	46. Mgmt of Personnel Resources	5

Table 6
Distribution of Skill Requirements Across Leisure Activities by Level of Expertise

Skill Level Required	Number of Activities at Each Skill Level for Each Level of Expertise			
	Novice	Average	Expert	Instructor[1]
0	4149	3751	3450	132
2.0	51	222	432	9
3.0	30	185	158	2
3.5	1	54	85	13
4.0	1	17	79	24
4.5	0	1	17	3
5.0	0	1	8	1
5.5	0	1	1	0
7.0	0	0	2	0

[1]Instructor level ratings were collected for 2 of the 46 skills, Instructing and Learning Strategies.

Table 7
Average Skill Requirements Across Activities by Level of Expertise for Each Skill

Skill[1]	Level of Expertise	Skill Level[2] Required Across Activities		
		Mean	Standard Deviation	Maximum[3]
1. Reading Comprehension	Novice	.22	.68	3.00
	Average	.48	1.19	5.00
	Expert	.58	1.38	7.00
2. Active Listening	Novice	.11	.52	3.00
	Average	.22	.78	4.00
	Expert	.23	.85	4.00
3. Writing	Novice	.08	.52	4.00
	Average	.14	.77	5.50
	Expert	.17	.99	7.00
4. Speaking	Novice	.17	.67	3.00
	Average	.31	.93	4.00
	Expert	.35	1.01	4.50
5. Mathematics	Novice	.05	.37	3.00
	Average	.21	.77	3.50
	Expert	.26	.81	3.50
6. Science	Novice	.00	.00	.00
	Average	.03	.31	3.00
	Expert	.03	.31	3.00
7. Critical Thinking	Novice	.08	.43	3.00
	Average	.82	1.30	4.00
	Expert	1.28	1.42	4.00
8. Active Learning	Novice	.00	.00	.00
	Average	.18	.68	4.00
	Expert	.27	.77	4.00
9. Learning Strategies	Novice	.00	.00	.00
	Average	.09	.52	3.50
	Expert	.29	.84	4.50
	Instructor	1.27	1.76	4.50
10. Monitoring	Novice	.02	.21	2.00
	Average	.36	.95	3.50
	Expert	.74	1.16	4.00
11. Social Perception	Novice	.02	.21	2.00
	Average	.20	.72	3.50
	Expert	.26	.88	4.00
12. Coordinating	Novice	.15	.59	3.00
	Average	.42	1.03	3.50
	Expert	.47	1.13	4.50

[1]Note that (9). Learning Strategies and (15). Instruction contain data for Instructor ratings.
[2]Note that the level of skill is defined as the mode across raters.
[3]Minimum modal skill ratings were zero for all 46 skills.

Table 7 (Continued)
Average Modal Skill Rating Across Activities for All Levels of Expertise

Skill	Level of Expertise	Skill Level Required Across Activities		
		Mean	Standard Deviation	Maximum
13. Persuasion	Novice	.00	.00	.00
	Average	.09	.48	3.00
	Expert	.10	.59	4.00
14. Negotiation	Novice	.00	.00	.00
	Average	.00	.00	.00
	Expert	.00	.00	.00
15. Instructing	Novice	.07	.36	2.00
	Average	.10	.55	3.50
	Expert	.20	.85	5.00
	Instructor	.73	1.49	5.00
16. Service Orientation	Novice	.02	.21	2.00
	Average	.09	.41	2.00
	Expert	.07	.36	2.00
17. Problem Identification	Novice	.10	.47	3.00
	Average	.89	1.41	4.00
	Expert	1.76	1.70	5.00
18. Information Gathering	Novice	.04	.29	2.00
	Average	.21	.71	3.50
	Expert	.40	.97	3.50
19. Information Organization	Novice	.03	.31	3.00
	Average	.25	.78	3.00
	Expert	.40	1.05	4.50
20. Synthesis/Reorganization	Novice	.00	.00	.00
	Average	.16	.63	3.00
	Expert	.24	.77	3.50
21. Idea Generation	Novice	.02	.21	2.00
	Average	.38	.85	3.00
	Expert	.82	1.24	4.00
22. Idea Evaluation	Novice	.02	.21	2.00
	Average	.48	.98	3.50
	Expert	1.00	1.29	4.00
23. Implementation Planning	Novice	.04	.29	2.00
	Average	.33	.87	3.00
	Expert	.57	1.14	4.50
24. Solution Appraisal	Novice	.02	.21	2.00
	Average	.41	.92	3.50
	Expert	1.08	1.27	4.00
25. Operation Analysis	Novice	.00	.00	.00
	Average	.26	.81	3.00
	Expert	.38	.97	4.50

Table 7 (Continued)
Average Modal Skill Rating Across Activities for All Levels of Expertise

Skill	Level of Expertise	Skill Level Required Across Activities		
		Mean	Standard Deviation	Maximum
26. Technical Design	Novice	.03	.31	3.00
	Average	.05	.37	3.00
	Expert	.05	.37	3.00
27. Equipment Selection	Novice	.03	.31	3.00
	Average	.56	1.10	3.50
	Expert	.97	1.41	4.00
28. Installation	Novice	.00	.00	.00
	Average	.14	.59	3.50
	Expert	.21	.70	3.50
29. Programming	Novice	.00	.00	.00
	Average	.00	.00	.00
	Expert	.00	.00	.00
30. Testing	Novice	.03	.31	3.00
	Average	.14	.60	3.00
	Expert	.25	.78	3.00
31. Operation Monitoring	Novice	.07	.44	3.00
	Average	.21	.71	3.50
	Expert	.31	.83	3.50
32. Operation and Control	Novice	.15	.63	3.50
	Average	.61	1.16	3.50
	Expert	.61	1.11	3.50
33. Product Inspection	Novice	.02	.21	2.00
	Average	.48	1.05	3.50
	Expert	.63	1.26	4.00
34. Equipment Maintenance	Novice	.03	.31	3.00
	Average	.34	.94	3.50
	Expert	.77	1.31	4.50
35. Troubleshooting	Novice	.13	.50	2.00
	Average	.37	.95	3.50
	Expert	.65	1.24	4.50
36. Repairing	Novice	.16	.68	3.00
	Average	.39	1.09	4.00
	Expert	.51	1.23	5.00
37. Visioning	Novice	.02	.21	2.00
	Average	.16	.62	3.50
	Expert	.61	1.08	4.00
38. Systems Perception	Novice	.07	.36	2.00
	Average	.35	.84	3.00
	Expert	.65	1.26	4.50

Table 7 (Continued)
Average Modal Skill Rating Across Activities for All Levels of Expertise

Skill	Level of Expertise	Skill Level Required Across Activities		
		Mean	Standard Deviation	Maximum
39. Ident of Downstrm Conseq	Novice	.00	.00	.00
	Average	.15	.53	2.00
	Expert	.32	.78	3.50
40. Ident of Key Causes	Novice	.00	.00	.00
	Average	.51	1.07	3.50
	Expert	1.04	1.33	4.00
41. Judgment & Decision Making	Novice	.03	.31	3.00
	Average	.70	1.24	4.00
	Expert	1.22	1.44	4.00
42. Systems Evaluation	Novice	.03	.31	3.00
	Average	.34	.96	4.00
	Expert	.47	1.14	5.00
43. Time Management	Novice	.02	.21	2.00
	Average	.18	.66	3.00
	Expert	.23	.86	4.00
44. Mgmt of Financial Resources	Novice	.02	.21	2.00
	Average	.21	.75	4.00
	Expert	.22	.80	4.00
45. Mgmt of Material Resources	Novice	.02	.21	2.00
	Average	.68	1.16	3.00
	Expert	.81	1.19	3.50
46. Mgmt of Personnel Resources	Novice	.02	.21	2.00
	Average	.13	.63	3.50
	Expert	.22	.90	5.00

Regarding the unskilled activity rating task, the majority of the activities classified as potentially unskilled (i.e., included in the unskilled activities rating task) were rated as unskilled by all thirteen raters (72%). Thirteen of the activities were rated as skilled by one to four raters. For example, race betting was rated as skilled by four raters and auto driving was rated as skilled by three raters. However, most of the raters agreed that participation in these activities does not require any of the O*NET skills. These 46 "unskilled" activities can be assigned skill levels of zero for all 46 O*NET skills.

The interrater reliabilities for the volunteer and social role ratings are presented in Table 8. The average interrater reliability across all the skills was .85 (range, .21-.95). As in the leisure activity ratings, lower interrater reliabilities were found for a few skills (e.g., Skill 28, Installation). Again, this occurred when several raters rated all the roles as requiring a zero level of that particular skill. Overall, the interrater reliabilities were fairly high, indicating that the raters were able to reliably link skills to volunteer and social roles.

The mean was chosen as the best indicator of the level of skill involved in a volunteer or social role, rather than the mode. There were several reasons for this decision. The leisure activities were very specific in terms of the types of tasks they involved while the volunteer and social roles were very broad and could include a variety of tasks. For example, singing is a very specific activity whereas serving in the role of a volunteer board member involves a wider variety of tasks. Also, there were no novice, average, expert distinctions in the role ratings. Raters were asked simply to make skill ratings for a competent person engaged in the role. This may have led the raters to think about a wider range of levels of skill than in the leisure activity ratings. Finally, there appears to be a wider range in the role ratings than in the leisure activity ratings.

Table 9 lists the mean and maximum rating across all skills for each volunteer or social role. As expected, the leadership roles (e.g., supervisor/manager, organizing/coordinating, board member) had generally higher skill ratings. For example, the supervisor/manager role had the highest mean ratings across all the skills while the visitor role had the lowest mean ratings across all the skills. Table 10 lists the mean rating across roles for each skill. Again, the pattern of mean skill ratings is consistent with volunteer and social roles. Several skills were rated as fairly important across the roles, including active listening and speaking skills. Other skills, like technical design, installation and programming, were rated as less important for the roles.

The results of both the leisure activity ratings and the volunteer and social role ratings indicate that there are work-related skills involved in most of these activities. By examining leisure and volunteer experience, additional work-related skills can identified and used to help match people with jobs. It may be that a wider range of potential job opportunities would be identified by including those skills developed in leisure and volunteer activities. In addition, people engage in leisure and volunteer activities on their own time, presumably due to a high level of interest in these activities. If so, then identifying the skills used in these activities should result in identification of those skills which the person enjoys using.

Table 8
Interrater Reliabilities for Ratings of Skill Level Required for Volunteer and Social Roles

Skill	ICC[1]	Skill	ICC
1. Reading Comprehension	.89	24. Solution Appraisal	.93
2. Active Listening	.88	25. Operation Analysis	.82
3. Writing	.95	26. Technical Design	.42
4. Speaking	.94	27. Equipment Selection	.83
5. Mathematics	.91	28. Installation	.21
6. Science	.54	29. Programming	.75
7. Critical Thinking	.94	30. Testing	.71
8. Active Learning	.94	31. Operation Monitoring	.87
9. Learning Strategies	.90	32. Operation and Control	.70
10. Monitoring	.88	33. Product Inspection	.80
11. Social Perception	.94	34. Equipment Maintenance	.88
12. Coordinating	.89	35. Troubleshooting	.73
13. Persuasion	.94	36. Repairing	.69
14. Negotiation	.91	37. Visioning	.88
15. Instructing	.94	38. Systems Perception	.88
16. Service Orientation	.78	39. Ident of Downstrm Conseq	.90
17. Problem Identification	.95	40. Ident of Key Causes	.92
18. Information Gathering	.93	41. Judgment & Decision Making	.93
19. Information Organization	.86	42. Systems Evaluation	.86
20. Synthesis/Reorganization	.86	43. Time Management	.90
21. Idea Generation	.95	44. Mgmt of Financial Resources	.94
22. Idea Evaluation	.94	45. Mgmt of Material Resources	.88
23. Implementation Planning	.93	46. Mgmt of Personnel Resources	.91

[1]This estimate of reliability was obtained by calculating the intraclass correlation for 13 judges across leisure activities: $ICC(3,k) = (BMS\text{-}EMS)/BMS$ (Shrout & Fleiss, 1979).

Table 9
Mean Volunteer and Social Role Rating - By Role

Role	Mean	Maximum
1. Supervisor/Manager	2.92	4.69
2. Organizing/Coordinating	2.56	4.85
3. Small Group Leader	2.06	4.15
4. Board Member	2.23	4.54
5. Committee Member	1.62	3.77
6. Secretary/Clerical Support	0.72	3.31
7. Accountant/Financial	1.71	4.62
8. Advisor	2.22	4.85
9. Aide (school, library)	0.36	3.00
10. Driver	0.34	2.00
11. Advocate (e.g., lobbyist)	1.94	5.15
12. Recruiter	1.48	4.31
13. Fund Raising	1.51	3.85
14. Public Relations	1.80	4.69
15. Teacher/Tutor	1.95	4.62
16. Trainer	2.10	4.46
17. Child Care	0.92	3.08
18. Visitor	0.30	3.77
19. Mentor	1.03	3.62
20. Counselor	1.98	5.62
21. Emergency Service	1.96	5.00
22. Tour guide/Give Demonstrations/Talks	0.43	2.23

Table 10
Mean Volunteer and Social Role Rating - By Skill

Skill	Mean Rating	Skill	Mean Rating
1. Reading Comprehension	2.72	24. Solution Appraisal	2.38
2. Active Listening	3.21	25. Operation Analysis	0.57
3. Writing	2.50	26. Technical Design	0.14
4. Speaking	3.12	27. Equipment Selection	0.67
5. Mathematics	0.71	28. Installation	0.18
6. Science	0.22	29. Programming	0.17
7. Critical Thinking	2.56	30. Testing	0.39
8. Active Learning	2.36	31. Operation Monitoring	0.39
9. Learning Strategies	1.46	32. Operation and Control	0.53
10. Monitoring	2.42	33. Product Inspection	0.68
11. Social Perception	2.51	34. Equipment Maintenance	0.14
12. Coordinating	2.33	35. Troubleshooting	0.71
13. Persuasion	2.27	36. Repairing	0.24
14. Negotiation	1.63	37. Visioning	1.64
15. Instructing	1.50	38. Systems Perception	1.87
16. Service Orientation	2.94	39. Ident of Downstrm Conseq	1.97
17. Problem Identification	2.78	40. Ident of Key Causes	2.48
18. Information Gathering	2.70	41. Judgment & Decision Making	2.52
19. Information Organization	2.23	42. Systems Evaluation	1.63
20. Synthesis/Reorganization	1.75	43. Time Management	1.45
21. Idea Generation	2.76	44. Mgmt of Financial Resources	1.23
22. Idea Evaluation	2.61	45. Mgmt of Material Resources	0.89
23. Implementation Planning	2.45	46. Mgmt of Personnel Resources	1.32

Person-Job Matching

Comparisons across the five different matching algorithms for each of the five hypothetical people led to similar conclusions. For purposes of illustration, this section focuses on the results for the person intended to have skills appropriate for the Sales Representative occupation, and then provides a discussion of similarities and differences in the results for the other four hypothetical people.

The calculation of the squared Euclidean distance scores was only modestly successful in matching the hypothetical people to their intended jobs. The top 50 matches for the hypothetical Sales Representative are listed in Table 11. The closest matching sales occupation was Sales Agent, Financial Services, which was 39th ($D^2 = 69.25$). The more general sales occupation, Sales Agent, Except Scientific and Engineering, arguably the intended occupation in this case, was the 155th best match ($D^2 = 111.53$). Additionally, examination of Table 11 reveals that the jobs having the lowest distance scores are predominantly occupations that require a generally high level of skill. This is likely a result of the disparity in overall level between the person scores and the analyst job data.

Table 12 shows the top 50 matches for the hypothetical Sales Representative using the second approach, that is, using percentile scores to compute D^2. Somewhat surprisingly, there is not much improvement in the results of the matching, even though this approach should alleviate the problem of an overall level difference between the worker and job information. The closest matching sales occupation was Sales Engineer, which was 16th. The intended occupation, Sales Agent, Except Scientific and Engineering, was the 115th best match. (Note that percentiles are on a different metric, so the D^2 values cannot be compared directly with those discussed above.) Across all five hypothetical people, the target jobs tend to be slightly *lower* in the list for this percentile method, although the jobs that rank the highest on these lists make somewhat more sense; that is, these highest ranking jobs are clearly similar to the target jobs.

The correlational approach resulted in substantially improved matching. In the case of the Sales Representative, the matches were an improvement over those generated by the distance score approaches (see Table 13 for the top five matches; see Appendix E for the top 50 matches). Five of the top six job matches are directly sales related, with correlations of .85 and greater. The results for the other hypothetical people were comparable in that the most highly correlated matches were very similar with respect to content (see Tables 13 - 17 for top five matches; see Appendix E for top 50 matches). The correlations between the best matching jobs and the person profiles were .72 or greater, and in all cases there were many highly correlated occupations that would likely prove beneficial to the end user.

The hybrid, multi-stage approach resulted in the best matches of the algorithms described here. Consider again the example of the Sales Representative (the five best correlation matches for the Sales Representative appear in Table 13; the 50 best matches for each hypothetical person appear in Appendix E). In this analysis, we retained the top 100 correlations (r = .72 - .86). The sales representative's overall skill percentile was 75. Retaining only jobs with a mean skill level 10 or less percentile points higher or lower, we would be left with a listing of 49 occupations. Sales Representative, Except Scientific and Engineering is now the 28th highest ranking occupation, a considerable improvement over the other algorithms. The level matching, in this

Table 11
Best 50 Matches Based on Distance Scores for Sales Representative

Rank	Occupational Unit Name and Number	D^2
1	Educational Program Directors - 15005B	40.90
2	Financial Managers, Branch or Department - 13002B	44.53
3	Information Systems Managers - 13017C	44.83
4	Advertising Managers - 13011A	46.14
5	Police and Detective Supervisors - 61005	48.14
6	College and University Administrators - 15005A	49.17
7	Employee Relations Specialists - 21511C	49.44
8	Curators - 31511A	50.68
9	Communications Managers - 15023B	50.76
10	Municipal Fire Fighting and Prevention Supervisors - 61002A	51.31
11	Dietitians and Nutritionists - 32521	51.42
12	Educational Psychologists - 27108D	55.68
13	Employee Training Specialists - 21511D	56.50
14	Sales Managers - 13011B	57.39
15	Public Relations Specialists and Publicity Writers - 13011B	58.00
16	Community Organization Social Workers - 27305A	59.08
17	Doctors of Medicine (MD) - 32102A	59.40
18	Industrial Production Managers - 15014	59.58
19	Employer Relations and Placement Specialists - 21511B	60.44
20	Management Analysts - 21905	60.75
21	Social Workers, Medical and Psychiatric - 27302	62.50
22	Commercial Art Directors - 34038E	63.00
23	Sales Engineers - 49002	63.22
24	Economists - 27102A	63.28
25	Marketing Managers - 13011C	63.33
26	Commercial and Industrial Designers - 34038B	63.58
27	Instructional Coordinators - 31517D	63.64
28	Speech-Language Pathologists and Audiologists - 32314	64.81
29	Government Service Executives - 19005A	66.25
30	Property Managers - 15011B	67.00
31	Human Resources Managers - 13005A	67.28
32	Private Sector Executives - 19005B	67.42
33	Managers and Agents Land Leasing and Development - 15011A	67.56
34	Job and Occupational Analysts - 21511A	67.67
35	First-Line Supervisors and Manager/Supervisors, Mechanics, Installers, and Repairers - 21511A	67.92
36	Security Managers - 19999F	69.04
37	Farm and Home Management Advisors - 31323	69.11
38	Postmasters and Mail Superintendents - 15002	69.17
39	Sales Agents, Financial Services - 43014B	69.25
40	Civil Engineers, Including Traffic - 22121	70.20
41	Sales Agents, Securities, and Commodities - 43014A	70.33
42	Foresters - 24302A	71.00

Table 11 (Continued)
Best 50 Matches Based on Distance Scores for Sales Representative

Rank	Occupational Unit Name and Number	D^2
43	Construction Managers - 15017B	71.36
44	Utilities Managers - 15023C	72.89
45	Natural Sciences Managers - 13017B	73.28
46	Directors, Religious Activities and Education - 27505	74.72
47	Vocational Rehabilitation Consultants - 31517B	75.40
48	Surgeons - 32102J	75.96
49	Health Specialties Teachers, Postsecondary - 31212	76.36
50	Computer Support Specialists - 25104	76.38

Table 12
Best 50 Matches Based on Percentile Distance Scores for Sales Representative

Rank	Occupational Unit Name and Number	D^2
1	Food Preparation and Service Supervisors - 61099B	9785
2	Data Base Administrators - 25103A	11667
3	Communications Managers - 15023B	11734
4	First-Line Supervisors and Manager/Supervisors, Mechanics, Installers, and Repairers - 81002	11852
5	Geographic Information System Specialist - 25103B	11905
6	Security Managers - 19999F	12077
7	Nursery and Greenhouse Managers - 15031	12896
8	Lawn Service Managers - 15032	13054
9	First-Line Supervisors and Manager/Supervisors, Transportation and Material-Moving Machine and Vehicle Operat - 81011	13488
10	Exercise Physiologists - 32399A	13543
11	Mechanical Drafters - 22514D	13641
12	Industrial Hygienists - 32996C	13659
13	First Line Supervisors and Manager/Supervisors- Construction Trades - 81005A	13725
14	Livestock Supervisors - 72002B	13826
15	Fire Inspectors - 63002A	14321
16	Sales Engineers - 49002	14466
17	Animal Care Supervisors, except Livestock - 72002C	14755
18	First Line Supervisors and Manager/Supervisors- Extractive Workers - 81005B	14762
19	Environmental Compliance Officers - 21911B	14855
20	Agricultural Crop Farm Managers - 79999K	15109
21	Fishery Supervisors - 72002G	15400
22	Civil Engineers, Including Traffic - 22121	15467
23	Electronic Drafters - 22514B	15823
24	Pharmacists - 32517	15879
25	Experimental Psychologists - 27108C	15948
26	Chefs and Head Cooks - 61099A	16314
27	Orthodontists - 32105D	16450
28	Landscape Supervisors - 72002D	16595
29	Manual Arts Therapists - 32311A	16919
30	Medical and Clinical Laboratory Technologists - 32902	16978
31	Exhibit Designers - 34038D	17108
32	Technical Directors/Managers - 34056K	17121
33	Lodging Managers - 15026A	17250
34	Model Makers - 89114A	17275
35	Agricultural Crop Supervisors - 72002A	17352
36	Logging Supervisors - 72002F	17357
37	Program Directors - 34056H	17429
38	Orthotic and Prosthetic Technicians and Technologists - 32999A	17463

Table 12 (Continued)
Best 50 Matches Based on Percentile Distance Scores for Sales Representative

Rank	Occupational Unit Name and Number	D^2
39	First-Line Supervisors and Manager/Supervisors, Production and Operating Workers - 81008	17547
40	Lodging and Personal Service Supervisors - 61099C	17585
41	Surgeons - 32102J	17687
42	Pathologists - 32102U	17742
43	Commercial and Industrial Designers - 34038B	17837
44	Municipal Fire Fighting and Prevention Supervisors - 61002A	17883
45	Industrial Safety and Health Engineers - 22132A	18173
46	Mine Supervisors and Superintendents - 15021A	18194
47	Data Communications Analysts - 25199A	18383
48	Registered Nurses - 32502	18445
49	Computer Security Specialists - 21999A	18472
50	Health Inspectors - 21911A	18522

Table 13
Best 5 Matches Based on Profile Correlation for Sales Representative

Rank	Occupational Unit Name and Number	Occupation Skill Percentile[1]	Correlation	Match Based on Level[2]
1	Sales Agents, Financial Services - 43014B	87	.86	
2	Sales Managers - 13011B	89	.85	
3	Sales Agents and Placers, Insurance - 43002	69	.85	Y
4	Sales Agents, Real Estate - 43008	73	.85	Y
5	Government Service Executives - 19005A	99	.84	

[1]Hypothetical Sales Representative Skill Percentile is 75.
[2]Y indicates a match based on overall level.

Table 14
Best 5 Matches Based on Profile Correlation for Industrial/Organizational Psychologist

Rank	Occupational Unit Name and Number	Occupation Skill Percentile[1]	Correlation	Match Based on Level [2]
1	Economists - 27102A	98	.88	Y
2	Educational Psychologists - 27108D	94	.85	Y
3	Association Managers and Administrators - 19999C	85	.85	
4	Job and Occupational Analysts - 21511A	91	.85	Y
5	Industrial-Organizational Psychologists - 27108J	93	.82	Y

[1]Hypothetical I/O Psychologist Skill Percentile is 97.
[2]Y indicates a match based on overall level.

Table 15
Best 5 Matches Based on Profile Correlation for Air Conditioning System Technician

Rank	Occupational Unit Name and Number	Occupation Skill Percentile[1]	Correlation	Match Based on Level [2]
1	Aircraft Mechanics - 85323A	66	.75	
2	Diesel Engine Mechanics - 85311A	61	.73	
3	Welder-Fitters - 93914C	39	.71	
4	Aircraft Systems Assemblers, Precision - 93102C	66	.71	
5	Grinding, Honing, Lapping, and Deburring Machine Set-Up Operators - 91114A	43	.69	

[1]Hypothetical Air Conditioning System Technician Skill Percentile is 88.
[2]Y indicates a match based on overall level.

Table 16
Best 5 Matches Based on Profile Correlation for Computer Programmer

Rank	Occupational Unit Name and Number	Occupation Skill Percentile[1]	Correlation	Match Based on Level [2]
1	Programmers, Numerical Tool and Process Control - 25111	80	.72	Y
2	Computer Engineers - 22127	99	.65	
3	Computer Security Specialists - 21999A	78	.62	Y
4	Data Base Administrators - 25103A	91	.61	
5	Electronic Drafters - 22514B	91	.61	

[1]Hypothetical Computer Programmer Skill Percentile is 75.
[2]Y indicates a match based on overall level.

Table 17
Best 5 Matches Based on Profile Correlation for Assembly Line Worker

Rank	Occupational Unit Name and Number	Occupation Skill Percentile[1]	Correlation	Match Based on Level[2]
1	Textile Machine Setters and Set-Up Operators - 92702	57	.78	
2	Conveyor Operators and Tenders - 97951	35	.77	Y
3	Helpers and Laborers, Semi-Skilled - 98999B	31	.75	Y
4	Helpers, Mechanics and Repairers - 98102	36	.75	Y
5	Soldering and Brazing Machine Setters and Set-Up Operators - 91708	38	.75	Y

[1]Hypothetical Assembly Line Worker Skill Percentile is 37.
[2]Y indicates a match based on overall level.

case, eliminated some occupations (e.g., Sales Representative, Financial Services and Sales Management) that were of a higher level, yet retained several related occupations that an end user may find worth investigating.

As with the correlational outcomes, the multi-stage matching outcomes were also quite good for most of the other hypothetical people. That is, the correlations yielded an acceptable subset of substantively similar jobs, as described above, and the level screening generally eliminated a fair number of these (see Tables 14, 15, 16, and 17). The number of occupations eliminated from the top 100 matches varied from only 43 to all 100. In most cases, the jobs screened out were of a lower overall skill level than that of the individual. The most unusual outcome was that obtained for the Air Conditioning System Technician. All of the top 100 profile (i.e., correlation) matches were screened out based on level, and therefore the level screening resulted in no matches for this individual. Perhaps, in retrospect, we assigned too many high level skill ratings to this hypothetical person.

The matches produced for some of the other hypothetical people highlight some other issues involved in matching algorithms of this type. For example, in the case of the Assembly Line Worker, the matches consisted primarily of positions that involved similar content, but the specific match for the target occupation of Assemblers and Fabricators, Except Machine, Electrical, Electronic, and Precision using distance scores was 263rd. This may be due to problems in the skills assigned to the hypothetical person, but the overlap in content with occupations deemed matches suggests that even with less than ideal individual assessments, the procedure can still produce useful matches.

Another issue becomes apparent when comparing the hypothetical Computer Programmer's outcomes on the different matching algorithms. The distance score technique resulted in computer-related and technical occupations being listed as good matches. The correlational method improved on this, as indicated by the tighter clustering of specifically computer-related occupations at the high end of the listing (e.g., Programmers, Numerical Tool and Process Control; Computer Engineers; Computer Security Specialists; Data Base Administrators;

Systems Analysts, Electronic Data Processing; and Data Processing Auditors as six of the top seven). This suggests that the profile information yields satisfactory matches for the computer programmer. However, when the level screening component of the multi-stage method is implemented, the position of Computer Programmer is screened out, because the hypothetical person's level is too low. This could be a function of the overall skill percentile being influenced by a subset of skill ratings that are not highly related to computer programming. Without more accurate real-world self ratings of people who would be a good match for the computer programming positions, it is difficult to tell whether this is a problem with the algorithm or with our hypothetical person.

The matches produced using the correlational approach on aggregate data were moderately successful, but the occupations indicated as matches were more heterogeneous than those produced using the full data set (see Table 18 for the top five matches; see Appendix E for the top 50 matches). Note that for the hypothetical Sales Representative, the top matches include such diverse occupations as Medicine and Health Services Managers, Transportation Managers, and Floral Designers in addition to the more similar matches generated using the full data set. Apparently the use of fewer skill descriptors results in poorer matching outcomes.

Table 18
Best 5 Matches Based on Profile Correlation of a Subset of Skills for Sales Representative

Rank	Occupational Unit Name and Number	Occupation Skill Percentile[1]	Correlation	Match Based on Level [2]
1	Wholesale and Retail Buyers, except Farm Products - 21302	70	.93	Y
2	Service Establishment Managers - 19999D	74	.92	Y
3	First-Line Supervisors and Manager/Supervisors, Sales and Related Workers - 41002	72	.90	Y
4	Directors, Religious Activities and Education - 27505	87	.90	
5	Sales Agents, Securities, and Commodities - 43014A	89	.89	

[1]Hypothetical Sales Representative Skill Percentile is 75.
[2]Y indicates a match based on overall level.

Software Demo

The software demo, which has been written to a CD-ROM, can be loaded onto any personal computer that runs Windows 95. In addition, if the computer has an internet browser, it can be configured to demonstrate the demo's internet capability. The demo includes captured internet screens, so access to the internet itself is not necessary to demonstrate this capability.

Appendix F contains printouts of many of the screens from the software demo. The initial screen in the demo allows the user to either complete the worker assessments ("Identify Occupations"), go directly to information about particular occupations ("Occupational Information"), or go directly to the internet to search for job openings ("Identify Job Opportunities"). When the user chooses to identify occupations, the demo displays a screen with five "buttons" along the bottom: (1) enter current occupation; (2) enter leisure activities; (3) do skills assessment; (4) who am I; and (5) my top 25 occupations. The first three options take him/her through the worker assessment tools. The fourth button shows the user what he/she has entered, and the final button shows the occupations that match the skills from the assessments. As this is only a demo, the same list of occupations is presented regardless of the user input in the worker assessment portion. Users can then browse occupational information, such as a description of the job, the employment outlook, salary information, and a video of workers performing that occupation.

The second section of Appendix F shows some of the internet screens that are included in the demo. The internet access is through a site developed by the University of Wisconsin. This site contains general occupational information and, more importantly, links to many other sites that contain more specific occupational information. The University keeps the links to these sites up to date, which is important because internet addresses frequently change and sites with occupational information may be added to or removed from the internet. Users need not worry about this if they begin their searches through the Wisconsin site. Appendix F shows a Career Mosaic site and an Occupational Outlook Handbook site that can be accessed in this way.

Discussion and Conclusions

Based on the results of the needs assessment focus groups and the research described here, we now have a clearer vision of the proposed career guidance system for displaced workers. The results of this research demonstrate both the capabilities that could be incorporated into an occupational information system and the feasibility of collecting the high quality occupation information needed to make such a system possible.

Based on the needs assessment feedback, there appears to be a great deal of interest in such a system. Many of the Kelly workers wanted information about the possibility of changing careers, but they were also very interested in information about actual job openings. The system should stand on its own in that a counselor should not be necessary in order to provide effective career guidance. It should provide information about relevant training opportunities, in addition to occupational information.

We believe the taxonomy of leisure activities that was developed in the present research is reasonably comprehensive. These activities have been reliably linked to the O*NET skills by a panel of judges. The summary information concerning the links between skills and leisure activities and volunteer and social roles is now ready to be incorporated into a career guidance system. For the leisure activities we recommend using the mode, and for the volunteer and social roles we recommend the mean across all judges. Once workers have indicated their leisure, volunteer and social activities, they can be assigned the levels of skill that have been linked to those activities. This would require a minimal effort on the part of the user. The skills could be organized according to the interests involved, which would make it relatively easy for users to locate and indicate their leisure activities.

The skill self assessment instrument that has been developed appears to have good potential for helping users make accurate ratings of their work-relevant skills. However, additional research is needed before these rating scales are ready for use in a career guidance system, because we have no information concerning the accuracy of the ratings obtained. This additional research might involve the following steps: (1) establish criteria that will reflect "accuracy" in the self assessment of skills (this could involve agreement with others, agreement with some "objective" measure of skills, etc.); (2) collect self assessments from individuals across various types of occupations, using the 46-component taxonomy; and (3) compare the pilot data to the established criteria, and determine whether an acceptable level of accuracy has been achieved. If these assessments are not accurate, we may need to modify the rating format, or assess skills at a different level of specificity. For example, it may be necessary to pursue the Behavioral Summary Scale approach rather than the currently available O*NET BARS.

The present research focused on skills. Further research will also be needed to generalize the results and procedures to other domains, such as abilities and interests, that are also important in career guidance applications. For example, self assessment instruments could be developed for these other domains. It would also be useful to link the leisure activities and volunteer and social roles to the interests involved, abilities required, etc. The present research provides a foundation upon which to base these additional developmental activities.

In the career guidance system, a worker's score profile (based on current job, leisure, and/or self assessments) could be compared with requirements for each occupation, and the user could then be presented with a list of alternative occupations, ordered according to how well they match the worker's skills, abilities and other work relevant traits. Users could also be provided the option of identifying those occupations for which, with extra effort and/or training, they could also qualify. Additionally, worker preferences, such as geographic location or additional training, can be taken into account, as well as the availability of jobs in each occupation.

From this listing, users could proceed with a simple click of a mouse to a more extensive search of the occupational information available on the jobs in which they are most interested. By making access to this more extensive information readily available, the system can increase the probability that users will be well informed about a given occupation before rejecting it or selecting it as a viable option.

Assessment of worker traits in the career guidance system could also be an iterative process. For example, once a worker has entered his/her current job title, an ordered list could be presented of the occupations most similar in terms of skills, abilities and other worker requirements to the worker's previous experiences. Then, once the non-work experiences have been assessed, another list could be presented, highlighting those occupations that differ from the first list. Finally, once the self assessments have been collected and the system has identified those skills and abilities most likely required in the occupations that best match the worker's profile, tests and/or inventories could be administered targeting just the most relevant worker traits. This sort of iterative approach allows the system to maximize the information collected without sacrificing efficiency. This is just one possibility for how a variety of approaches to worker assessment could be incorporated into the system.

The preliminary assessment of matching algorithms suggests that a two stage procedure that begins with correlating profiles and then introduces overall skill level information is the best of those considered in the present research. Additional research in this area would be extremely

useful. The present research focused on hypothetical people, so interpretation of the results is limited by the extent to which these hypothetical people are, in fact, reasonable and have appropriate skill patterns for their intended occupations. Future research should employ the skill profiles of real people, and the matching algorithms can be assessed, at least in part, based on how useful these people find the results.

The commercial potential of the system described here is considerable. The system is extremely flexible in terms of the content of the output and how it is matched to the user. The occupational information that can be provided by such a system is extensive. The careful attention to worker assessment and state-of-the-art person-job matching represents a significant improvement over the systems currently available.

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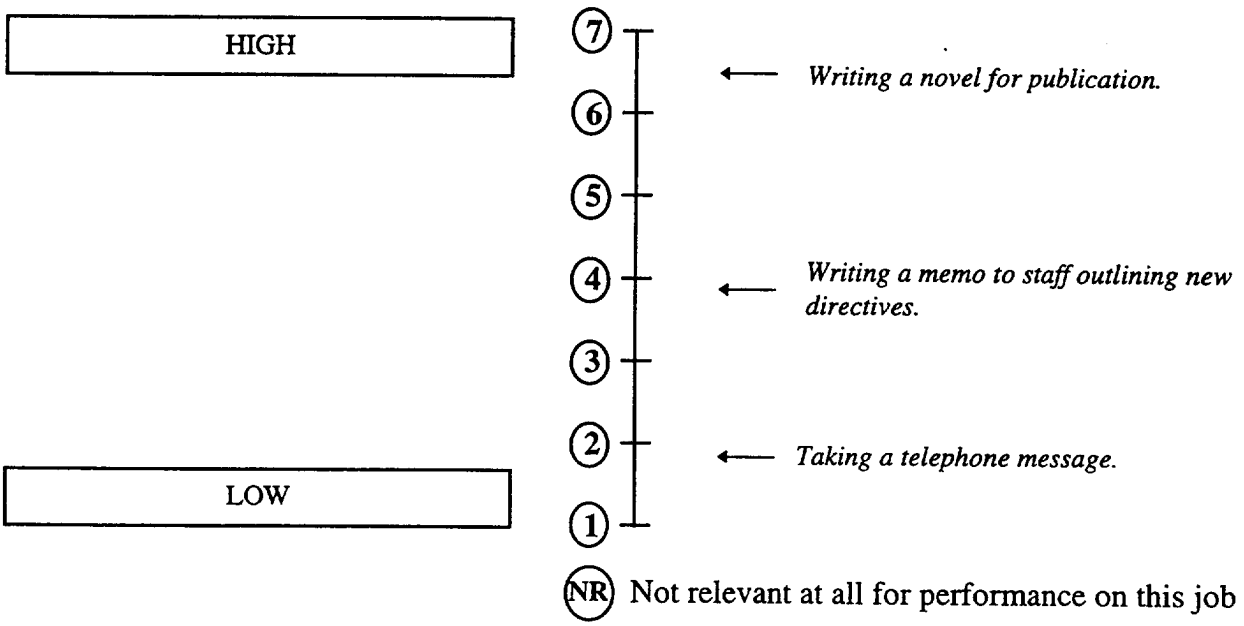
Appendix A - Example of O*NET Job Analysis Scale for Skills

3. Writing

Communicating effectively with others in writing as indicated by the needs of the audience.

Level

What level of this skill is needed to perform this job?



NR Not relevant at all for performance on this job

Importance

How important is this skill to performance on this job?

Not Important	Somewhat Important	Important	Very Important	Extremely Important
1	2	3	4	5

Job Entry Requirement

Is this level of skill required for entry to this job?

1. **YES**, it is required for entry on the job.
2. **NO**, it can be learned on the job.

Air Force Career Guidance: General Instructions for Rating Task

Instructions

Participation in various leisure, volunteer and social activities may provide the opportunity to display or develop work-related skills. In the following rating tasks, you will be asked to determine which skills are involved in a variety of leisure and non-work activities.

There are three separate rating tasks:

1. Leisure Activities Ratings
2. Social and Volunteer Role Ratings
3. Unskilled Activities Ratings

Please read the instructions for *each* rating task *very carefully*.

Leisure Activities Ratings

To complete the Leisure Activities Rating task you will need two booklets: the **Leisure Activities Rating Booklet** and the **Skill Definitions Booklet**.

The **Leisure Activities Rating Booklet** is a table in which you will record your ratings. The column on the far left side of this table contains a list of leisure activities. There is a total of 92 leisure or non-work activities in this booklet. These are arranged in a series of hierarchical categories. You will not be rating the categories, only the specific activities. To clarify what should be rated and what should not be rated, we have numbered the leisure activities you will be rating. We have also shaded the rows that do not need to be rated (i.e., the headings).

For each of the leisure activities in this booklet, you will be asked to rate the extent to which each of 46 different skills is required to perform the activity. ***For each skill/activity pair you will actually make three separate ratings.*** First, you will rate the level of the skill required to perform the activity at an expert level. Then you will rate the level of the skill required to perform at an average level and then finally at a novice level. Use the following definitions when making your ratings:

Expert: Highly skilled in the activity; considered by others to be a master, authority, or gifted practitioner.

Average: Performs at an average level; proficient; effective; has learned most of the tasks involved with the activity but still developing or fine-tuning skills.

Novice: Beginner; still learning the activity.

The 46 skills you will be rating are defined in the **Skill Definitions Booklet**. This booklet contains one page for each skill, and the numbers correspond to the numbers in the **Leisure Activities Rating Booklet** (although they are not in numerical order in either booklet). For each skill there is a definition, and examples of activities at each of three levels of the skill.

You should ***make all the ratings for one skill*** before moving on to the next skill. For example, you will fill in the first column for all 92 activities before moving on to the second column.

Begin by reading the skill definition and the example activities carefully, and keep them in mind as you make your ratings. Review them often. When you make your ratings, ask yourself, "What level of this skill does an [expert, average, novice] ***need*** to perform this activity?". Consider if the skill is ***required*** in order to perform the activity. For example, an expert photographer may have a moderate level of reading comprehension, but one does not ***need*** a moderate level of reading comprehension to be an expert photographer. Also, ***do not consider the skills needed to instruct, teach, or learn*** the activity when you make your ratings. Consider only the skills needed to participate in or perform the activity at the various levels (i.e., novice, average, expert).

Remember, these are leisure activities; these people are not professionals who perform these activities as part of their job. For example, when you think of someone playing basketball, think of someone who may play on the weekends or on a corporate team - not Michael Jordan.

To help you make these judgments, each skill scale includes descriptions of activities requiring high, medium and low levels of the skill. These are work examples rather than leisure activity examples. In most cases they will not apply directly to the activity you are rating. However, please try to ***use these examples to give you a general feel*** for what high, medium and low means for each skill. Try not to focus too much on the specific examples that are presented, but rather use them to help define the various effectiveness levels related to that skill.

If a skill is not relevant for a particular activity, mark a "0" on your rating form. For some of the activities, many of the skills may not be relevant. Don't spend a lot of time trying to decide whether a skill is not relevant or at the "1" or "2" level. If an activity does not require at least a "3" level of a skill, simply rate the skill as not relevant or "0." In other words, ***you won't record any "1"s or "2"s at all.***

Shading in the **Leisure Activities Rating Booklet** indicates a heading or category. Do not record your ratings in the shaded areas, we are only interested in the more specific, numbered activities. However, if you think an entire category does not involve certain skills, you may want to indicate this by marking a rating in the shaded area, so that when you rate the more specific activities you won't have to stop and think about it each time. For example, if you think the entire Health/Exercise category does not involve Negotiation skills, you could mark "0" in the shaded area to help you when you make your actual ratings.

For each activity, it might be easiest if you start by rating experts. If an expert doesn't need to have a particular skill it is highly unlikely (or impossible?) that an average person or a novice would need that skill. If you mark a "0" for the expert rating we will assume you would have rated the average and novice at the "0" as well (e.g., if you want to minimize writing).

Example:
For the leisure activity "Photography", you will make three ratings for each skill. For example, you will rate an expert, average and novice photographer on the "Idea Generation" skill.

In some cases, you will notice that several activities have been grouped to form a more general activity. For example, activity #1 "Individual Shooting/Throwing Sports," is actually made up of several more specific sports. Please note any occasions where you would have assigned ***different*** skill ratings for activities in the ***same*** grouping. Circle the activity (or activities) that doesn't belong with the group and make separate, circled ratings just above the ratings for the rest of the group.

Once you have made all of your ratings, please indicate how familiar you are with each activity rated. Use the following scale to rate "Familiarity with the Activity."

5 = participate in this activity regularly
4 = have participated in this activity, but not frequently
3 = have not participated in this activity, but am reasonably familiar with what is involved
2 = somewhat unsure about what is involved in this activity
1 = haven't a clue; had trouble making ratings

Finally, if you have a particularly difficult time rating some activities or skills, please make a note as to which activities/skills were involved and the nature of the problem.

Social and Volunteer Role Ratings

Participation in volunteer activities or social organizations is likely to involve somewhat different skills than other leisure activities. In addition, the skills that are demonstrated or developed in these activities are probably most strongly related to the roles or functions people serve in these organizations. A particular role, such as supervising, could be carried out in many different organizations. A single individual could also play multiple roles or serve several different functions in a single organization.

Instead of rating specific social or volunteer activities, we would like you to rate the skills involved in each of 22 different roles or functions. As you did in the Leisure Activities Rating task, you will rate the extent to which each of the 46 skills is needed. However, you will make only one rating for each role/skill combination (i.e., you will not make separate ratings for experts-novices).

Each of the roles is defined in the **Role Definitions Booklet**, and examples of activities that represent each role are provided. Read these carefully. Then, ask yourself, "What level of this skill does a [manager/supervisor, accountant, recruiter...] ***need*** to perform this role?". Again, remember, these are people who perform these activities outside of work, they are not paid professionals. Use the example activities for each skill to help you understand what high, medium and low means for each skill. Select the number on the skill rating scale that indicates the skill level demonstrated by someone performing this role well or successfully. Write the number in the appropriate space on the **Volunteer Activities Rating Booklet**. Again, you should ***make all the ratings for one skill*** before moving on to the next skill.

If a skill is not relevant to a volunteer or social role, mark "0" on your rating form. In addition, don't spend a lot of time trying to decide whether an activity is not relevant or at the "1" or "2"

level. If an activity does not require at least a "3" level of that skill, simply rate the skill as not relevant or "0." ***In other words, you won't record any "1"s or "2"s at all.***

Unskilled Activities Ratings

There are leisure activities that we don't view as requiring much skill at all (e.g., watching television). Rather than asking you to make 46 separate skill ratings for each of these 46 activities, we have simply listed them in the **Unskilled Activities Booklet.**

If you believe the activity does not involve any of the 46 skills (at least the "3" level or above), please check the NO SKILLS column. If the activity does involve at least one skill (at least the "3" level or above), please check the SKILLED column. For those activities that you marked SKILLED, use the blank rating form provided. Write in the leisure activity and make the appropriate skill ratings.

Once you have completed your unskilled activities ratings, please review all of the activities (leisure and unskilled) and the volunteer/social roles and think about whether anything is missing. That is, are any leisure activities or categories of activities missing from this list, especially activities that involve demonstrating or developing one of the 46 skills. List any additional activities at the end of the blank rating form, and rate the extent to which they require each of the 46 skills. (Note that we have excluded academic activities on purpose. Do not add activities such as taking classes.)

Some Final Notes

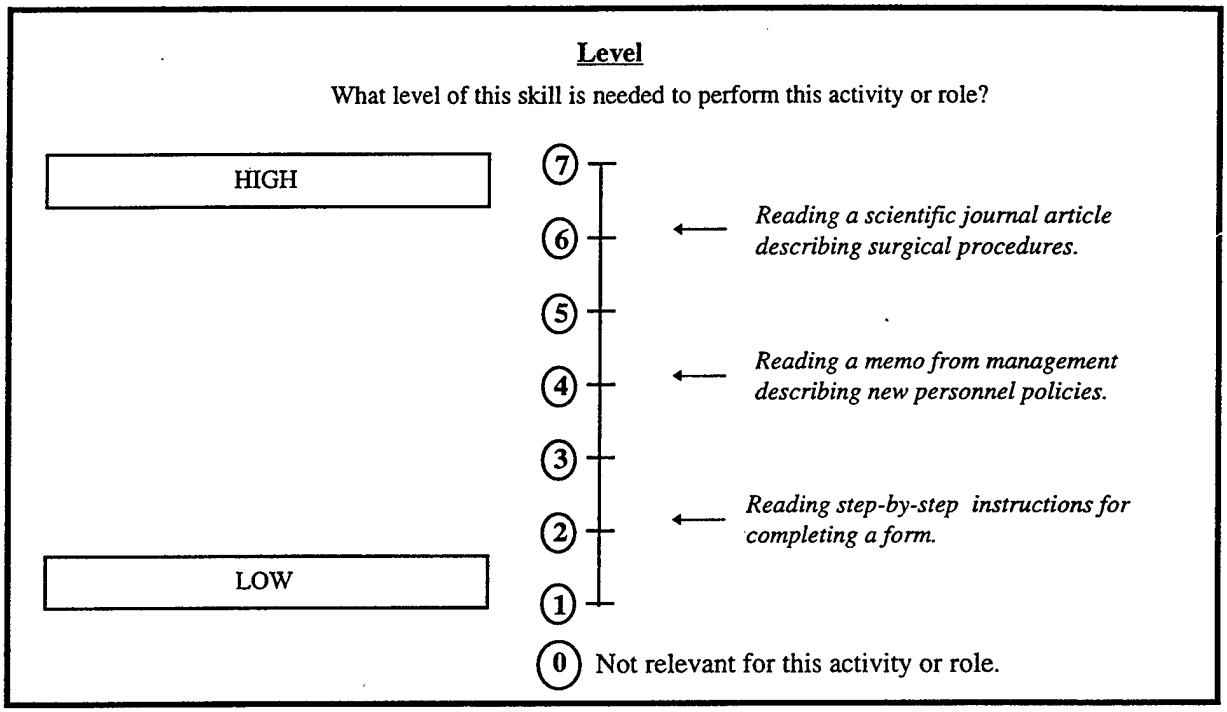
This is a long and difficult rating process. We suggest that you work on the rating task for no longer than 3 hours at a time and that you take frequent breaks.

If you have *any questions at all,* about the activities, the skills, or any other part of the rating process, please call Kristen Horgen or Mary Ann Hanson at PDRI at 813-229-6646.

Air Force Career Guidance: Skill Definitions Booklet

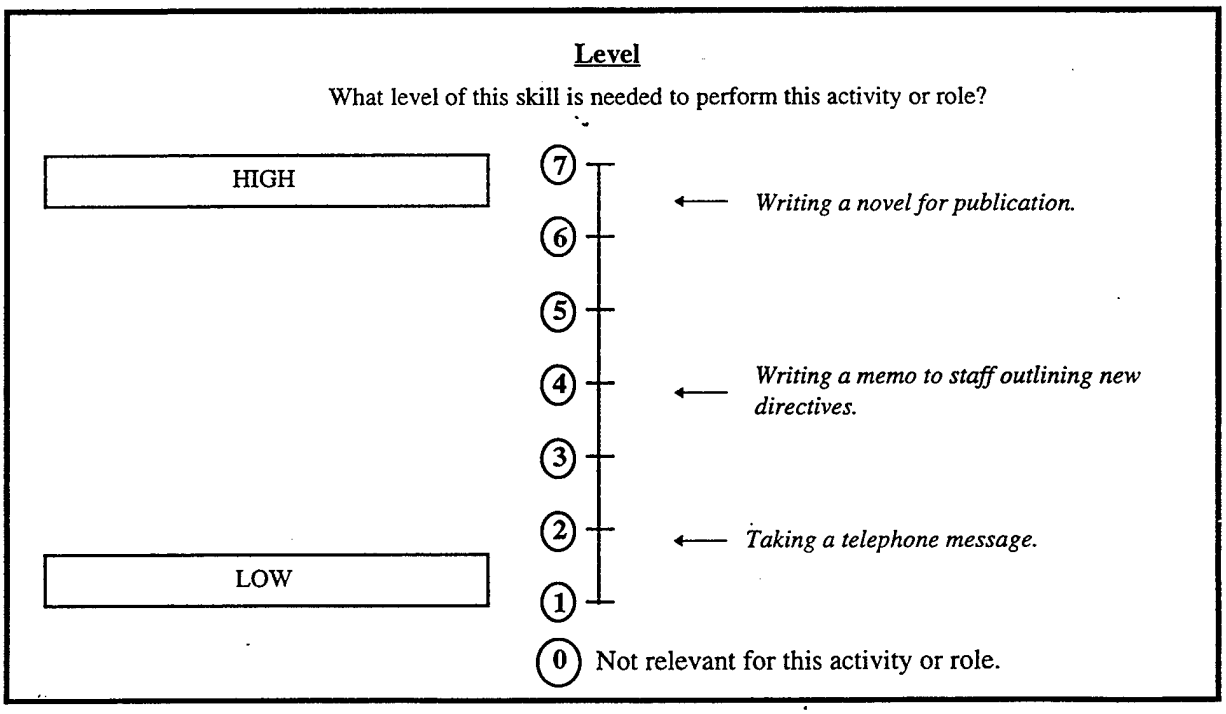
1. Reading Comprehension

Understanding written sentences and paragraphs in work related documents.



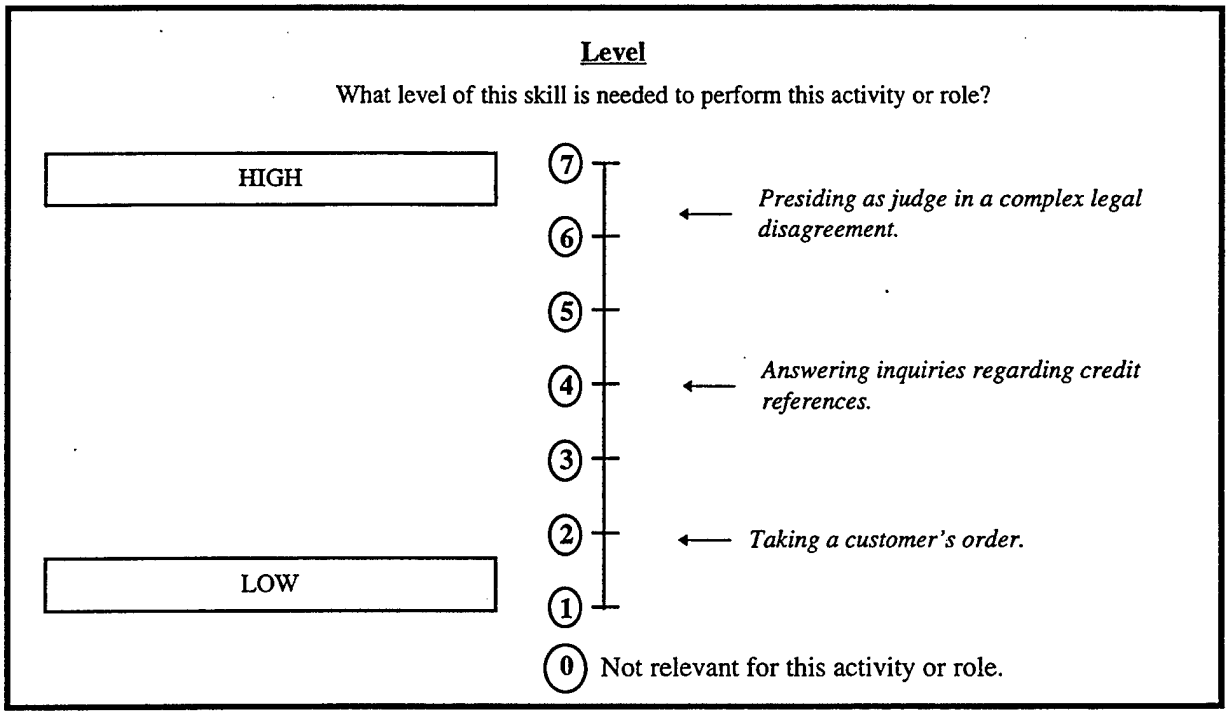
3. Writing

Communicating effectively with others in writing as indicated by the needs of the audience.



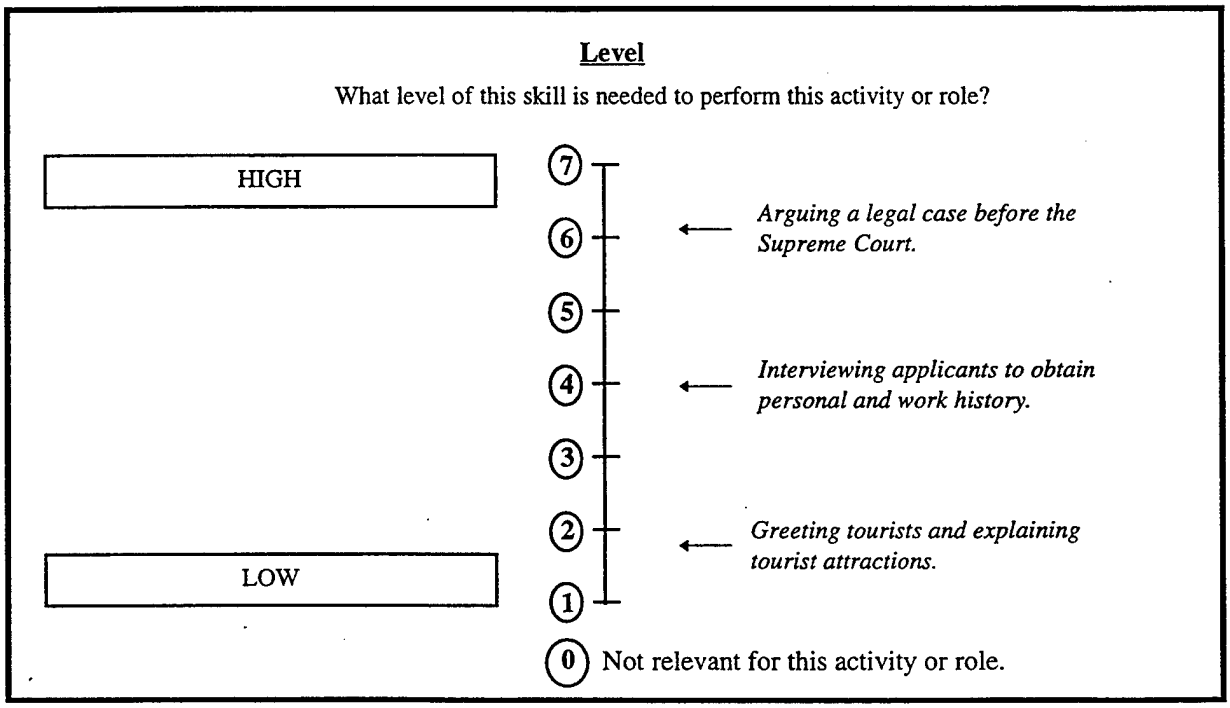
2. Active Listening

Listening to what other people are saying and asking questions as appropriate.



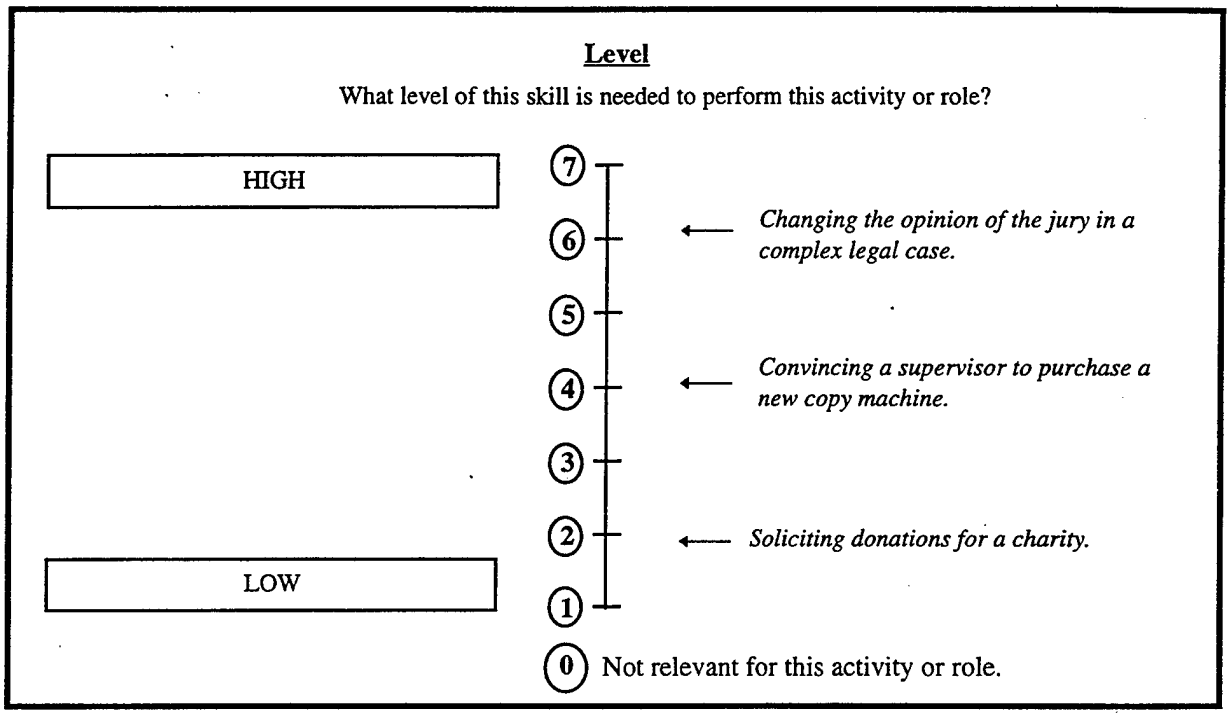
4. Speaking

Talking to others to effectively convey information.



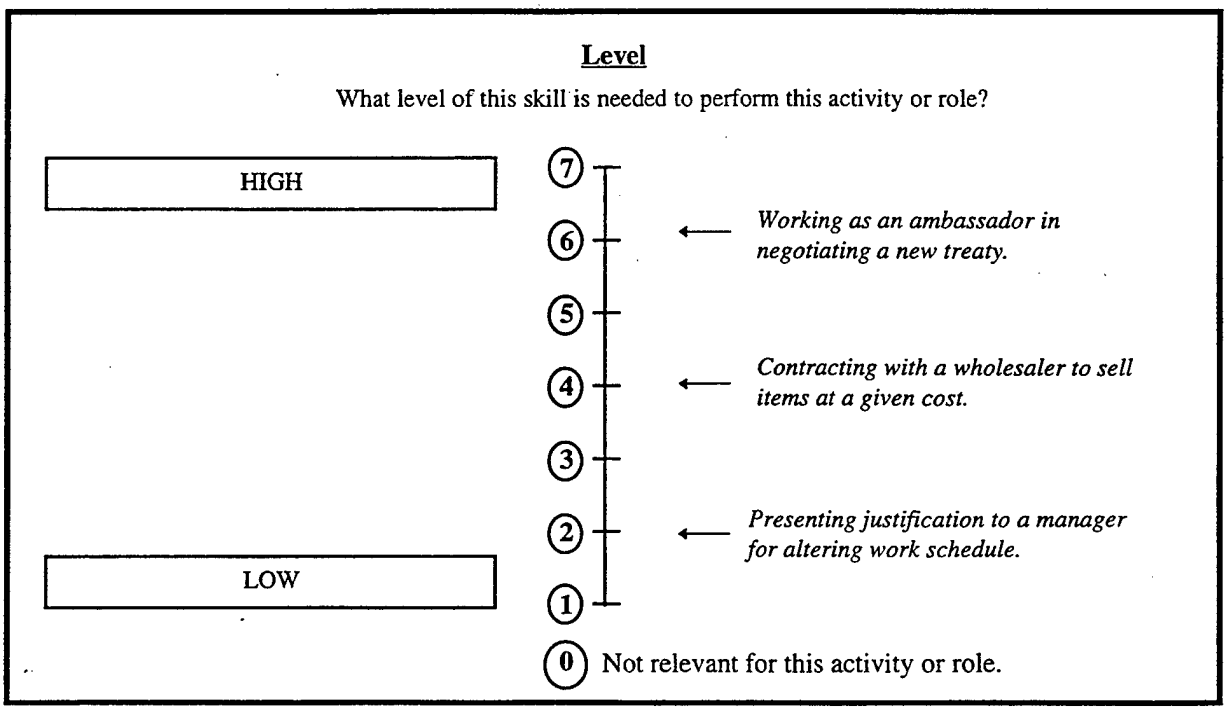
13. Persuasion

Persuading others to approach things differently.



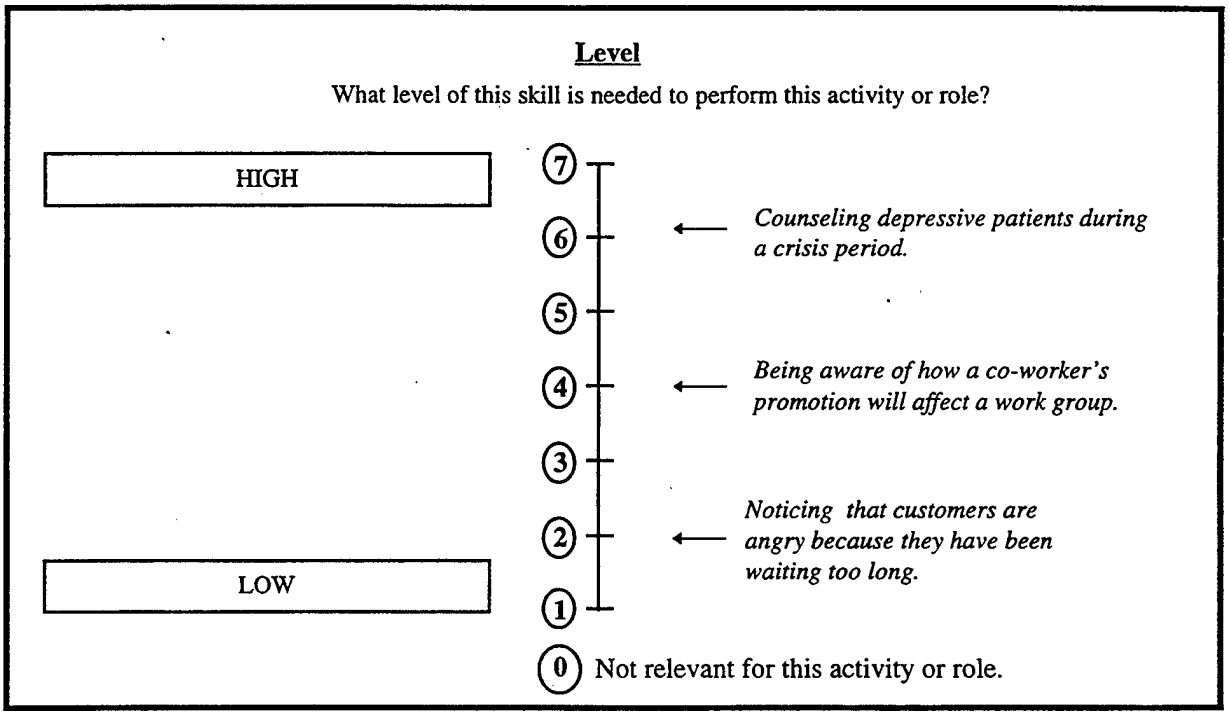
14. Negotiation

Bringing others together and trying to reconcile differences.



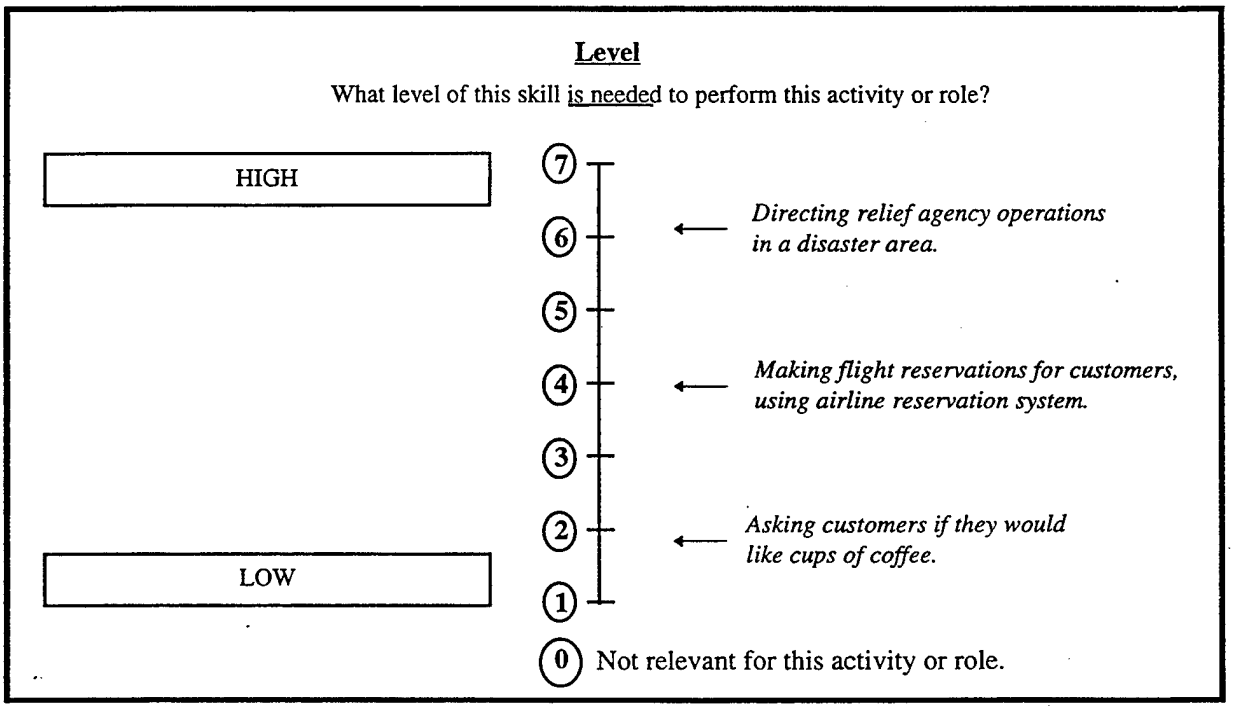
11. Social Perceptiveness

Being aware of others' reactions and understanding why they react the way they do.



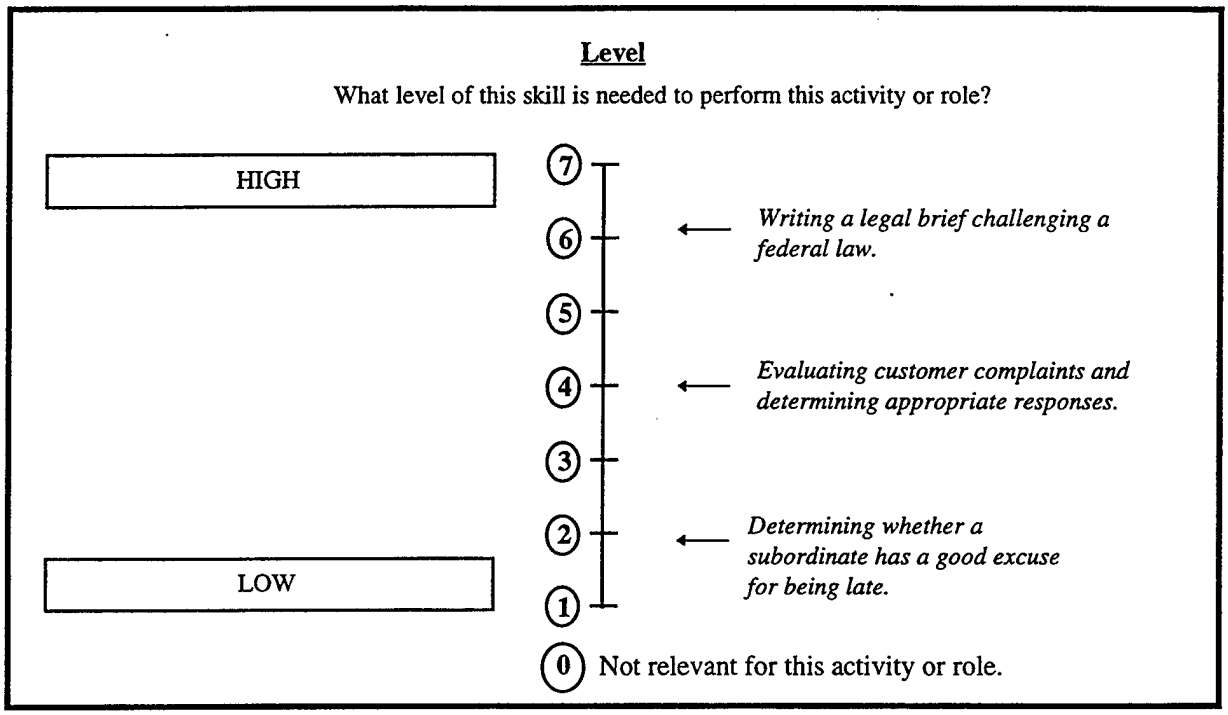
16. Service Orientation

Actively looking for ways to help people.



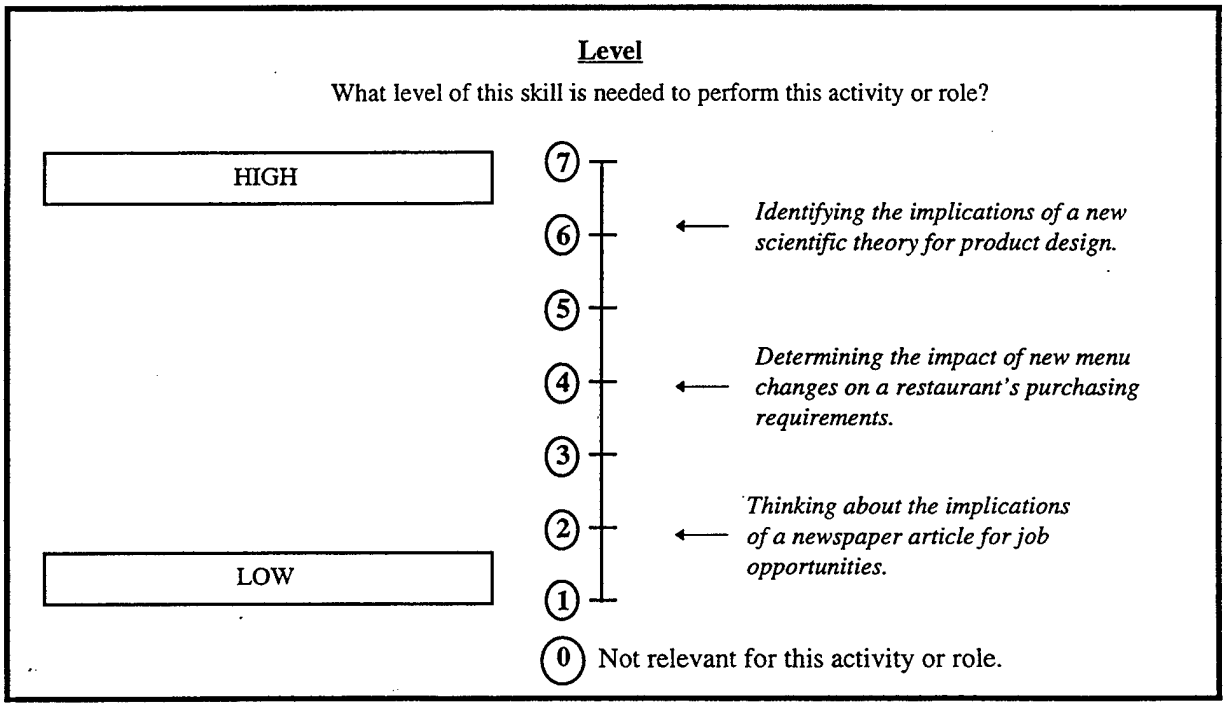
7. Critical Thinking

Using logic and analysis to identify the strengths and weaknesses of different approaches.



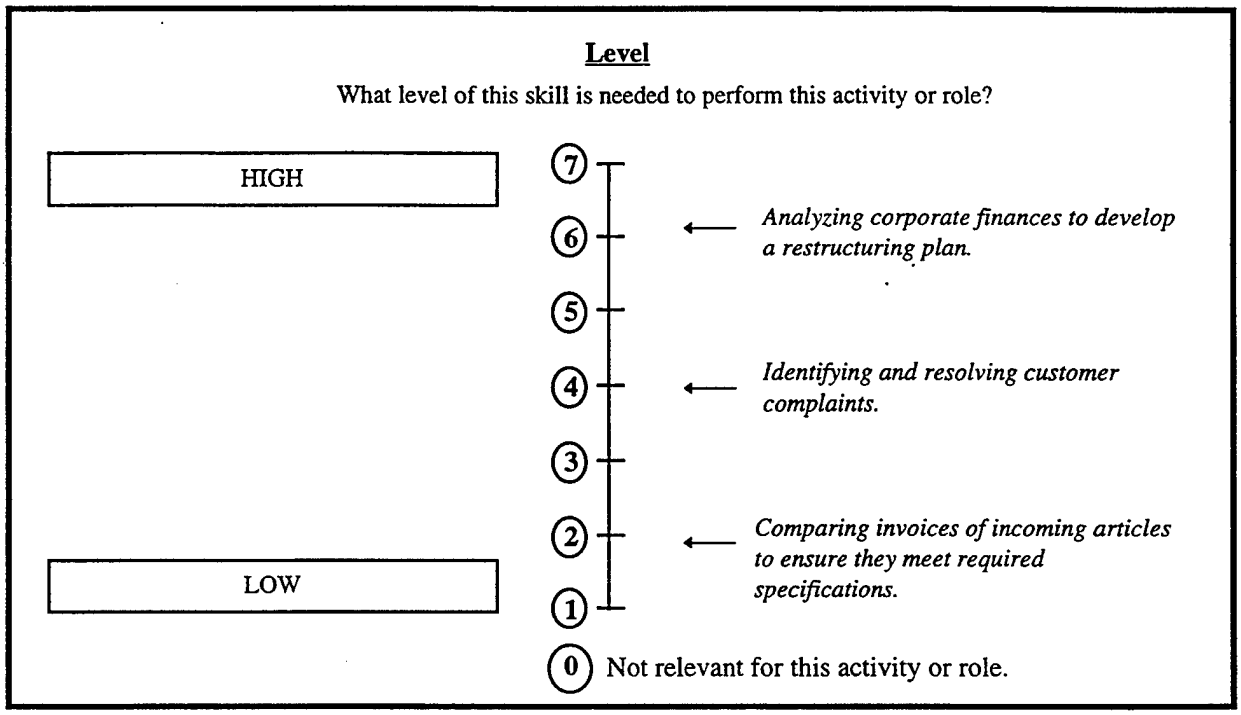
8. Active Learning

Working with new material or information to grasp its implications.



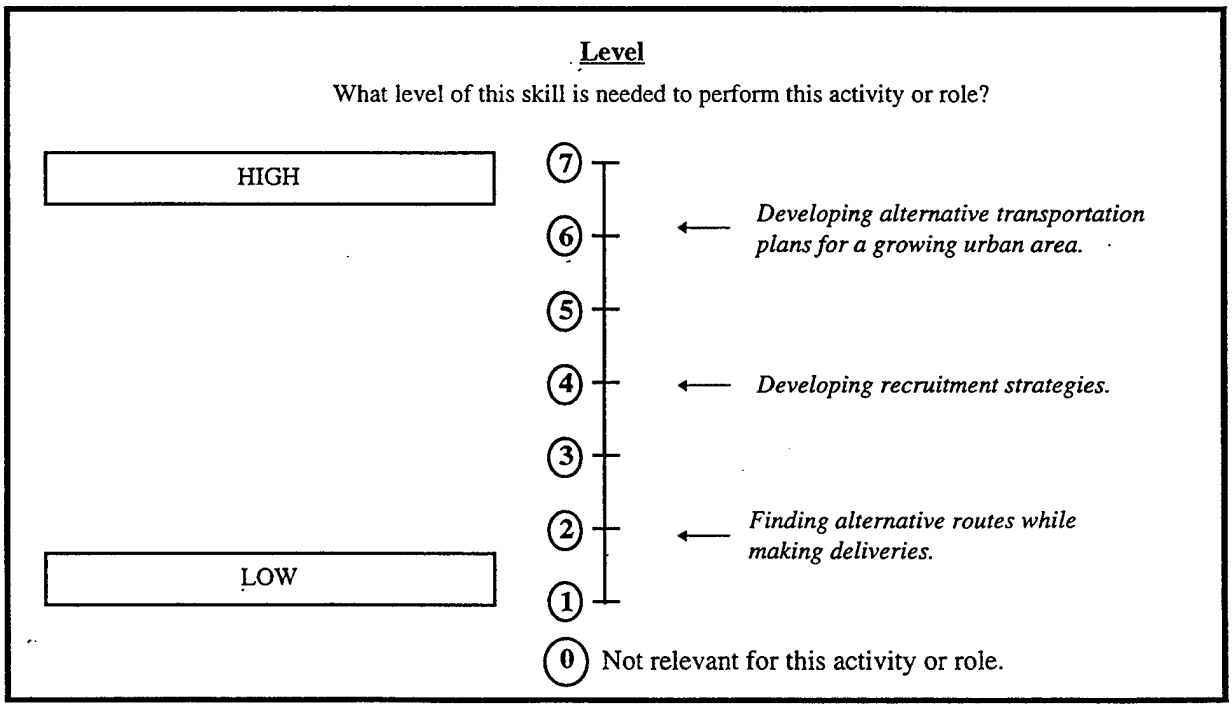
17. Problem Identification

Identifying the nature of problems.



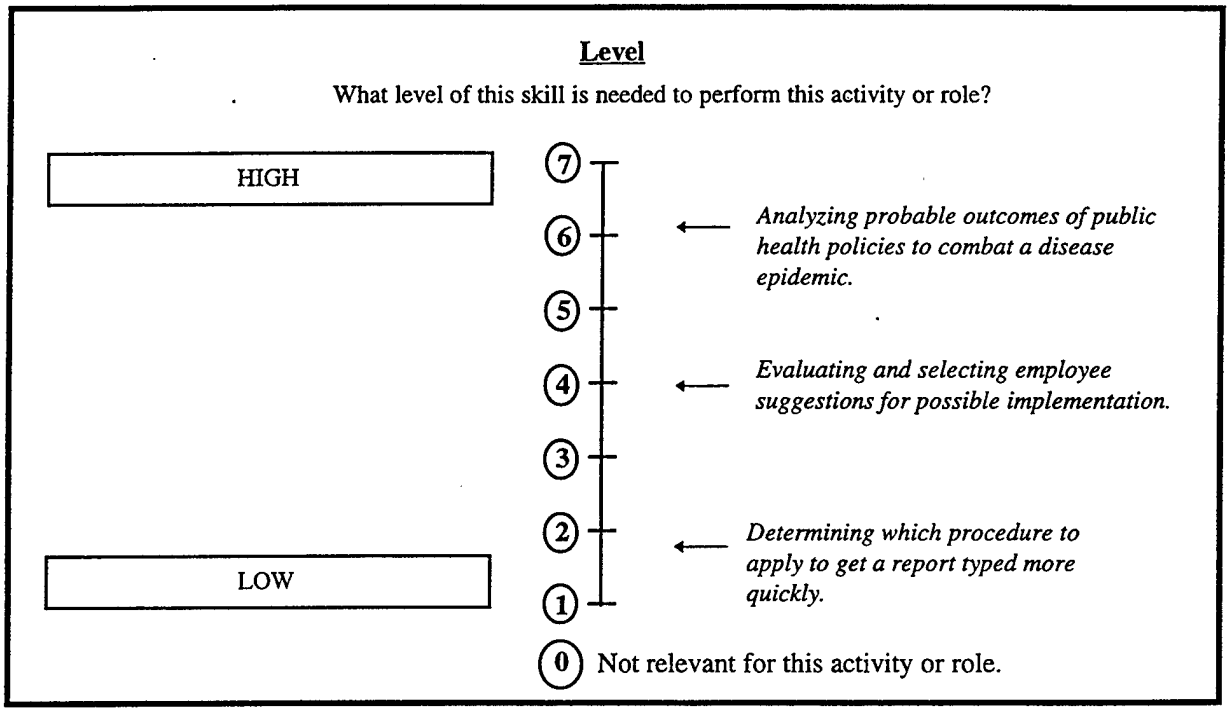
21. Idea Generation

Generating a number of different approaches to problems.



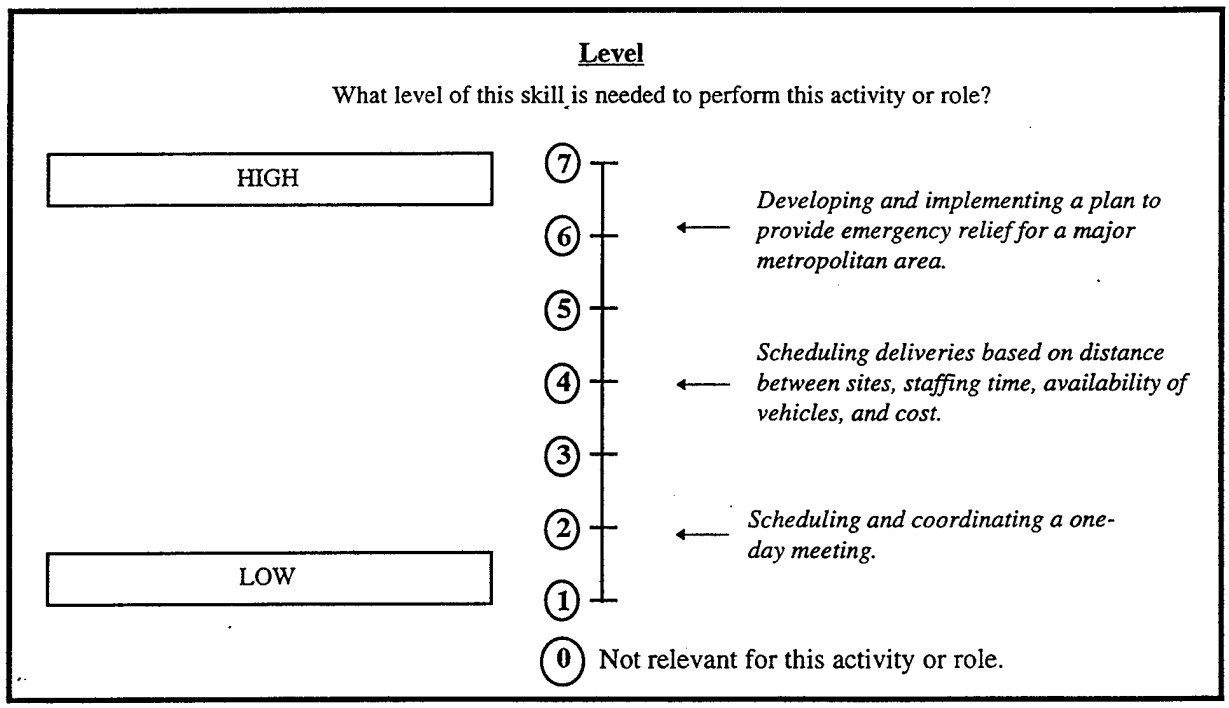
22. Idea Evaluation

Evaluating the likely success of an idea in relation to the demands of the situation.



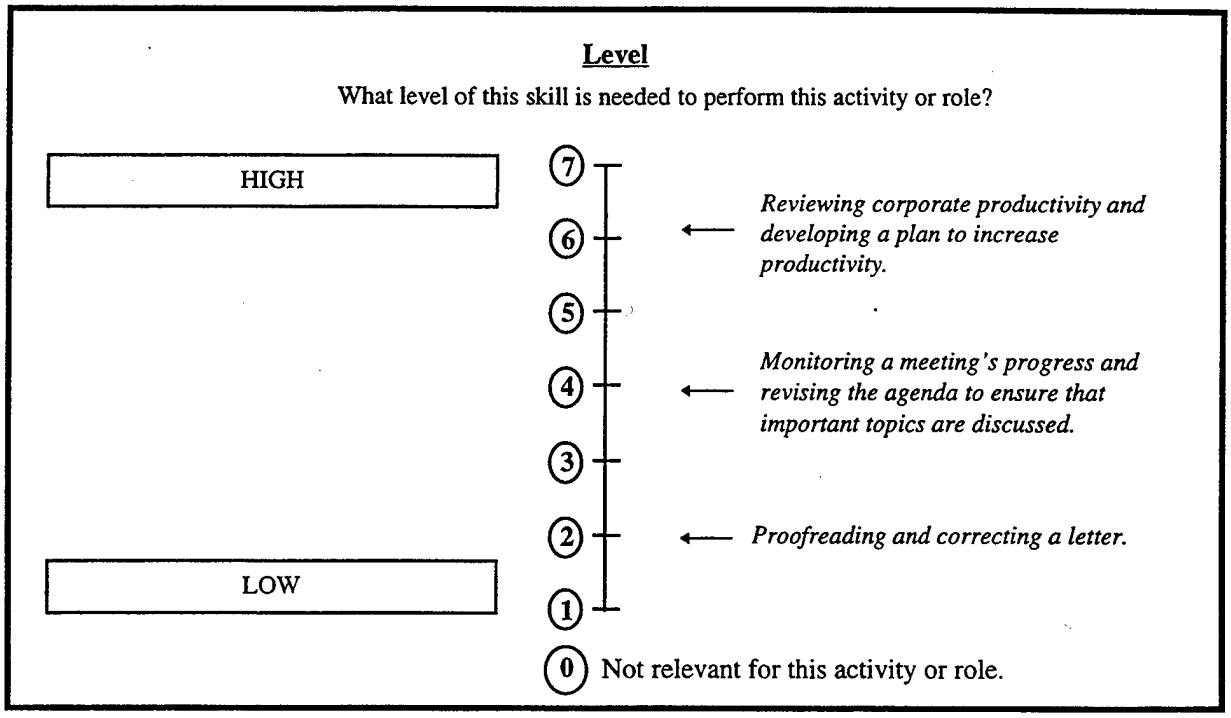
23. Implementation Planning

Developing approaches for implementing an idea.



10. Monitoring

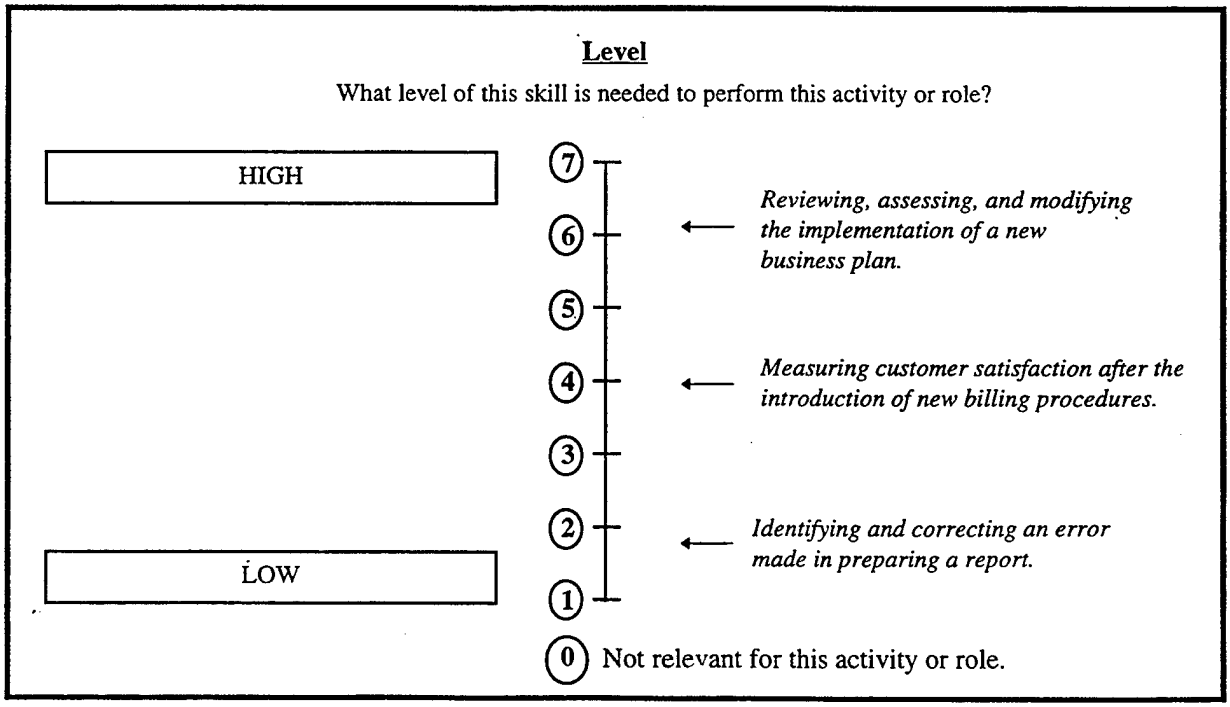
Assessing how well one is doing when learning or doing something.



Note: This <u>does not include</u> monitoring one's own physical performance.

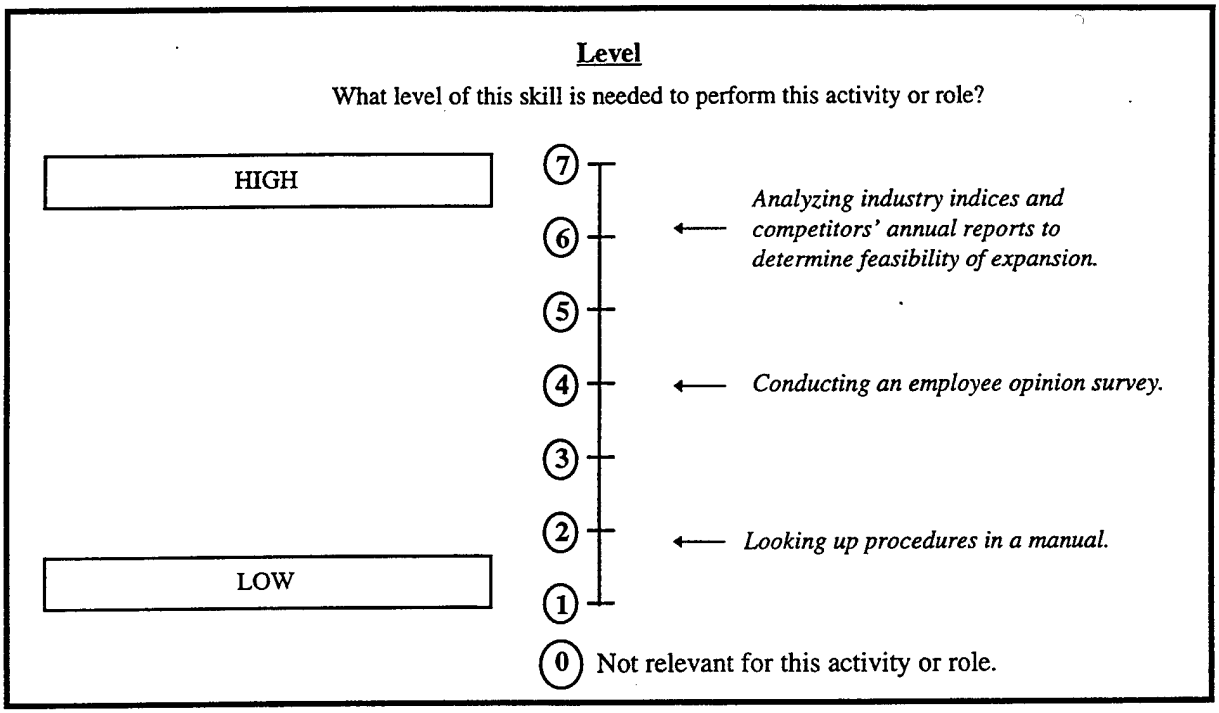
24. Solution Appraisal

Observing and evaluating the outcomes of a problem solution to identify lessons learned or redirect efforts.



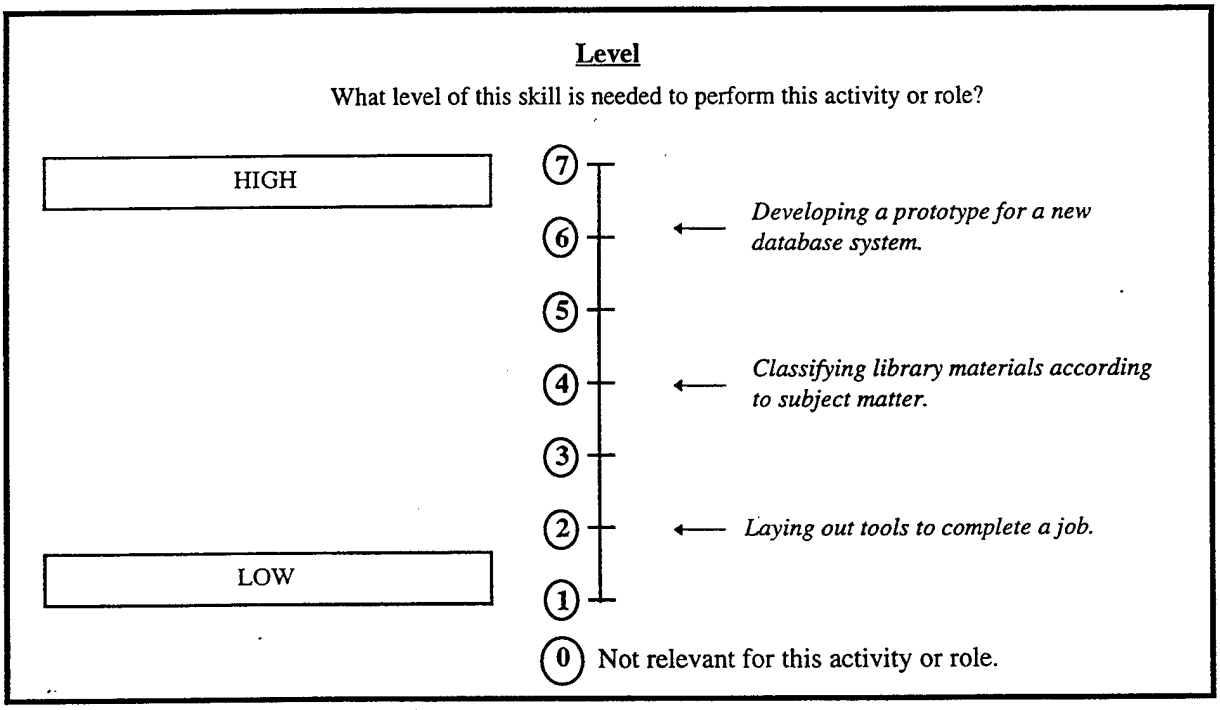
18. Information Gathering

Knowing how to find information and identifying essential information.



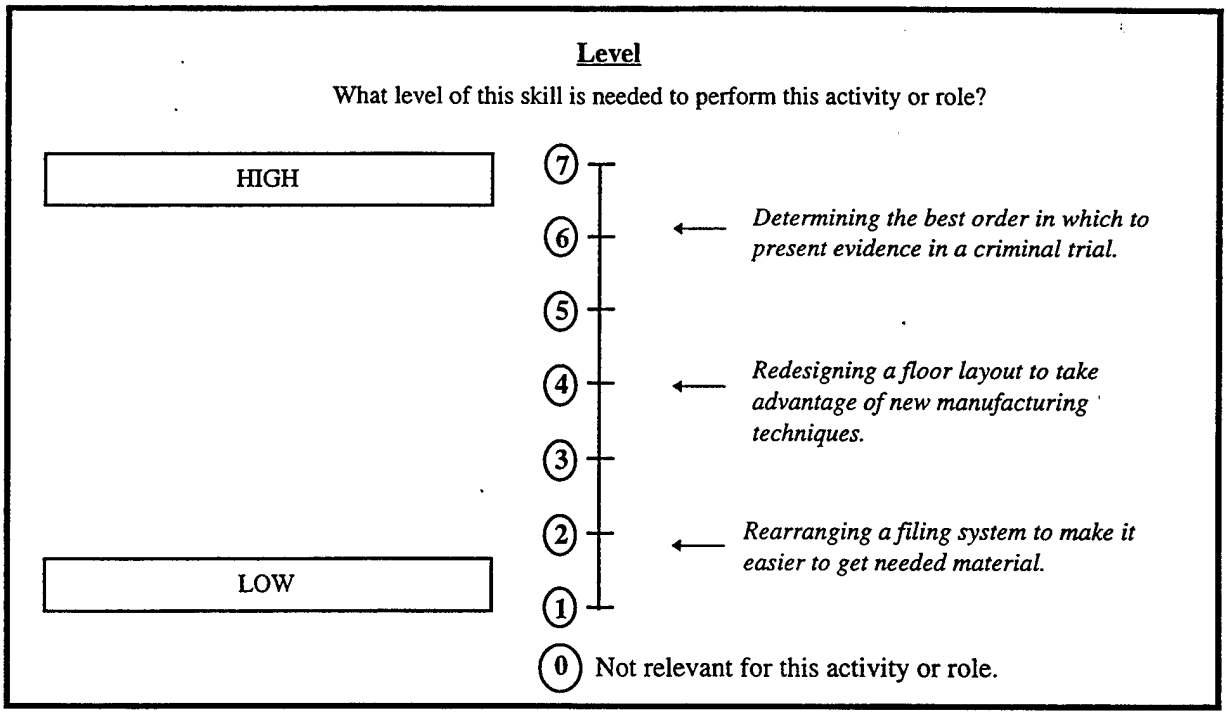
19. Information Organization

Finding ways to structure or classify multiple pieces of information.



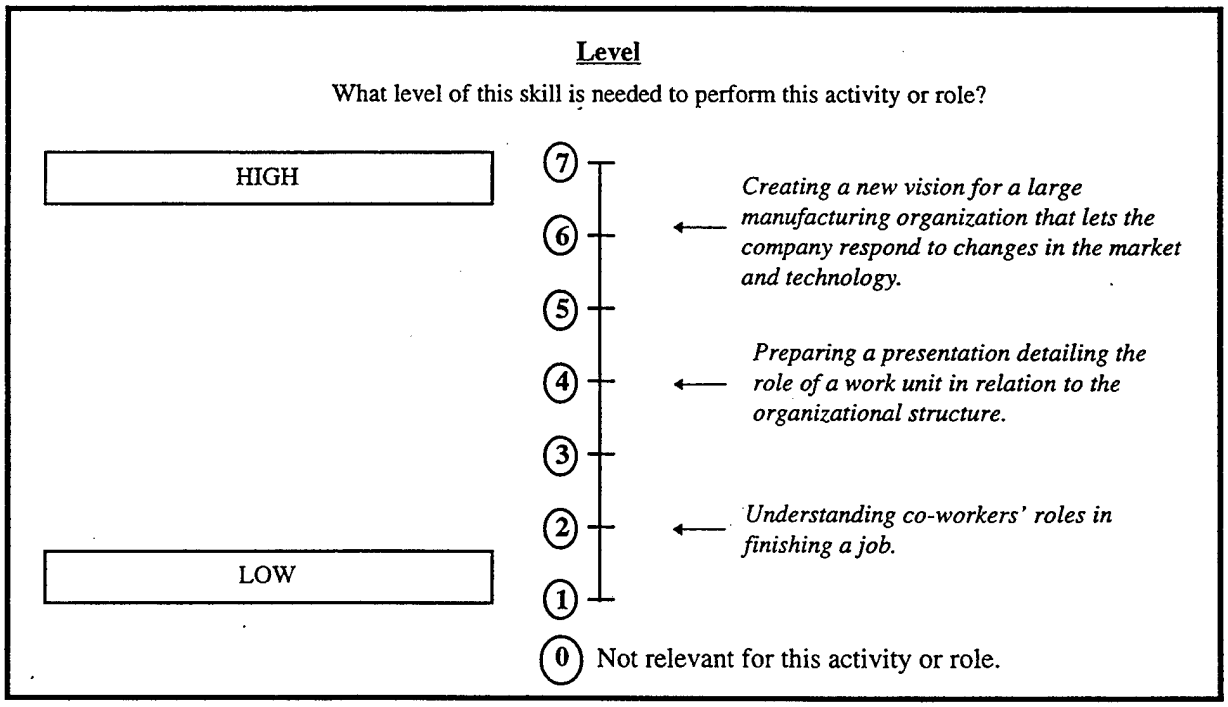
20. Synthesis/ Reorganization

Reorganizing information to get a better approach to problems or tasks.



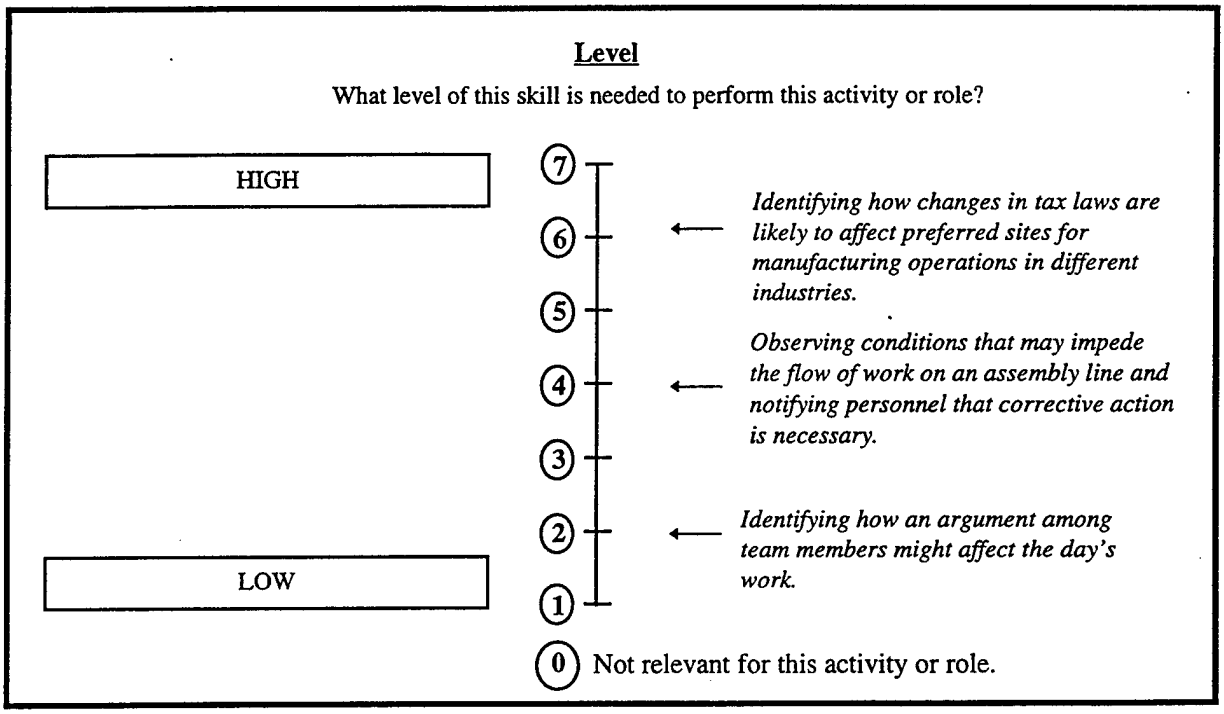
37. Visioning

Developing an image of how a system should work under ideal conditions.



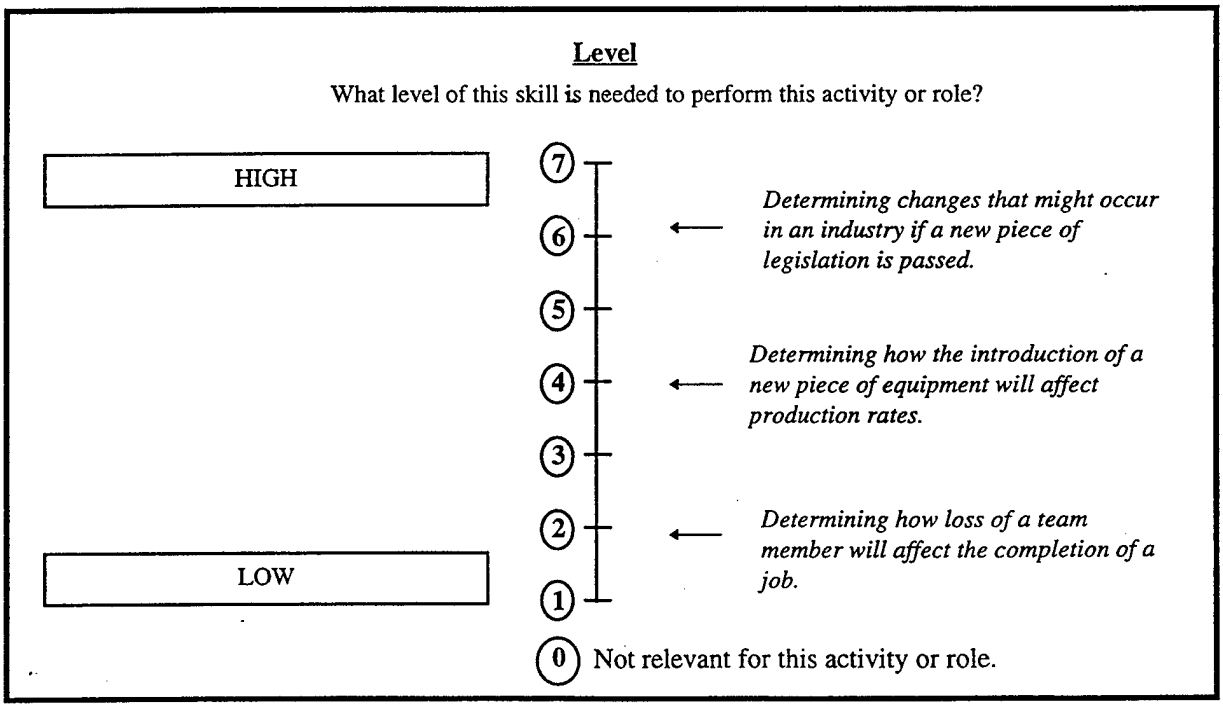
38. Systems Perceptions

Determining when important changes have occurred in a system or are likely to occur.



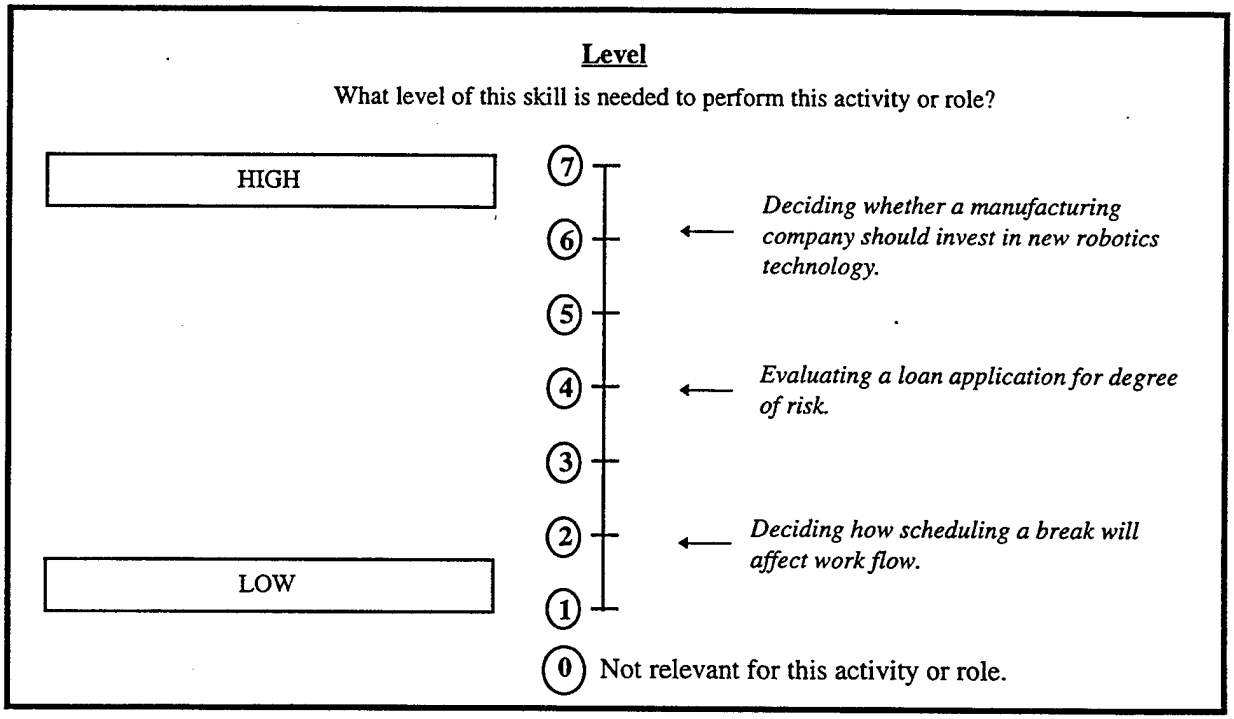
39. Identification of Downstream Consequences

Determining the long-term outcomes of a change in operations.



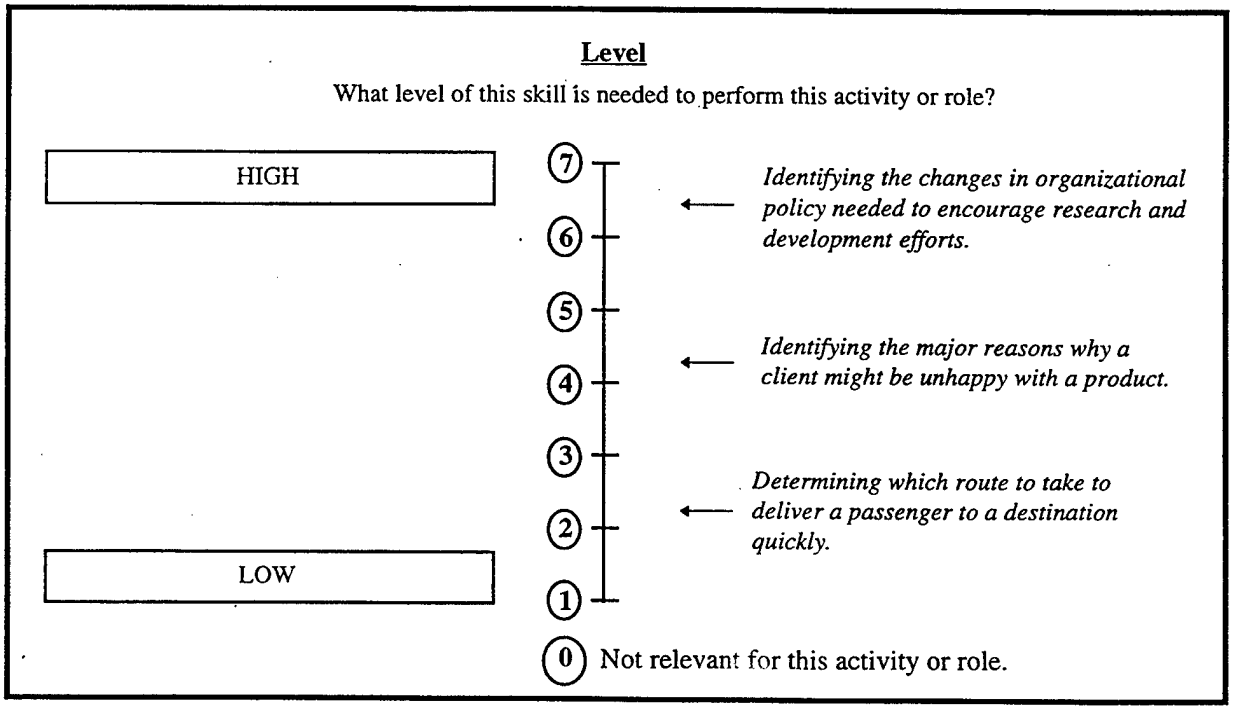
41. Judgment and Decision Making

Weighing the relative costs and benefits of a potential action.



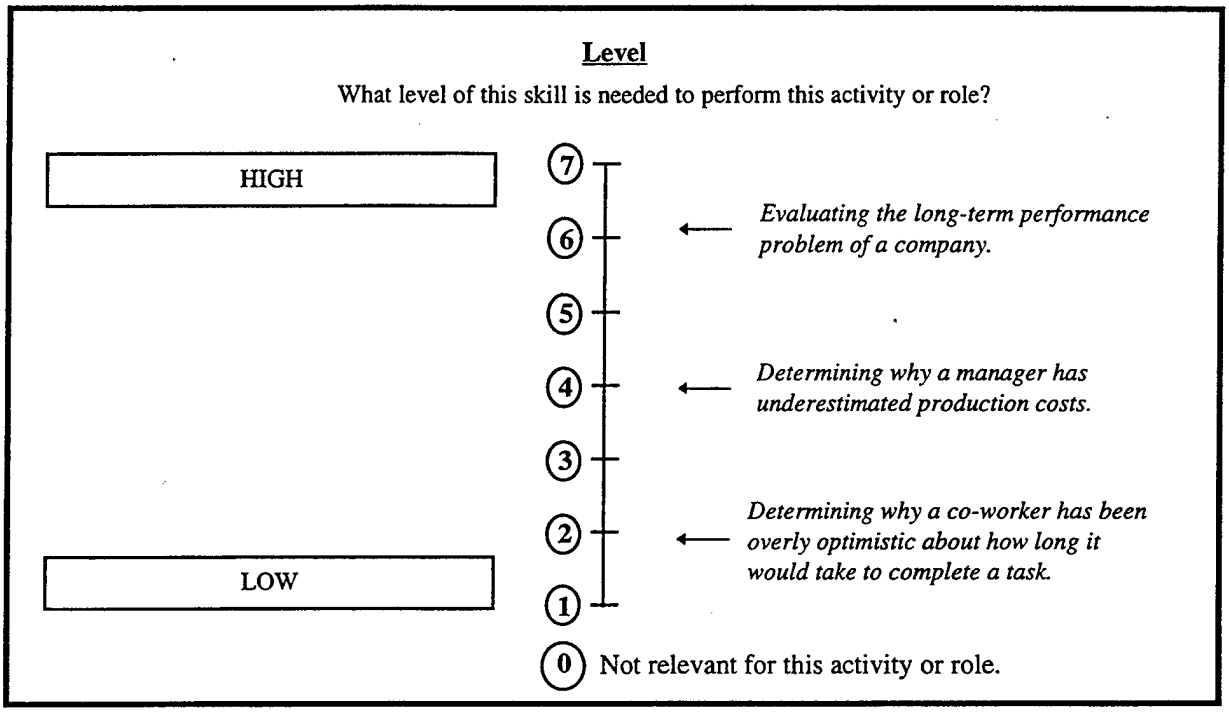
40. Identification of Key Causes

Identifying the things that must be changed to achieve a goal.



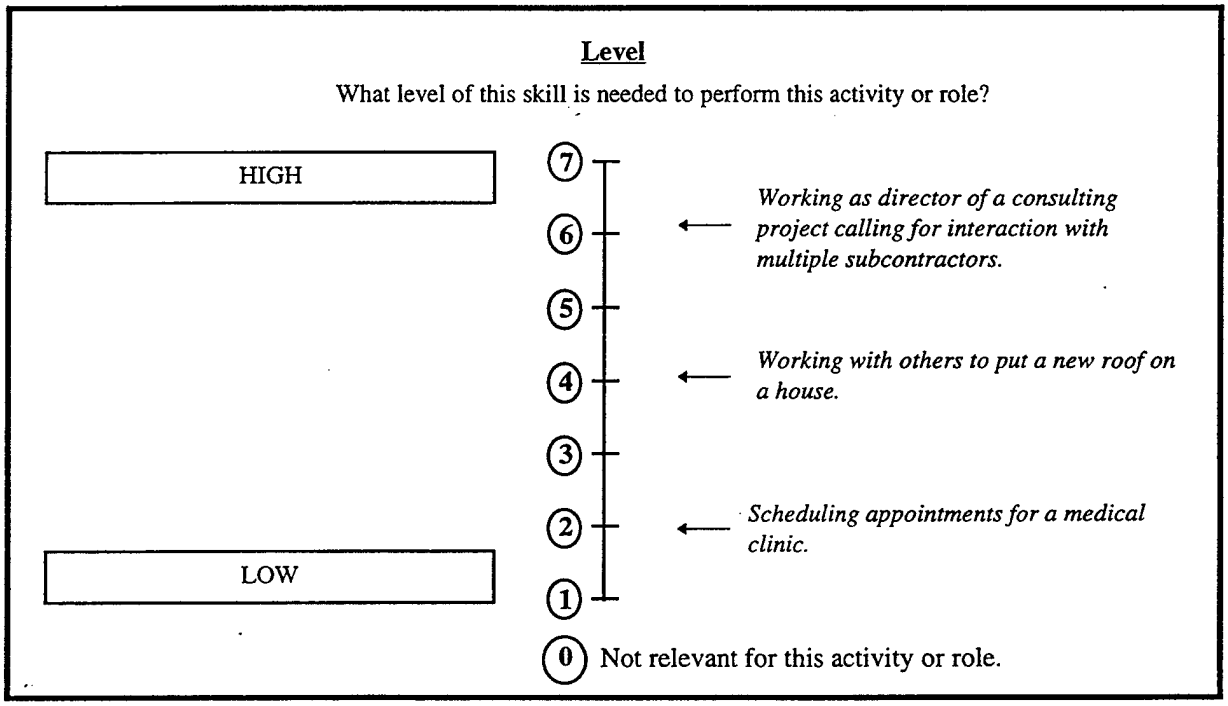
42. Systems Evaluation

Looking at many indicators of system performance, taking into account their accuracy.



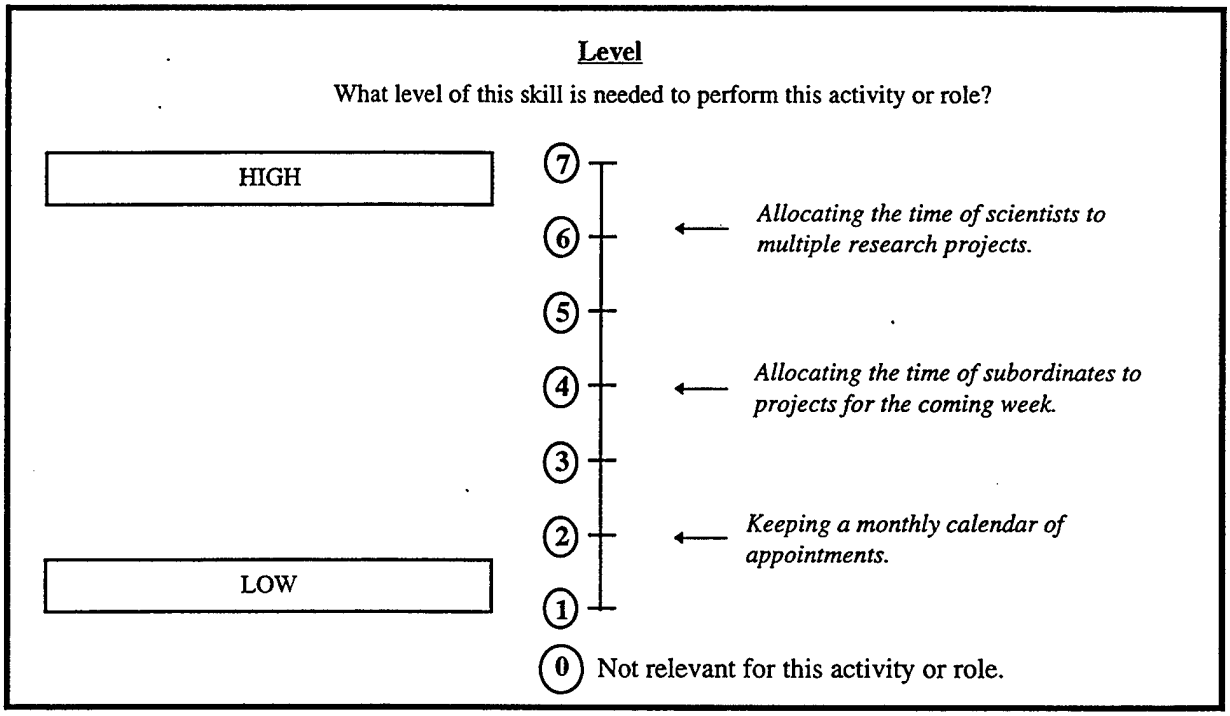
12. Coordination

Adjusting actions in relation to others' actions.



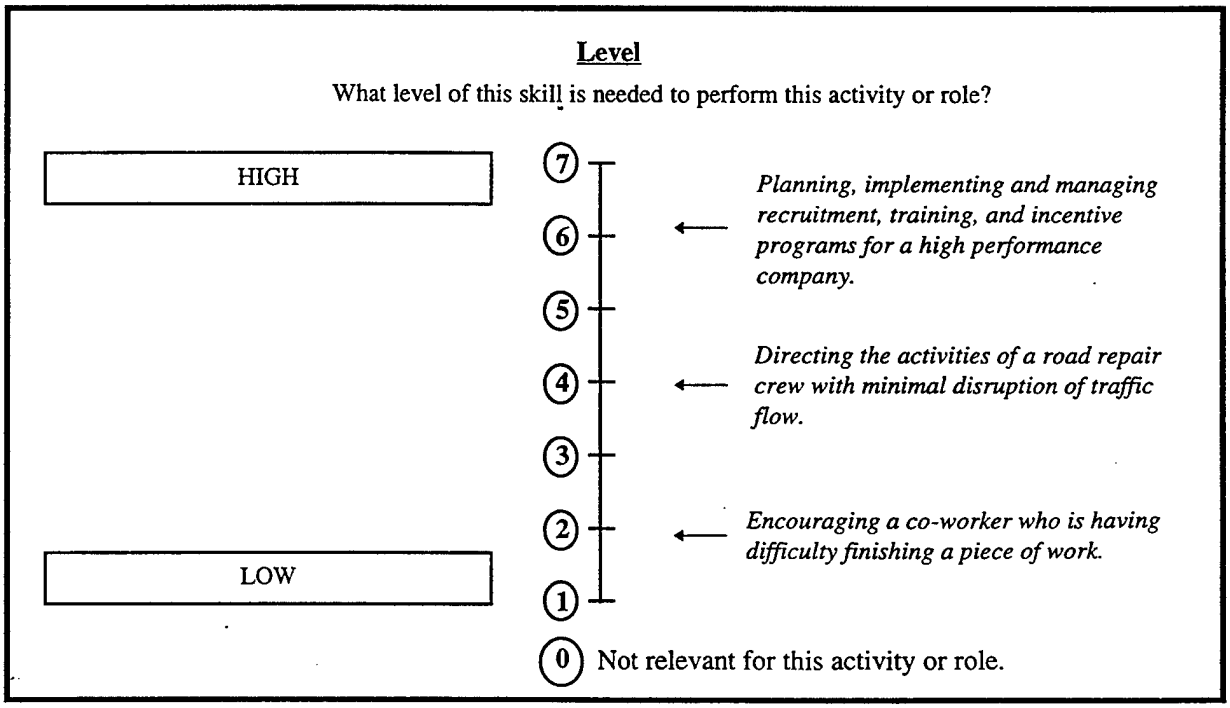
43. Time Management

Managing one's own time and the time of others.



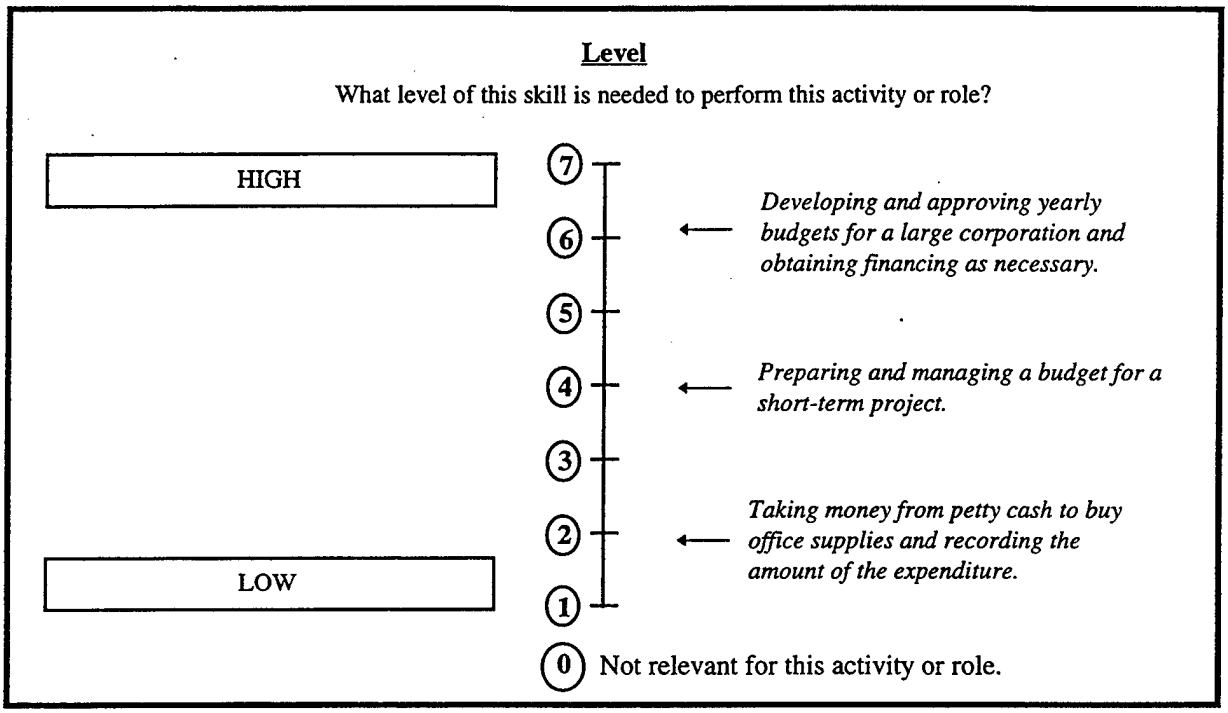
46. Management of Personnel Resources

Motivating, developing, and directing people as they work, identifying the best people for the job.



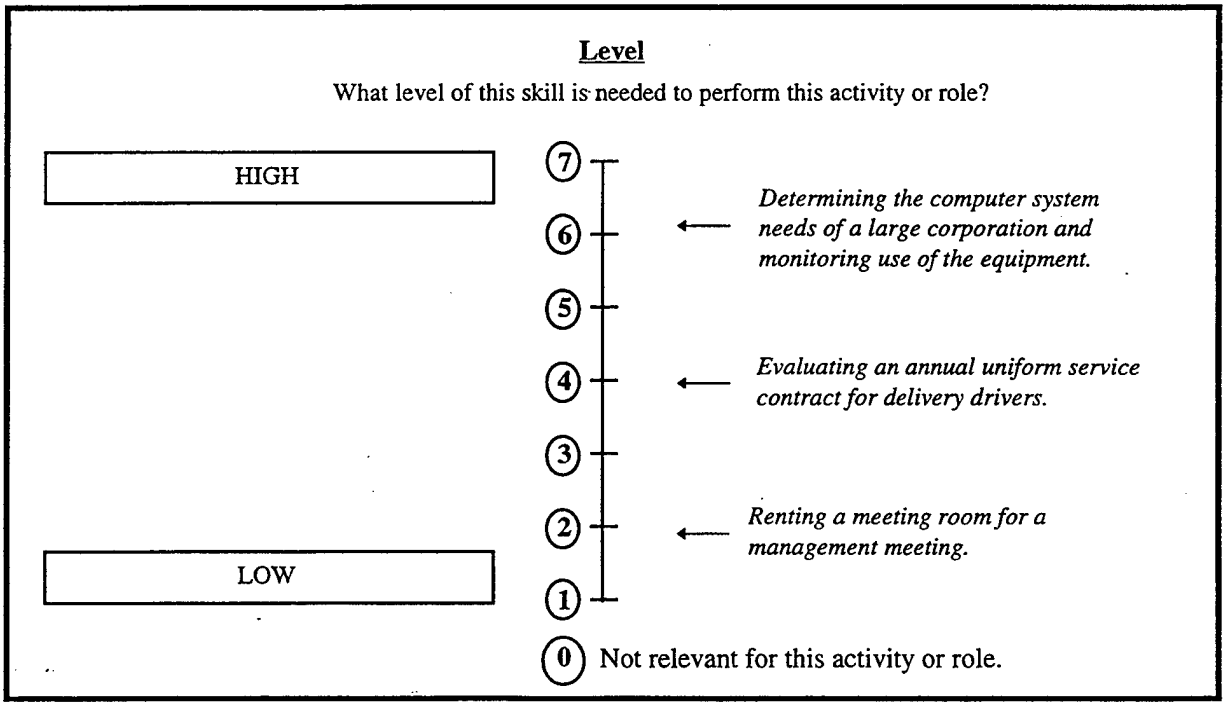
44. Management of Financial Resources

Determining how money will be spent to get the work done, and accounting for these expenditures.



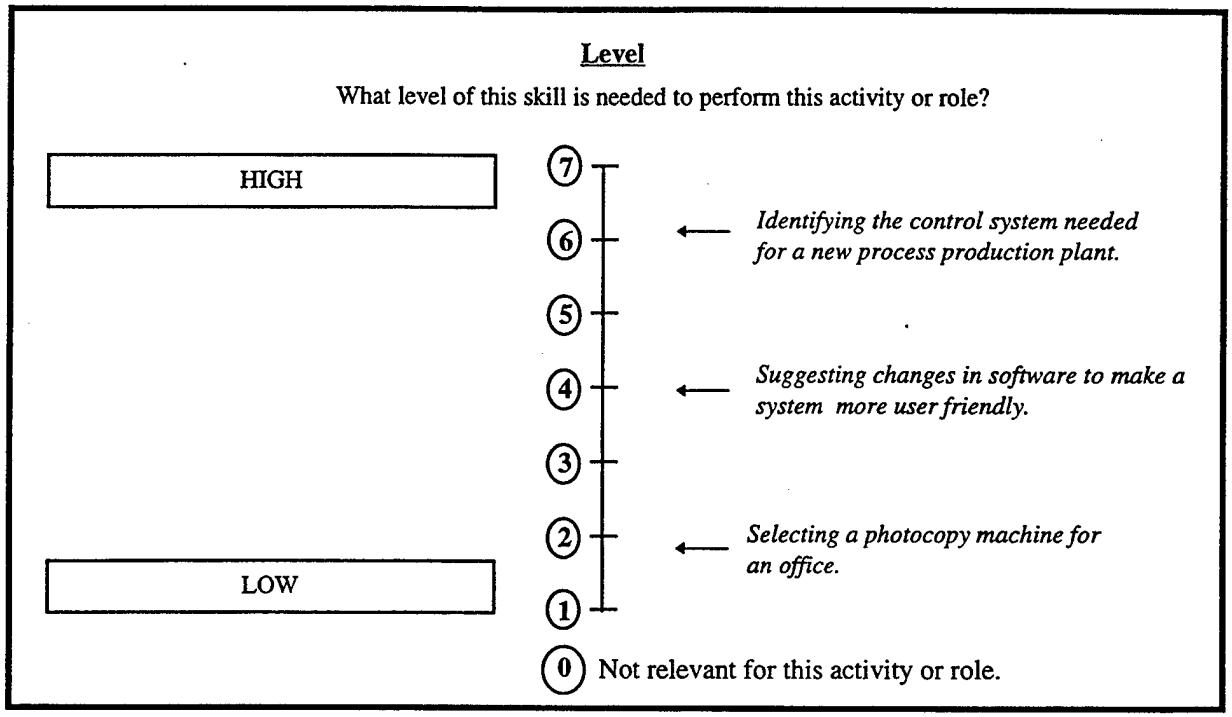
45. Management of Material Resources

Obtaining and seeing to the appropriate use of equipment, facilities, and materials needed to do certain work.



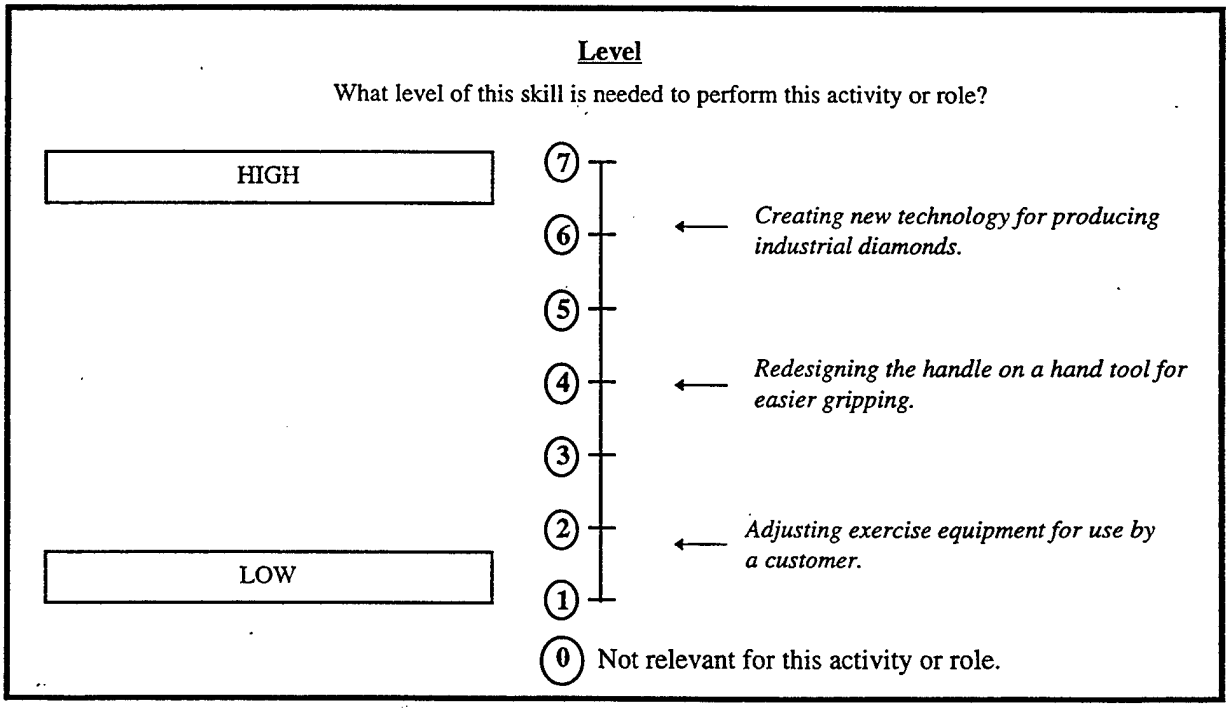
25. Operations Analysis

Analyzing needs and product requirements to create a design.



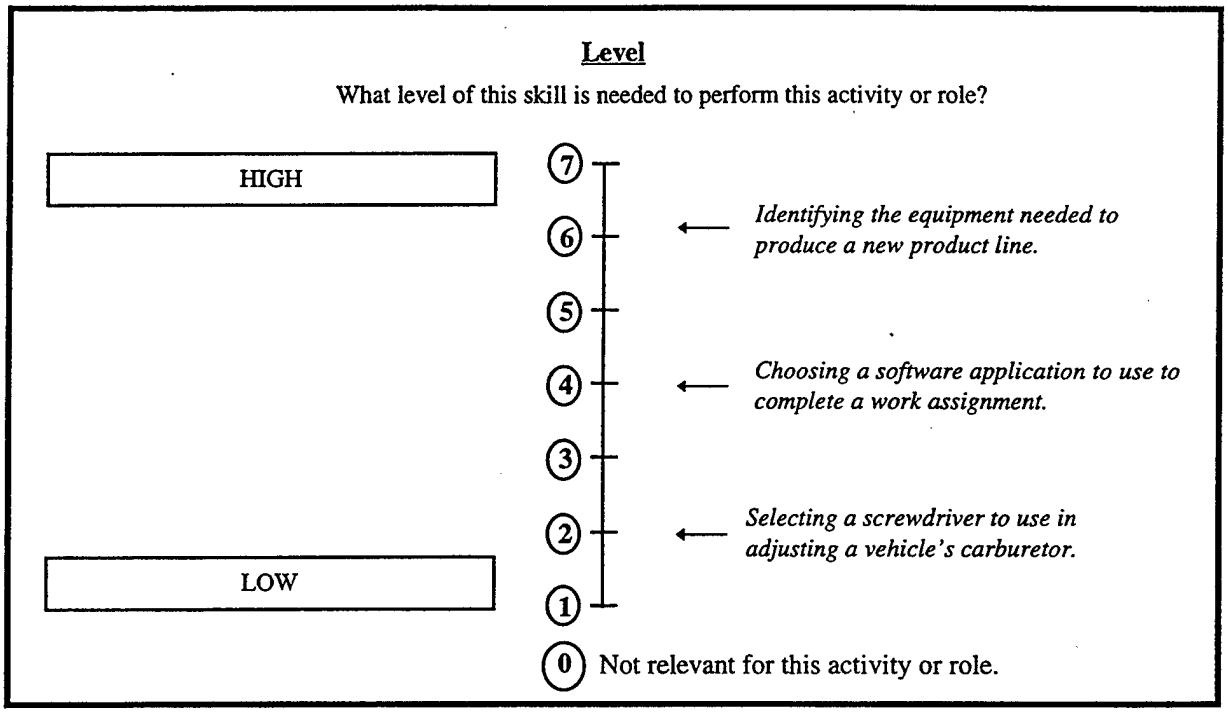
26. Technology Design

Generating or adapting equipment and technology to serve user needs.



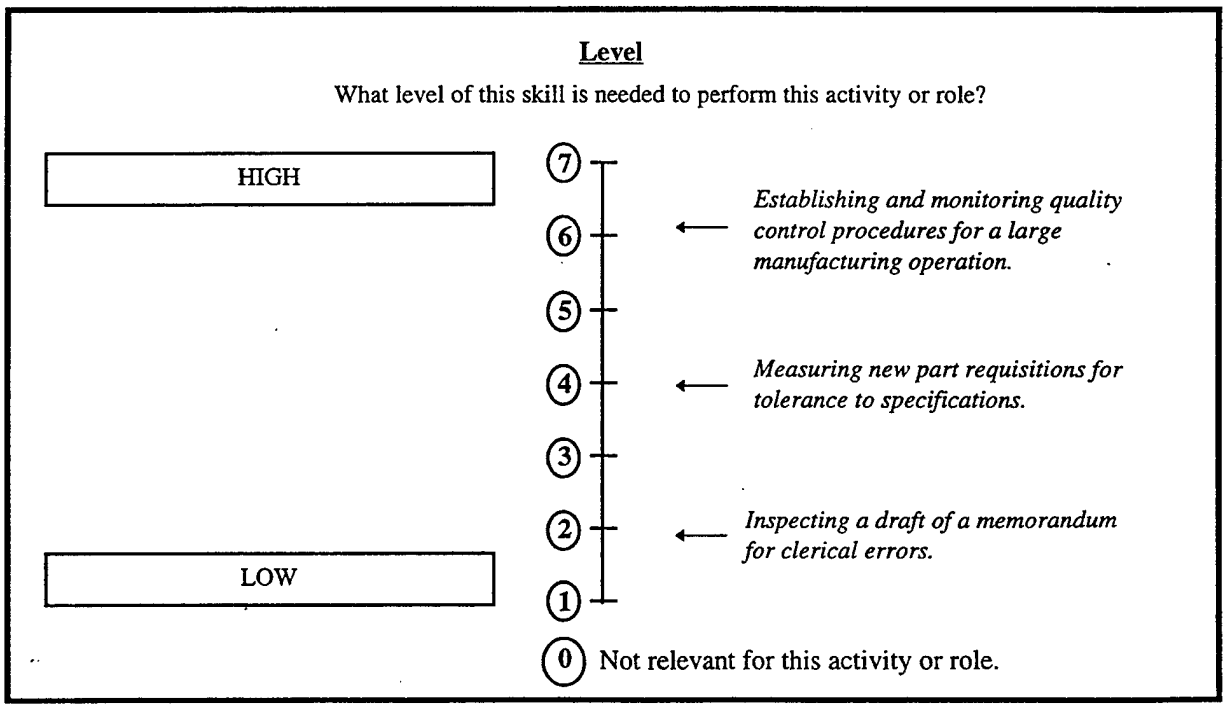
27. Equipment Selection

Determining the kind of tools and equipment needed to do a job.



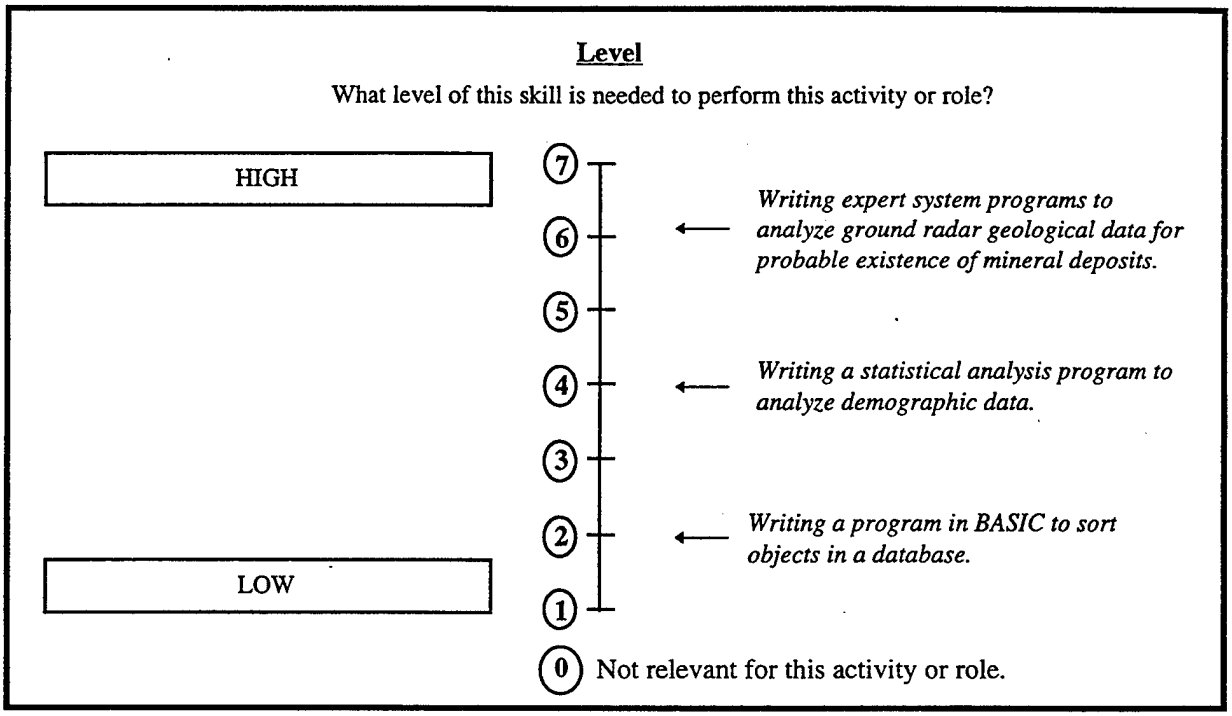
33. Product Inspection

Inspecting and evaluating the quality of products.



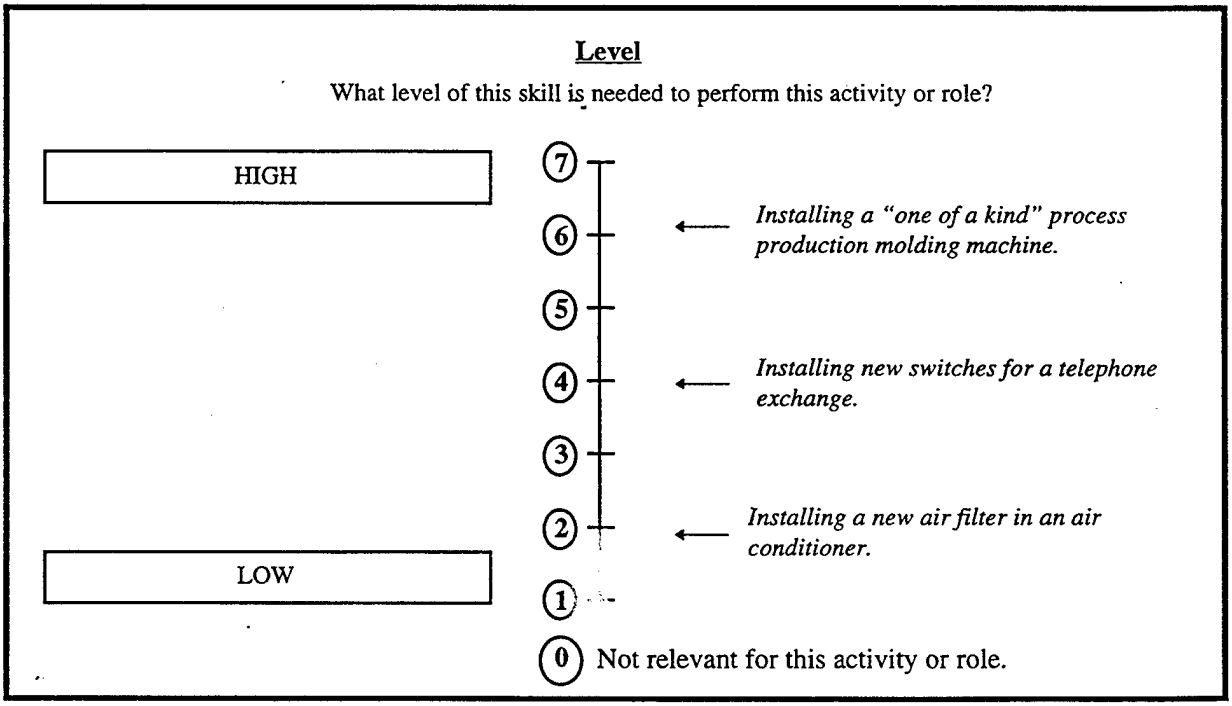
29. Programming

Writing computer programs for various purposes.



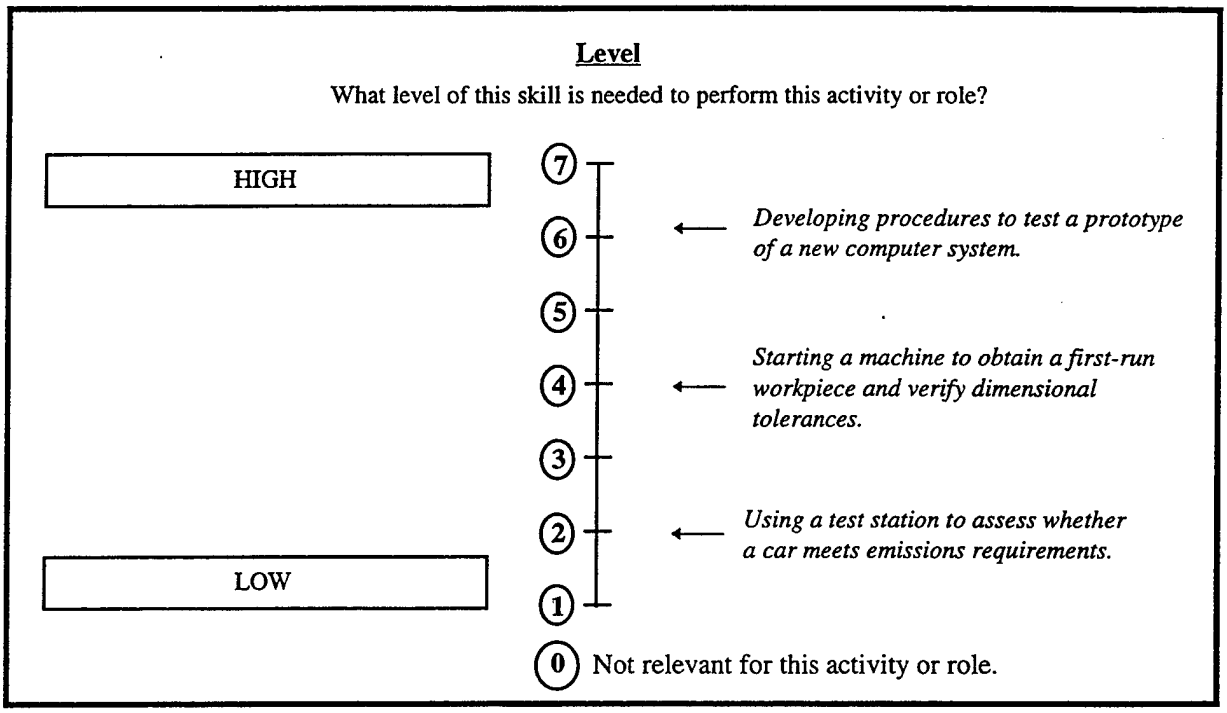
28. Installation

Installing equipment, machines, wiring, or programs to meet specifications.



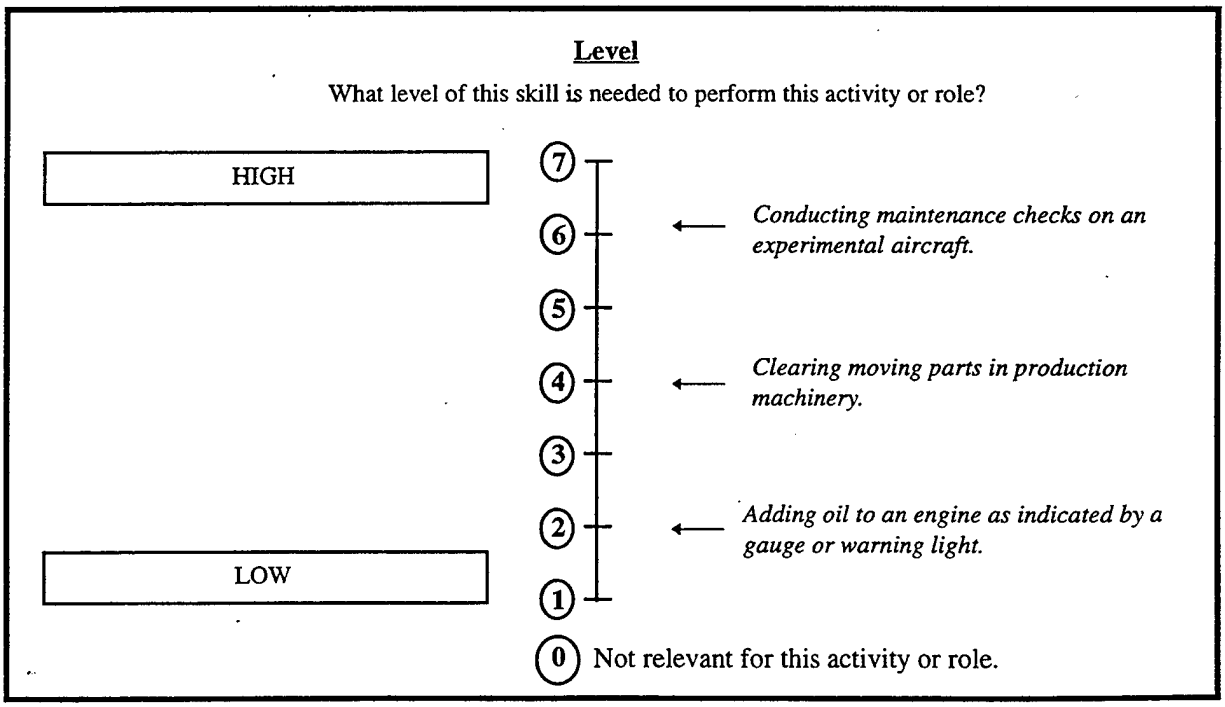
30. Testing

Conducting tests to determine whether equipment, software, or procedures are operating as expected.



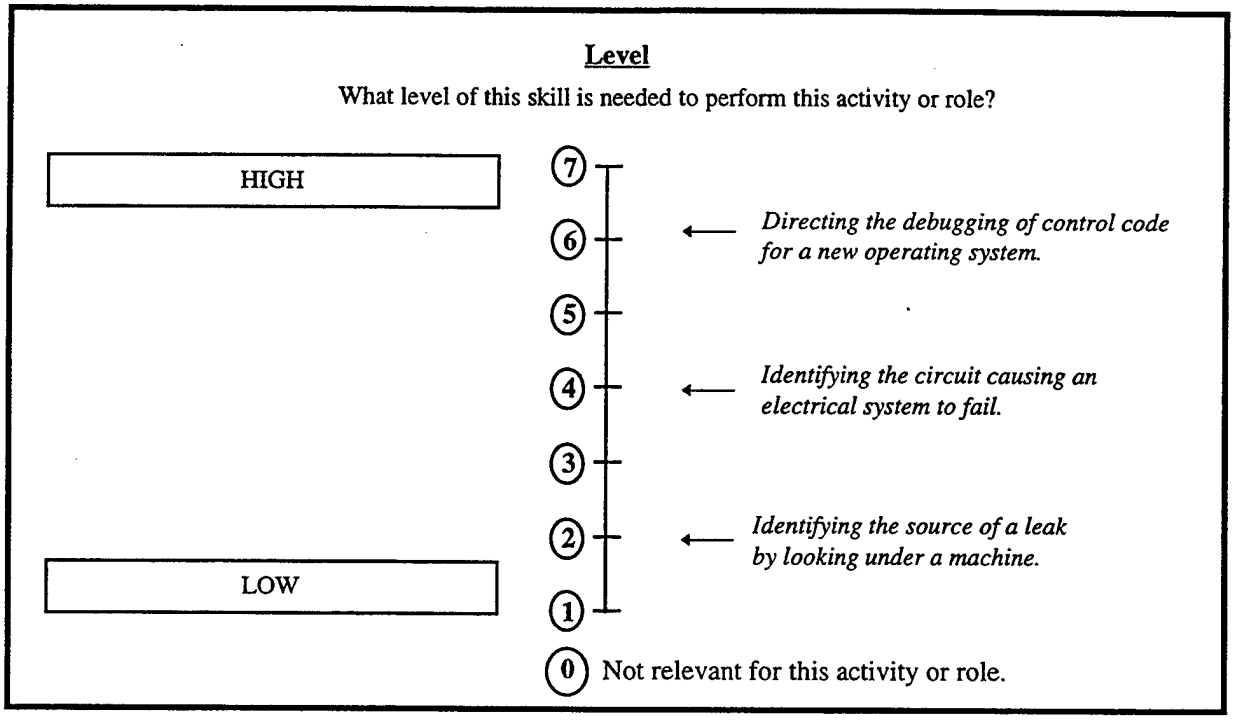
34. Equipment Maintenance

Performing routine maintenance and determining when and what kind of maintenance is needed.



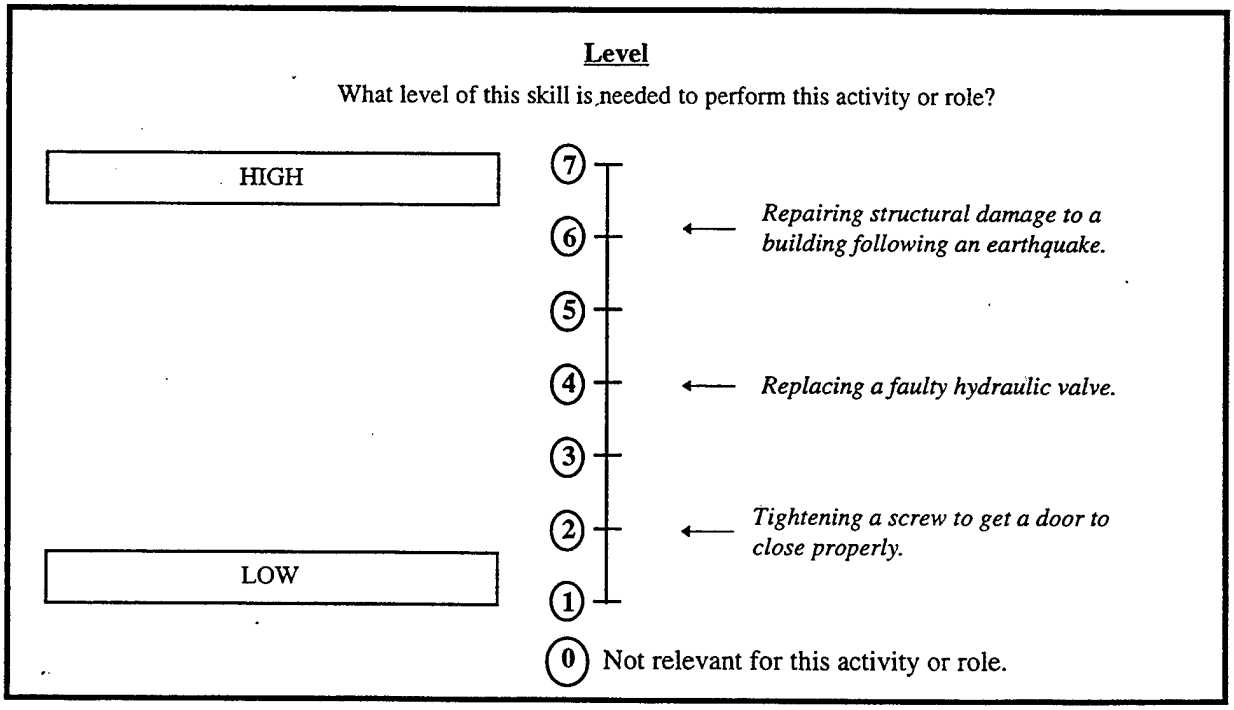
35. Troubleshooting

Determining what is causing an operating error and deciding what to do about it.



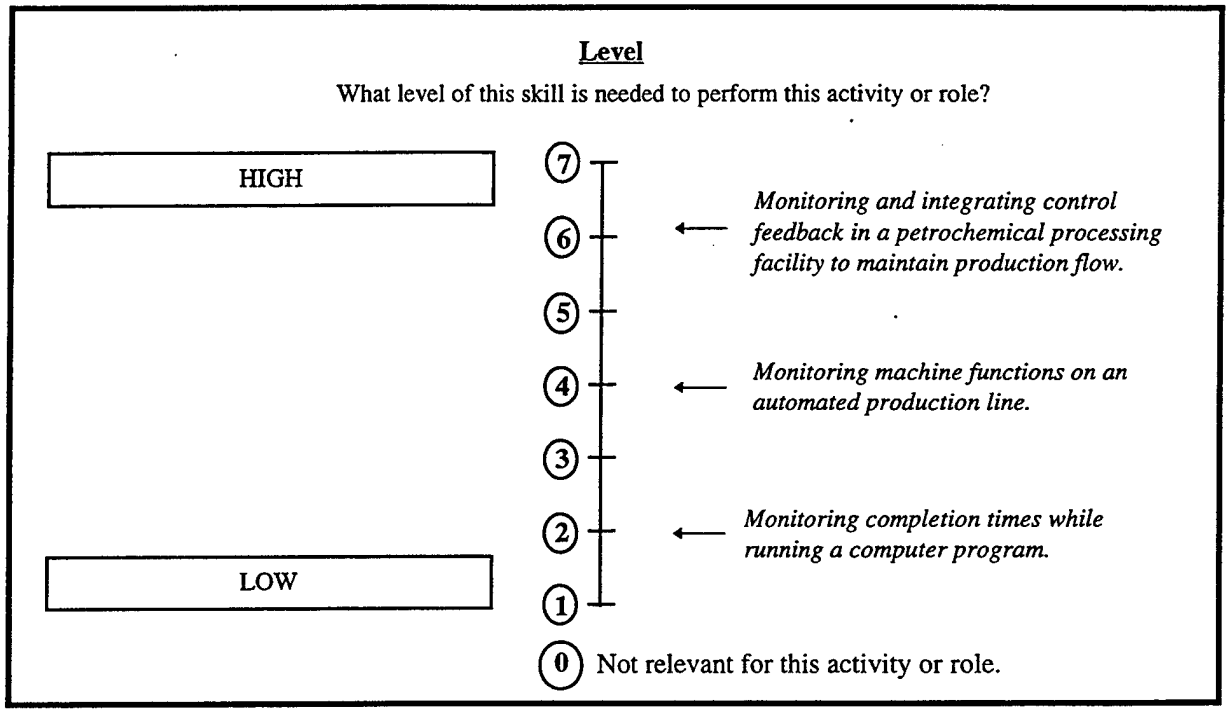
36. Repairing

Repairing machines or systems using the needed tools.



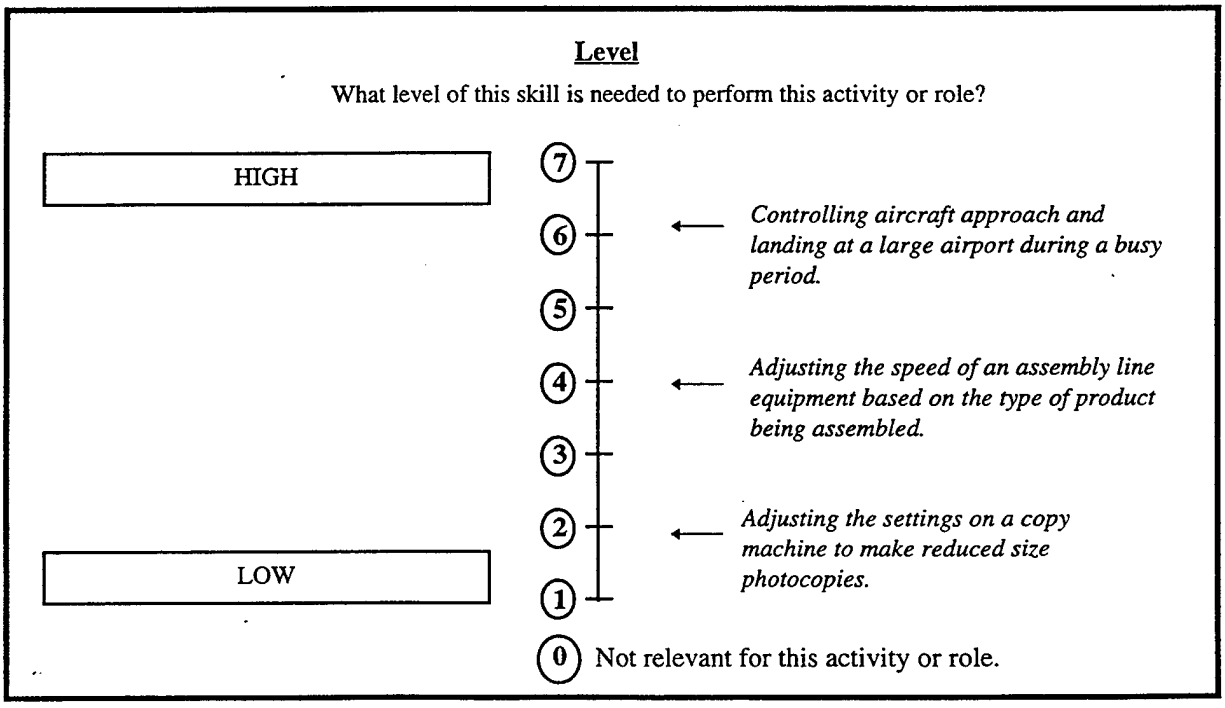
31. Operation Monitoring

Watching gauges, dials, or other indicators to make sure a machine is working properly.



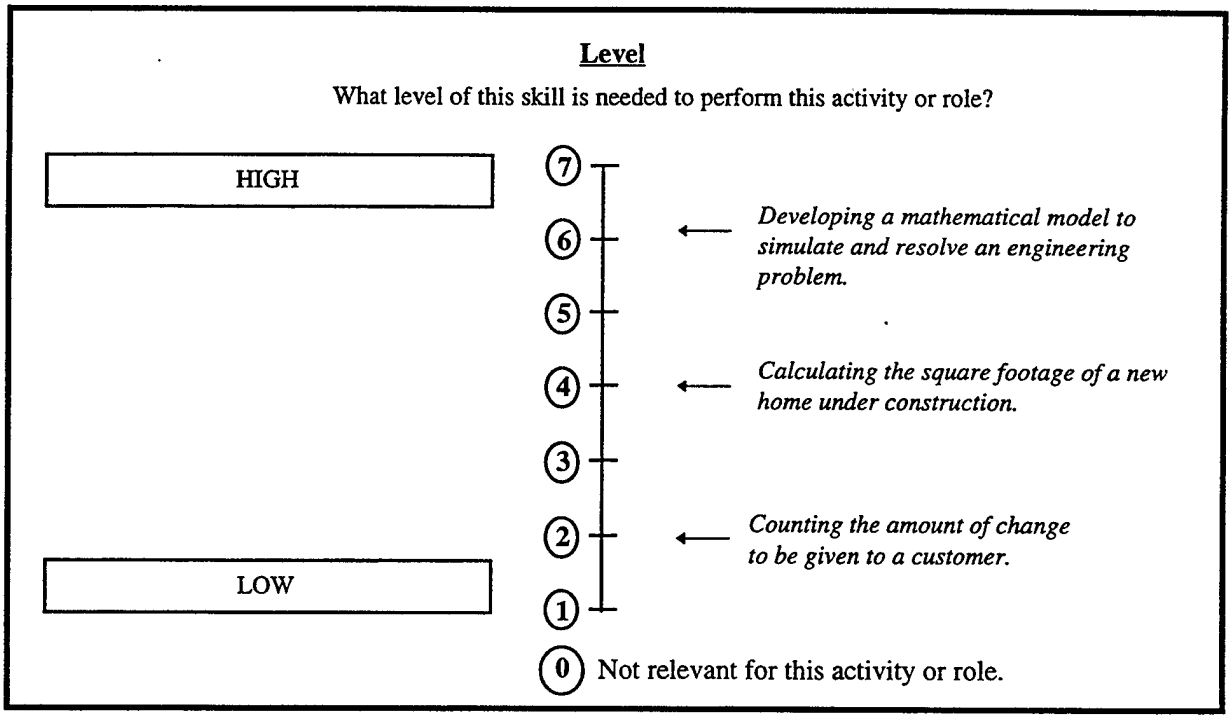
32. Operation and Control

Controlling operations of equipment or systems.



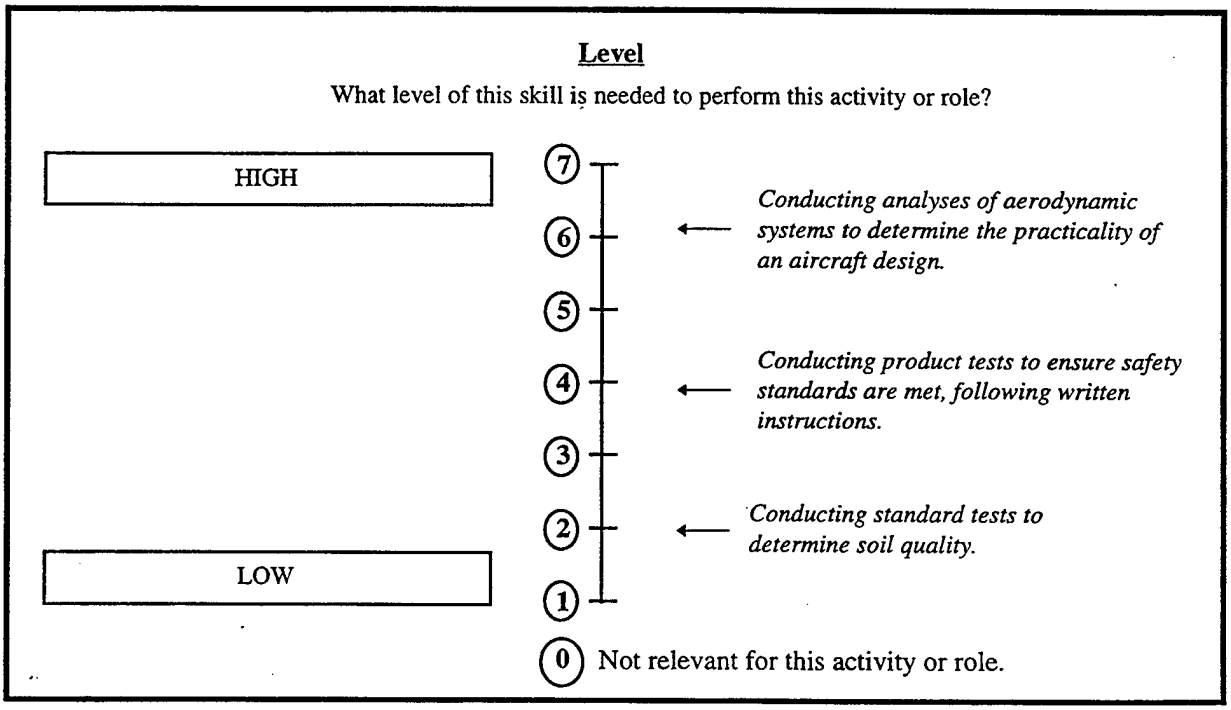
5. Mathematics

Using mathematics to solve problems.



6. Science

Using scientific methods to solve problems.



Stop!

Read this before making any ratings!!!!

For the last two skills, "Learning Strategies" and "Instructing" you will be asked to make one additional rating for each activity in addition to rating the level of skill needed to perform the activity at the novice, average , and expert levels.

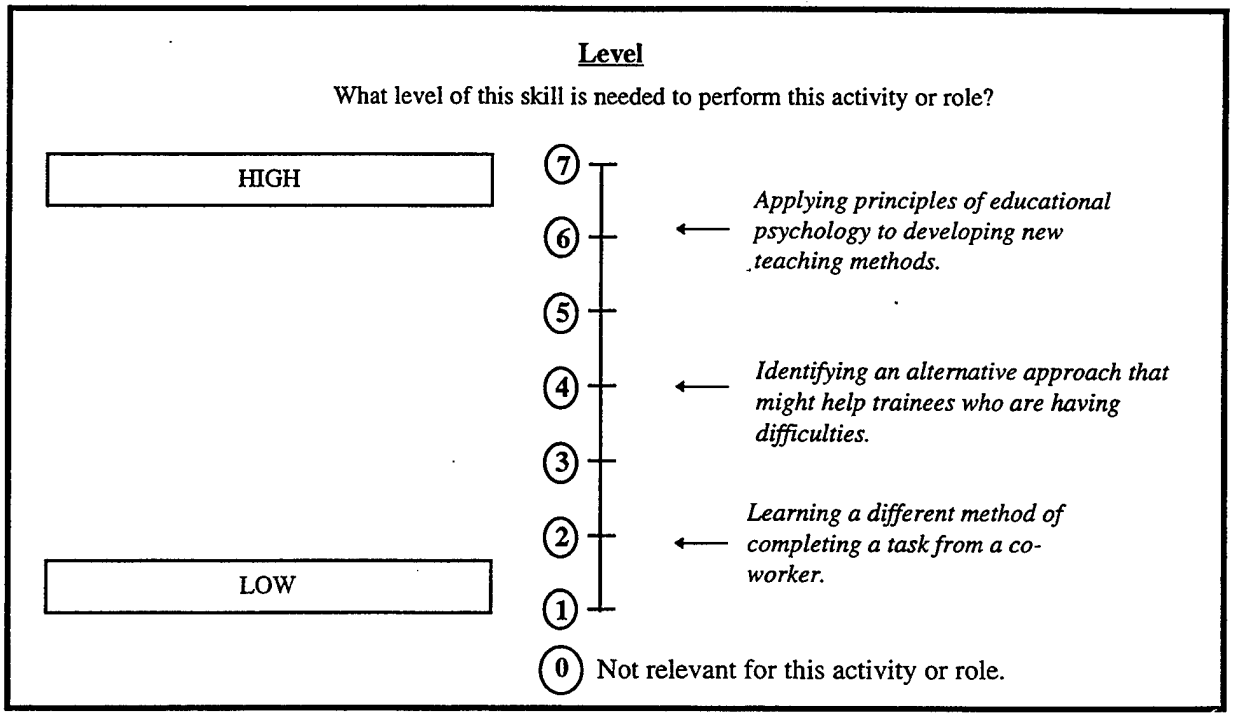
For the Novice-Expert (N, A, E) Columns
As with the previous skills, rate the level of skill needed to ***perform the activity*** at the novice, average, and expert levels. In other words, you will be rating someone who is simply participating in the activity, not someone who is learning the activity or acting as an instructor. For example, what level of "Instructing" skill is required to "golf" or to "coach"?

For the Instructing (I) Column
There is a fourth column labeled "I" for Instructing in which you will record additional ratings for these two skills. Think about people who ***train*** or ***instruct others*** to perform each activity. Think about how difficult it would be to train others in that activity, and what level of instructional skill would be required to do so successfully. For example, what level of "Instructing" skill is required to train others to "golf" or to train others to "coach"?

All of the general instructions still apply (e.g., do not record any "1"s or "2"s, etc.).

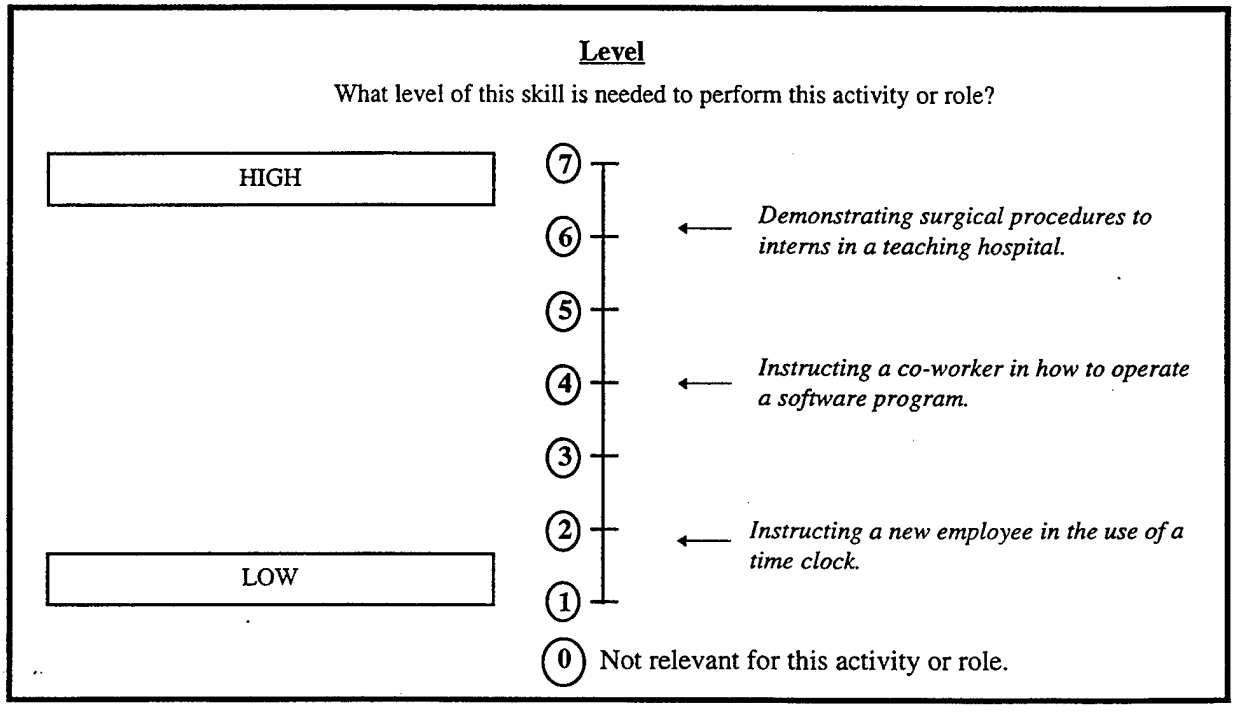
9. Learning Strategies

Using multiple approaches when learning or teaching new things.



15. Instructing

Teaching others how to do something.



Air Force Career Guidance: Leisure Activities Rating Booklet

Activities	1. Reading Comprehension			3. Writing		
N = Novice, A = Average, E = Expert	N	A	E	N	A	E
ACTION ACTIVITIES						
Sports						
1. Individual Shooting/Throwing Sports: Such as archery, skeet or rifle shooting, bowling, Frisbee, javelin/shot-put/discus throwing						
(see above)						
2. Individual Physical Sports: Such as biathlon, triathlon, bicycling, diving (e.g., platform, springboard), gymnastics, roller skating/blading, figure skating, running, skate boarding, skiing (cross-country, downhill, water) surfing, snorkeling, swimming						
(see above)						
3. Riding Sports: Such as horseback riding, dressage, rodeo riding						
(see above)						
4. Individual Vehicle Sports: Such as personal water craft (e.g., waverunner/jet ski™), wind surfing						
(see above)						
5. Motor Racing Sports: Driving (such as auto, motorcycle, dirt bike, or power boat racing, 4-wheeled ATV)						
(see above)						
6. Motor Racing Sports: Working in Pit Crew/Repair (such as auto, motorcycle, dirt bike, or power boat racing)						
(see above)						
7. Adventure Sports: Such as scuba diving, hang gliding, sky diving, mountain climbing (e.g., Mt. Everest)						
(see above)						
8. Combative Individual Sports: Such as boxing, fencing, wrestling, martial arts						
(see above)						
9. Golf						

9. Learning Strategies				15. Instructing				Familiarity with the Activity
N	A	E	I	N	A	E	I	

Activities	1. Reading Comprehension			3. Writing		
N = Novice, A = Average, E = Expert	N	A	E	N	A	E
10. Competitive Team/Group Sports: Such as baseball, softball, basketball, football, rugby, hockey (roller, ice or field) lacrosse, racquet sports (e.g., tennis, racquetball, squash) rowing/crew, soccer, volleyball						
(see above)						
11. Team Yacht Racing						
12. Coaching (e.g., Little League, corporate team)						
13. Umpire or Referee (i.e., athletic game/event)						
Outdoor Activities						
Nature						
14. Astronomy						
15. Camping, Hiking: Includes backpacking, nature walks, canoeing						
(see above)						
16. Fishing/Hunting						
17. Outdoor Adventure: Such as cave exploring, rock climbing, white water rafting, kayaking						
(see above)						
18. Beekeeping						
19. Bird Watching						
Skilled Vehicle/Motor Activities						
Pleasure Boating						
20. Power Boat (i.e., piloting)						
21.Sailing (active participation)						
Flying/Ballooning						
22. Flying (i.e., piloting); Ultralight flying						
23. Hot-air Ballooning (i.e., piloting)						

9. Learning Strategies				15. Instructing				Familiarity with the Activity
N	A	E	I	N	A	E	I	

Activities	1. Reading Comprehension			3. Writing			9. Learning Strategies				15. Instructing				Familiarity with the Activity
N = Novice, A = Average, E = Expert	N	A	E	N	A	E	N	A	E	I	N	A	E	I	
Driving															
24. Motorcycle Riding															
Gardening															
25. Gardening: Vegetable Garden, Trees, Landscaping															
26. Gardening: Houseplants															
27. Plant/Flower Breeding															
Health/Exercise															
28. Aerobics															
29. Meditation, Yoga															
30. Weight Lifting, Body Building															
31. Travel															
CREATIVE ACTIVITIES															
Arts & Music															
Performing Arts															
32. Acting															
33. Performing Arts Crew (e.g., lighting crew, stage crew)															
34. Dancing (e.g., ballet, ballroom, folk, tap)															
35. Singing With a Group (e.g., choir singing, barbershop quartet, opera singing)															
(see above)															
36. Singing Alone															
37. Clowning: Juggling, Magic															
38. Clowning: Comic															
39. Performing Arts Manager/Director (e.g., stage manager)															
(see above)															

Activities	1. Reading Comprehension			3. Writing			9. Learning Strategies				15. Instructing				Familiarity with the Activity
N = Novice, A = Average, E = Expert	N	A	E	N	A	E	N	A	E	I	N	A	E	I	
Visual Arts															
40. Drawing (e.g., sketching, cartooning, calligraphy), Painting, Sculpture															
41. Film/Video Making															
Music															
42. Playing a Musical Instrument Alone (e.g., guitar, piano)															
43. Playing an Instrument in a Band, Orchestra or Other Group															
44. Directing a Musical Group (e.g., choir, orchestra)															
45. Composing Music; Song Writing															
Writing															
46. Writing for Publication (e.g., novels, short stories, poetry, articles)															
(see above)															
47. Writing for Pleasure (e.g., novels, short stories, poetry; editing/writing a small newsletter)															
(see above)															
48. Writing Letters to Friends and Family															
Hobbies/Crafts															
Animals															
49. Animal Racing (e.g., dog racing, horse racing)															
50. Animal Training															
51. Animal Showing															
52. Breeding Pets/Animals															

Activities	1. Reading Comprehension			3. Writing		
N = Novice, A = Average, E = Expert	N	A	E	N	A	E
53. Collecting, e.g., antiques, autographs, books, bottles, coins, photographs, stamps, etc.						
(see above)						
Crafts						
54. Candle Making; Ceramics; Pottery Making						
55. Clock Making/Repair; Doll-House Construction						
56. Flower Arranging						
57. Jewelry Making; Leather Working						
58. Sewing/Needle Crafts (e.g., sewing/mending clothes, macramé, needlepoint, quilting, doll-making, weaving, chair-canning)						
(see above)						
59. Model Building, Model Racing						
60. Metal Working (e.g., blacksmith, gunsmith, welding)						
61. Photography						
62. Short-Wave Radio Listening, Ham/CB Radio						
Woodworking						
63. Furniture Refinishing						
64. Carpentry (e.g. cabinet making, boat building)						
65. Wood Carving; Toy Making						
66. Upholstering						

9. Learning Strategies				15. Instructing				Familiarity with the Activity
N	A	E	I	N	A	E	I	

Activities	1. Reading Comprehension			3. Writing		
N = Novice, A = Average, E = Expert	N	A	E	N	A	E
MECHANICAL/HOME IMPROVEMENT ACTIVITIES						
67. Home Improvement/Repair: Major (e.g., tile bathroom, add room to house, build deck/porch)						
(see above)						
68. Home Improvement/Repair: Minor (e.g., paint, small plumbing repairs, patch hole in wall)						
(see above)						
69. Electrical/Appliance Repair (e.g., repair washer, repair lawnmower, repair VCR)						
(see above)						
70. Mechanical Device Maintenance/Repair (e.g., auto, motorcycle, boat)						
71. Mechanical Device Restoration (e.g., auto, motorcycle, boat)						
INDOOR ACTIVITIES						
Entertaining/Socializing						
72. Planning and Giving Parties; Catering						
Games						
73. Computer Games (skill or strategy games)						
74. Word Games (e.g., scrabble, crossword puzzles)						
75. Games of Skill (e.g., chess)						
76. Skilled Casino Gambling (e.g., blackjack, craps - not slots)						
77. Card Games (e.g., bridge, poker)						

9. Learning Strategies				15. Instructing				Familiarity with the Activity
N	A	E	I	N	A	E	I	

Activities	1. Reading Comprehension			3. Writing		
N = Novice, A = Average, E = Expert	N	A	E	N	A	E
Cooking/Food						
78. Gourmet Cooking; Canning/Preserving Food						
79. Beer/Wine Making/Distilling						
Reading						
80. Reading Technical or Scientific Books, Journals, or Papers						
81. Reading Popular Books (e.g., bestsellers, novels for pleasure)						
82. Reading Newspapers and Magazines						
Household Activities						
83. Meal Preparation						
84. Manage household activities (e.g., plan meals and family outings)						
Household/Personal Finance						
85. Balance Checkbook, Pay Bills						
86. Tax Return Preparation						
87. Make Investments, Oversee Investments (e.g., stock market investing)						
(see above)						
Computer Related Activities						
88. Programming (e.g., web page programming)						
89. Surfing the Internet						

9. Learning Strategies				15. Instructing				Familiarity with the Activity
N	A	E	I	N	A	E	I	

Activities	1. Reading Comprehension			3. Writing		
N = Novice, A = Average, E = Expert	N	A	E	N	A	E
90. Desktop Publishing						
91. Other computer use (e.g., word processing, drawing)						
92. Research family history/genealogy						

9. Learning Strategies				15. Instructing				Familiarity with the Activity
N	A	E	I	N	A	E	I	

Air Force Career Guidance: Role Definitions Booklet

Role	Examples	Definition
Leadership Roles		
1. Supervisor/manager	Supervising volunteers and/or staff members (e.g., in a thrift shop, at a recycling center, at a theater, etc.), managing or leading relief efforts (e.g., soup kitchen, disaster relief, homeless shelter, etc.), acting as an officer in a club (e.g., Rotary, Jaycees, Men's/Women's club, etc.), etc.	Directing the activities of an organization or group; setting goals; assigning individuals to tasks; may monitor and provide feedback on performance, establish policies and procedures, manage resources (e.g., budgeting), etc.
2. Organizing/coordinating events/programs	Organizing or coordinating community service efforts (e.g., local neighborhood clean-up effort or neighborhood watch), relief efforts (e.g., local "Toys for Tots," distribution of food or clothing donations), entertainment or social events (e.g., for hospital or senior center, racquet club matches, high school reunion, etc.), public events (e.g., parades, historical reenactments, festivals, memorial services, etc.), running church or synagogue fund-raising drive, etc.	Planning, organizing and implementing events, programs, etc.; coordinating activities of organization members.
3. Small group leader	Leading a scout troop or youth group; book or garden club leader, head of a committee, etc.	Coordinating/directing the activities of individuals working in a small group (e.g., a committee, a focus group, etc.), leading small group discussions.

Role	Examples	Definition
Committee Work		
4. Board member	Serving as a board member or trustee for association, theater group, orchestra, museum, public library, voluntary health organization, etc.	Attending board meetings, determining policy and broad direction of operations; participating in committees.
5. Committee member	Serving on committees such as the PTA, Catholic Charities, local government (e.g., planning council, zoning committee) Chamber of Commerce; Rotary Club, etc.	Working with a small group of people to set specific goals and create plans to implement those goals.
Administrative Support		
6. Secretary/clerical support	Providing secretarial or clerical services (e.g., stuffing envelopes, acting as a receptionist) for an organization, such as a political campaign, a family service agency, etc.	Performing routine clerical tasks like word processing, filing, mailing, scheduling appointments, answering the phone, photocopying; responding to routine requests for information.
7. Accountant/financial	Providing bookkeeping or accounting services for a social or voluntary organization (e.g. church or synagogue, shelter, social service agency, etc.)	Compiling and analyzing financial information and preparing financial reports using computer or calculator.
8. Advisor	Providing business, legal, financial, publicity or technical advice or services for social service, arts, civic or other voluntary organizations.	Using expertise in a particular area (e.g., business, legal, financial, public relations, etc.) to provide voluntary technical assistance or advice to a group or organization.

Role	Examples	Definition
Assistance Roles		
9. Aide	Acting as a teacher's aide or library volunteer; assisting the nursing staff in a hospital; assisting animal keepers or trainers at a zoo; working in a community center (YMCA, Jewish Community Center, Senior Center, Youth Center, etc.), etc.	Assisting others in performing some kind of service or task, usually under supervision.
10. Driver	Providing transportation for elderly, children, handicapped; acting as a driver for "Meals on Wheels"; driving a bus for soccer team	Transporting people or materials in a car, truck or van; may assist disabled passengers in and out of vehicle; may operate radio or telephone to communicate with others.
Boundary Spanning Roles		
11. Advocate	Acting as a lobbyist or advocate for an organization or cause (e.g., conservation organization, civil rights, freedom of speech, animal rights, historic site preservation, neighborhood growth, environment, recycling; League of Women Voters), acting as a legal system advocate (e.g. for abused or neglected children).	Promoting awareness of a cause or situation and obtaining support through letters, speeches or personal persuasion; may lobby local or state governments; may collect information to support arguments or cause.
12. Recruiter	Recruiting volunteers for various organizations and/or efforts.	Seeking out, interviewing, screening and recruiting people; providing basic information about an organization's goals and functions; may write notices to attract volunteers.

Role	Examples	Definition
13. Fund raising	Raising money for service, religious, or other organizations and causes (e.g., United Way, March of Dimes, other foundations, alumni organizations, etc.).	Writing, telephoning, or visiting individuals or organizations to persuade them to contribute funds or gifts-in-kind by explaining purpose and benefits of organization.
14. Public relations/representing organization	Delivering speeches for PTA or other organization; acting as a labor union representative.	Representing an organization in community activities; may deliver speeches or prepare promotional materials to educate or inform public about the organization's activities.
Teaching/Training Roles		
15. Teacher/tutor	Serving as a Sunday school teacher, literacy volunteer, etc.	Teaching academic subjects, such as English, math, foreign language, religion to pupils; may adapt curriculum or teaching methods to meet individual's needs.
16. Trainer	Train and/or orienting new volunteers (e.g., at a crisis intervention organization).	Developing and conducting training sessions for organization members; may determine instructional methods; may select or develop training aids, such as handbooks or demonstrations.

Role	Examples	Definition
Service Roles		
17. Child care	Working with young children in day care, play groups, a church nursery, etc.	Organizing and supervising the activities of children in nursery schools, day care centers, play groups; organizing and participating in games; reading to children; teaching children simple activities (e.g., drawing, singing); maintaining discipline; may serve meals or refreshments.
18. Visitor	Reading for the blind; visiting and helping the elderly, handicapped, hospitalized patients, home-bound, prisoners, etc.	Providing companionship; traveling to various locations to talk with or help people; may perform small tasks like reading out loud, writing letters, grocery shopping, playing card games, etc.
19. Mentor	Acting as a Big Brother/Big Sister; Junior Achievement mentor; professional association mentor; assisting new immigrants with housing and employment; etc.	Providing advice and support and acting as a role model for an individual or group (advice is less technical than an Advisor would provide).
20. Counselor	Staffing a hotline/crisis intervention center; providing counseling concerning suicide, drug use, domestic violence, neglect and abuse prevention; proving youth or family counseling; participating in a self-help/support group (e.g., divorced parents group, Alcoholics Anonymous); etc.	Collecting information to assess client needs; providing individual or group counseling services to assist individuals with personal, social, education and vocational problems.

Role	Examples	Definition
Miscellaneous Roles		
21. Emergency service	Serving in the volunteer police reserve, or as a volunteer ambulance driver, paramedic volunteer, Ham/CB radio operator, rescue diver, or fire fighting volunteer.	Providing emergency services like police, paramedic and fire fighting services.
22. Tour guide/giving demonstrations/talks	Demonstrating crafts or skills for a museum, art show, or dance exhibition; acting as a tour guide for museum or historic site.	Escorting groups or individuals through establishments like museums, aquariums, public or historic buildings, historical or outdoor scenic sites; providing information regarding the features of interest; answering questions; may demonstrate various activities.

Air Force Career Guidance: Volunteer Activities Rating Booklet

Roles	1. Reading Comprehension	3. Writing	9. Learning Strategies	15. Instructing	Familiarity with the Activity
1. Supervisor/manager					
2. Organizing/coordinating					
3. Small group leader					
4. Board member					
5. Committee member					
6. Secretary/clerical support					
7. Accountant/financial					
8. Advisor					
9. Aide (school, library)					
10. Driver					
11. Advocate (e.g., lobbyist)					
12. Recruiter					
13. Fund raising					
14. Public relations etc.					
15. Teacher/tutor					
16. Trainer					
17. Child care					
18. Visitor					
19. Mentor					
20. Counselor					
21. Emergency service					
22. Tour guide/giving demonstrations/talks					

Air Force Career Guidance: Unskilled Activities Booklet

Activities	No Skills	Skilled*
1. Auto driving (e.g., driving around town)		
Sports Activities		
2. Watching sports games/events		
3. Athletic club member		
4. Jogging/walking		
Outdoor Activities		
5. Picnicking		
Social/Volunteer Activities		
6. Attend church, religious meetings		
7. Attend auctions		
8. Attend lectures		
Attend meetings		
9. Attend religious group meetings		
10. Attend social group meetings		
11. Attend sports club meetings		
12. Attend local council meetings		
13. Attend political meetings		
14. Attend school committee meetings		
15. Attend book club meetings		
Entertainment Activities		
Attend musical performances		
16. Attend opera		
17. Attend jazz concerts		
18. Attend orchestral concerts		
19. Attend pop concerts		
Attend theatrical performances		
20. Attend plays		
21. Attend dance performances (e.g., ballet)		
22. Attend musicals		

* Make sure you have completed skill ratings for any activities you checked in this column.

Activities (cont.)	No Skills	Skilled*
Miscellaneous entertainment		
23. Attend race track, race betting		
24. Attend strip shows		
25. Attend rodeo		
26. Going dancing		
27. Visiting friends and relatives		
29. Dining out		
30. Drinking and socializing		
31. Shopping (e.g., mall, garage sale, flea market)		
32. Visit museum, zoo, fairs, festivals		
33. Visit amusement parks		
34. Visiting art shows and galleries		
Indoor Activities		
Games		
35. Card games (e.g., solitaire, crazy 8s)		
36. Arcade games		
37. Games of chance (e.g., slots, roulette, bingo)		
38. Board games		
39. Lawn games		
40. Billiards, pool		
Passive audio/visual entertainment		
41. Listening to music		
42. Watching movies (e.g., videos, theater)		
43. Watching television		
Cooking/Food		
44. Cake decorating		
45. Food/wine/beer tasting		
46. Cleaning		

* Make sure you have completed skill ratings for any activities you checked in this column.

I. Sports, Health & Exercise

A. Sports

1. Adventure Sports

a) Hang gliding
b) Mountain climbing
c) Mountain biking
d) Rock climbing
e) Scuba diving
f) Sky diving
g) White water rafting

2. Endurance Sports

a) Biathlon
b) Marathon
c) Triathlon

3. Equestrian Sports

a) Dressage
b) Horseback riding
c) Rodeo riding

4. Racquet Sports

a) Badminton
b) Handball
c) Ping pong
d) Racquetball
e) Tennis
f) Squash

5. Team Sports

a) Baseball
b) Basketball
c) Bowling
d) Crew
e) Field hockey
f) Football
g) Gymnastics
h) Ice hockey
i) Lacrosse
j) Roller hockey
k) Rugby
l) Soccer
m) Softball
n) Volleyball
o) Yacht racing

6. Track & Field Sports

a) Running
b) Javelin throwing
c) Discus throwing, Shot-put throwing, Hammer throw

7. **Water Sports**
   a) Crew, Rowing, Sculling
   b) Diving, e.g., platform, springboard
   c) Kayaking
   d) Personal water craft, e.g., waverunner/jet ski™
   e) Sailing
   f) Snorkeling
   g) Surfing
   h) Swimming
   i) Water skiing
   j) White water rafting
   k) Wind surfing
   l) Yacht racing
8. **Winter Sports**
   a) Cross country skiing
   b) Downhill skiing
   c) Figure skating
   d) Ice Hockey
   e) Snowboarding
9. **Other Sports**
   a) Archery
   b) Bicycling
   c) Bowling
   d) Boxing
   e) Fencing
   f) Frisbee
   g) Golf
   h) Gymnastics
   i) Martial arts
   j) Rifle shooting
   k) Rodeo riding
   l) Roller skating/blading
   m) Running
   n) Skate boarding
   o) Skeet shooting
   p) Wrestling
10. **Coach, e.g., Little League, corporate team**
11. **Umpire or referee athletic game/event**
12. **Member of athletic club/team**
13. **Attend sports games/events**

B. Health & Exercise

1. **Aerobics**
2. **Martial arts**
3. **Meditation, Yoga**
4. **Running/Jogging**

5. Walking
6. Weight lifting, body building
7. Member of athletic club

II. Outdoor Activities

A. Astronomy
B. Backpacking
C. Beekeeping
D. Bicycling
E. Bird watching
F. Camping
G. Canoeing
H. Cave exploring
I. Dressage
J. Fishing
K. Horseback riding
L. Hiking
M. Hunting
N. Nature walks
O. Picnicking
P. Rifle shooting
Q. Rock climbing
R. Rodeo riding
S. Skateboarding
T. Skeet shooting
U. White water rafting
V. Member of outdoor activity club
W. Gardening

1. Gardening - vegetable garden, trees
2. Gardening - houseplants
3. Plant/Flower breeding or selling

III. Travel/History

A. Travel
B. History

1. Family history/genealogy research
2. Participating in historical reenactments

IV. Arts

A. Performing Arts

1. Acting
2. Performing arts crew, e.g., lighting crew, stage crew
3. Dancing, e.g., ballet, ballroom, folk, tap, etc.
4. Clowning, juggling, magic
5. Comic
6. Performing arts manager/director, e.g., stage manager

B. Visual Arts

1. Calligraphy

2. Cartooning
3. Drawing
4. Film/video making
5. Painting
6. Photography
7. Sculpture
8. Sketching

C. Member of arts club or organization
D. Attend arts performances, e.g., plays, musicals, etc.
E. Visit museums, galleries, etc.

V. Music

A. Singing with a group, e.g., choir singing, barbershop quartet, opera singing
B. Singing solo
C. Playing a musical instrument solo, e.g., guitar, piano
D. Playing an instrument in a band, orchestra or other group
E. Directing a musical group, e.g., choir, orchestra
F. Composing music; song writing
G. Member of music club or organization
H. Attend musical performances

VI. Writing

A. Writing for publication, e.g., novels, short stories, poetry, articles, screen plays
B. Writing for pleasure, e.g., novels, short stories, poetry; editing/writing a small newsletter
C. Writing letters to friends and family
D. Calligraphy
E. Member of writing club

VII. Plants/Animals

A. Gardening - vegetable garden, trees, landscaping
B. Raising houseplants
C. Plant/Flower breeding
D. Beekeeping
E. Animal racing, e.g., dog racing, horse racing
F. Animal training
G. Animal showing
H. Breeding pets/animals
I. Bird watching
J. Member of garden, plant, flower, animal club
K. Attend plant or animal events, e.g., garden shows, pet shows, etc.

VIII. Collecting

A. Collecting, e.g., antiques, autographs, books, bottles, coins, photographs, stamps, etc.
B. Member of collecting club

C. Attend collecting shows or events

IX. Crafts

A. Candle making
B. Ceramics; pottery making
C. Clock making/repair
D. Flower arranging
E. Jewelry making
F. Leather working
G. Painting
H. Sewing/Needle crafts, e.g., sewing/mending clothes, macramé, needlepoint, quilting, doll-making, weaving
I. Chair-caning
J. Model building, model racing, e.g., planes, trains, automobiles, boats, etc.
K. Metal working, e.g., blacksmith, gunsmith, welding
L. Woodworking
1. Carpentry, e.g., cabinet making
2. Doll house construction
3. Furniture refinishing
4. Wood carving; toy making

M. Upholstering
N. Member of craft club
O. Attend craft events, e.g., craft show, etc.

X. Building, Repair and Home Improvement Activities

A. Home improvement/repair - major, e.g., tile bathroom, add room to house, build deck/porch
B. Home improvement/repair - minor, e.g., paint, small plumbing repairs, patch hole in wall
C. Electrical appliance repair, e.g., repair washer, repair lawnmower, repair VCR
D. Clock making
E. Model building, model racing, e.g., planes, trains, automobiles, boats, etc.
F. Metal working, e.g., blacksmith, gunsmith, welding
G. Woodworking
1. Carpentry, e.g., cabinet making
2. Doll house construction
3. Furniture refinishing
4. Wood carving; toy making

H. Upholstering

XI. Activities Involving Motorized Vehicles

A. Automobiles
1. Driving
2. Motor racing
   a) Race driving

b) Working in pit crew/repair

3. **Restoration**
4. **Member of auto interest club**
5. **Attend automobile events, e.g., shows, auctions**

B. Motorcycles

1. **Motorcycle riding/driving**
2. **Motorcycle racing**
   a) Race driving, e.g., motorcycle, dirt bike racing, 4-wheeled ATV
   b) Working in motorcycle pit crew/repair
3. **Restoration**
4. **Member of motorcycle interest club**
5. **Attend motorcycle events, e.g., Bike week**

C. Boats

1. **Power Boating**
2. **Power boat racing**
3. **Sailing**
4. **Yacht racing**
5. **Boat restoration**
6. **Boat building**
7. **Boat repair**
8. **Personal water craft riding, e.g., waverunner/jet ski**
9. **Canoeing**
10. **Kayaking**
11. **White water rafting**
12. **Member of boating club**
13. **Attend boating events, e.g., shows, races, etc.**

D. Aircraft

1. **Flying planes**
2. **Ultralight flying**
3. **Hot-air ballooning**
4. **Plane, ultralight repair**
5. **Member of plane or flying club**
6. **Attend events related to flying, e.g., air shows, etc.**

XII. Indoor Entertainment

A. Audio/visual entertainment, e.g., listening to music, watching movies, watching television, short-wave radio listening, Ham/CB radio

B. Games

1. **Computer games (skill or strategy games)**
2. **Computer games (other)**
3. **Word games, e.g., scrabble, crossword puzzles**
4. **Games of skill, e.g., chess**
5. **Casino gambling, e.g., blackjack, craps - not slots**
6. **Games of chance, e.g., slots, roulette, bingo**

7. **Card games**
   a) Bridge
   b) Poker
   c) Other, e.g., solitaire, crazy 8s
   d) Member of game club, e.g., bridge club
8. **Arcade games**
9. **Board games**
10. **Lawn games, e.g., croquet**
11. **Billiards, pool**
12. **Member of game club, e.g., bridge club, pool club**

C. *Reading*

1. **Reading technical or scientific books, journals, or papers**
2. **Reading popular books, e.g., bestsellers, novels for pleasure**
3. **Reading newspapers and magazines**
4. **Member of book club**

XIII. Domestic Activities

A. *Cooking/Food & Beverage*

1. **Gourmet cooking**
2. **Beer/wine making/distilling**
3. **Food/wine/beer tasting**
4. **Cake decorating**
5. **Canning, preserving food**
6. **Member of cooking/food club, e.g., vegetarian club**
7. **Attend cooking or food events**

B. *Household Activities*

1. **Meal preparation**
2. **Manage household activities, e.g., plan meals, plan family outings**
3. **Cleaning**

C. *Shopping, e.g., mall, garage sale, flea market*

XIV. Finance/Computer

A. *Personal Finance*

1. **Balance checkbook, pay bills**
2. **Tax return preparation**
3. **Make investments, oversee investments, e.g., stock market investing**
4. **Member of investment club**

B. *Computer Related Activities*

1. **Programming, e.g., web page programming**
2. **Surfing the internet**
3. **Desktop publishing**
4. **Other computer use, e.g., word processing, drawing**
5. **Computer games (skill or strategy games)**
6. **Computer games (other)**
7. **Member of computer club**

8. Attend computer shows or events

XV. Social Activities

A. Entertaining/socializing, e.g., planning and giving parties

B. Organization member

1. Hobby, interest and games clubs/organizations, e.g., chess club, garden club, bridge club, photography club, automobile interest club, book club, ethnic club, vegetarian club
2. Recreational clubs/organizations, e.g., bowling team, racquet club, hunting club
3. Social clubs/organizations, e.g., alumni organization, fan club, fraternity/sorority, retiree organization, men's/women's clubs, veterans' organization
4. Professional/Trade Association member
5. Self-help/support group, e.g., single parents group, Alcoholics Anonymous
6. Service clubs/organizations, e.g., animal rights organization, conservation organization, arts/cultural organization, preservation society, political organization (election campaign group, local government organization), educational organization (PTA, school committee)
7. Religious organization/club

C. Attend events/meetings

1. Attend church, religious organization meetings
2. Attend auctions
3. Attend lectures
4. Attend social group meetings
5. Attend political meetings
6. Attend school committee meetings
7. Attend club meetings, e.g., book club, etc.
8. Attend sporting events
9. Attend other events, meetings or gatherings

D. Attend musical performances, e.g., opera, jazz concerts, orchestral concerts, pop concerts

E. Attend theatrical performances, e.g., plays, dance performances, musicals

F. Miscellaneous entertainment

1. Going dancing
2. Visiting friends and relatives, entertaining friends
3. Going to the movies
4. Dining out
5. Drinking and socializing
6. Attending strip shows
7. Attending race track, race betting
8. Attending rodeo

G. Shopping, e.g., mall, garage sale, flea market

H. Visiting, e.g., museums zoo, fairs, festivals, amusement parks, art shows, galleries

XVI. Volunteer Activities

1. Service volunteer, e.g., social service, religious organization, scouting, education/tutoring, visiting the elderly, counseling, fund raising, emergency services, health/hospital, working with children, etc.

2. Public issue/advocacy volunteer, e.g., political campaign, social action/protest, public education, etc.

3. Arts/cultural volunteer, e.g., museums, theaters, art galleries, zoos, etc.

4. Civic and professional association volunteer, e.g., local government, labor union, etc.

Instructions

In the following rating task, you will be asked to rate your level of skill and interest in 46 different ***work-related*** areas.

The 46 areas (or skills) are defined in the **Skills Definitions Booklet**. This booklet contains one page for each skill and the numbers correspond to the numbers on the rating form. For each skill there is a definition and two scales, a "Level" scale and a "Desire to Use" scale. The "Level" scale asks you to rate the level of your skill in a particular area and offers examples of activities at each of three levels of the skill. The "Desire to Use" scale asks you to rate your desire to use a particular skill on the job. You will mark your ratings on the **Skills Self-Assessment Rating Form.**

Begin by reading the skill definition carefully, and keep it in mind as you make your ratings. To help you make these judgments, each "Level" scale includes descriptions of activities requiring high, medium and low levels of the skill. Please try to ***use these examples to give you a general feel*** for what high, medium and low means for each skill. ***Do not*** rate how well you can perform these particular example activities. Rather, use these activities to understand what it means to be at a low, medium or high level for that skill. Then mark your rating (1-7) in the "Level" column on your rating form.

For the next scale, "Desire to Use", simply examine the labels under the numbers to help you make your rating of your desire to use the skill at work. Then mark your rating (1-5) in the "Desire to Use" column on your rating form.

Skill Self Assessment Rating Form

Skill	Level	Desire to Use
1. Reading Comprehension		
2. Active Listening		
3. Writing		
4. Speaking		
5. Mathematics		
6. Science		
7. Critical Thinking		
8. Active Learning		
9. Learning Strategies		
10. Monitoring		
11. Social Perceptiveness		
12. Coordination		
13. Persuasion		
14. Negotiation		
15. Instructing		
16. Service Orientation		
17. Problem Identification		
18. Information Gathering		
19. Information Organization		
20. Synthesis/Reorganization		
21. Idea Generation		
22. Idea Evaluation		
23. Implementation Planning		
24. Solution Appraisal		
25. Operations Analysis		
26. Technology Design		
27. Equipment Selection		
28. Installation		

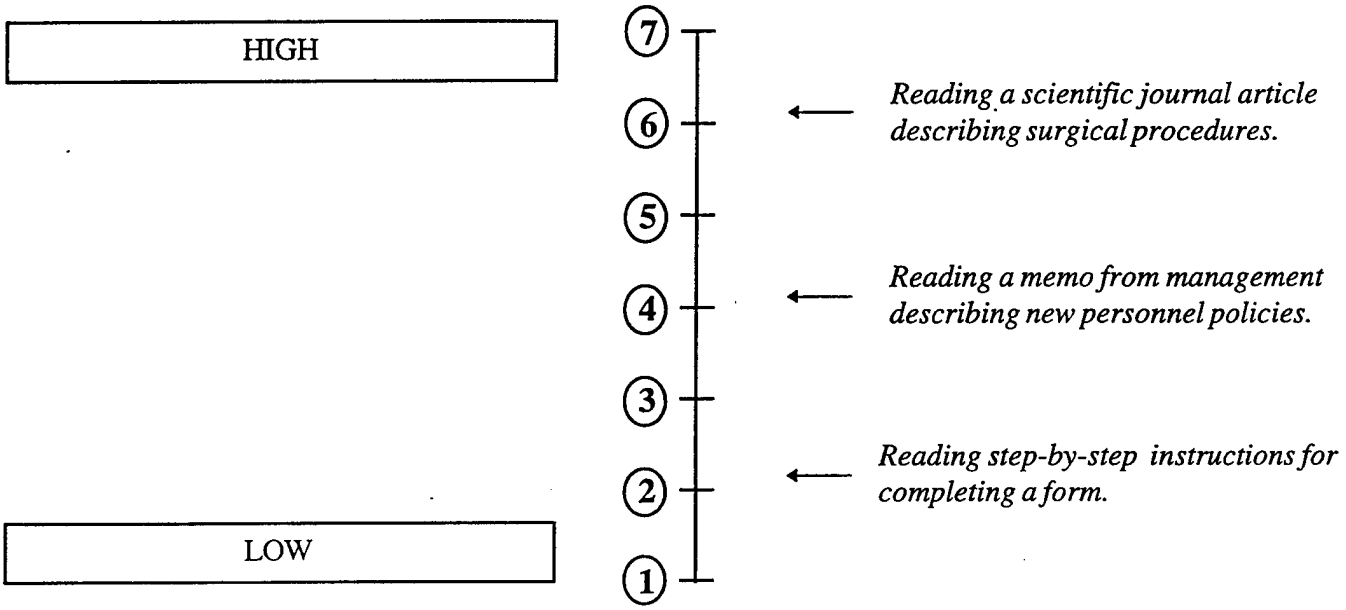
Skill	Level	Desire to Use
29. Programming		
30. Testing		
31. Operation Monitoring		
32. Operation and Control		
33. Product Inspection		
34. Equipment Maintenance		
35. Troubleshooting		
36. Repairing		
37. Visioning		
38. Systems Perception		
39. Identification of Downstream Consequences		
40. Identification of Key Causes		
41. Judgment and Decision Making		
42. Systems Evaluation		
43. Time Management		
44. Management of Financial Resources		
45. Management of Material Resources		
46. Management of Personnel Resources		

1. Reading Comprehension

Understanding sentences and paragraphs in written documents.

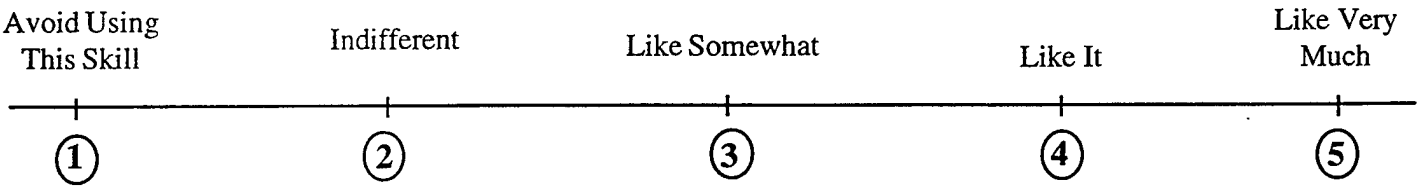
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

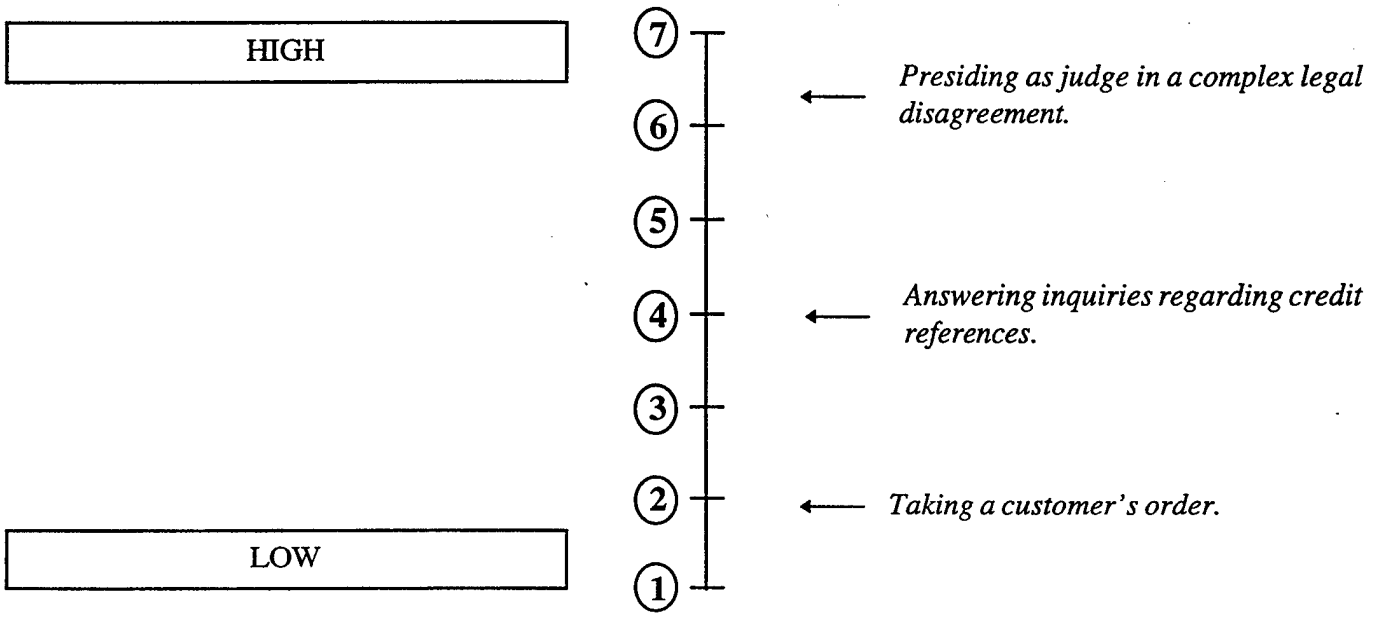


2. Active Listening

Listening to what other people are saying and asking questions as appropriate.

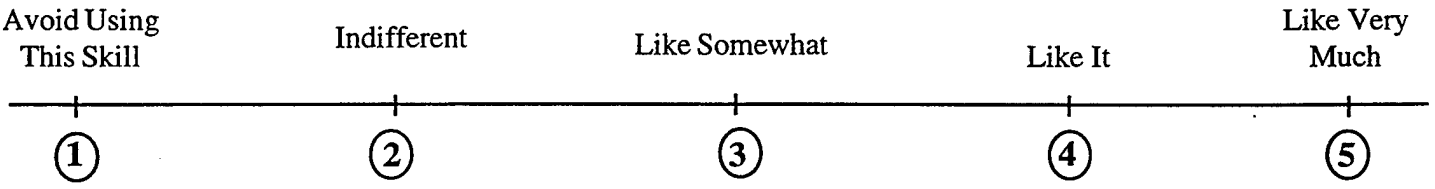
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

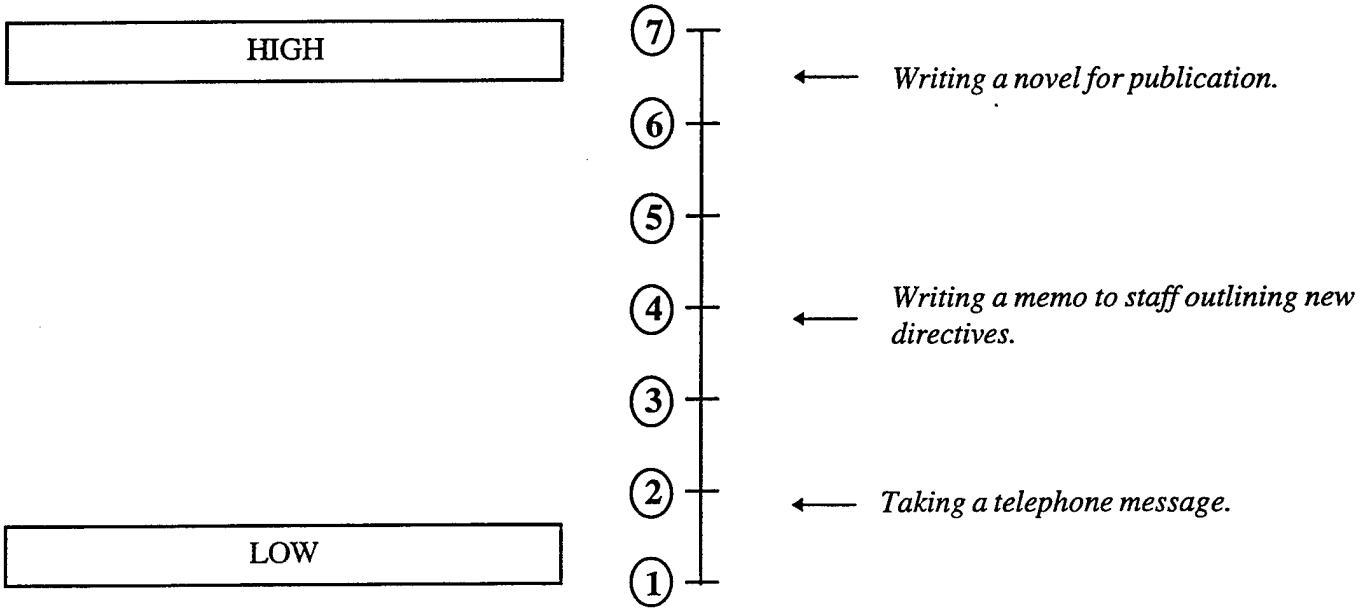


3. Writing

Communicating effectively with others in writing as indicated by the needs of the audience.

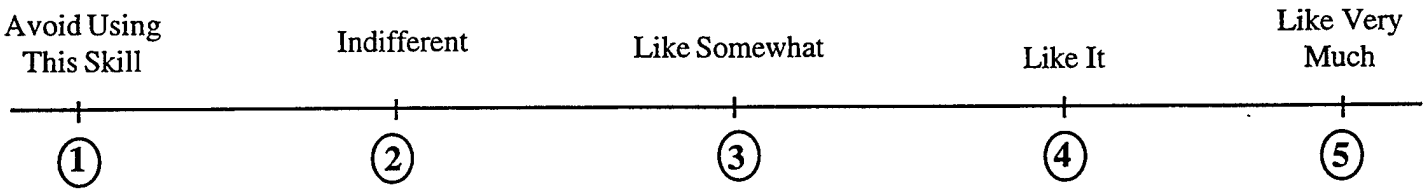
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

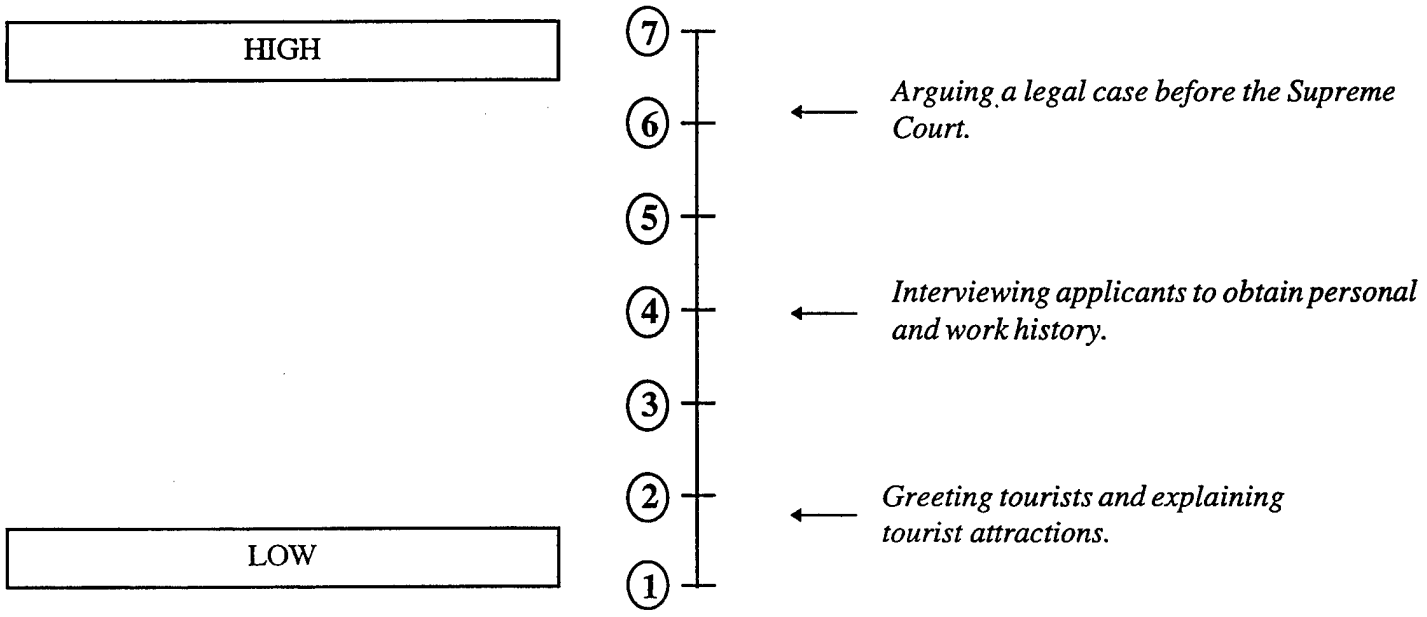


4. Speaking

Talking to others to effectively convey information.

Level

Choose the number that best describes your skill in this area.



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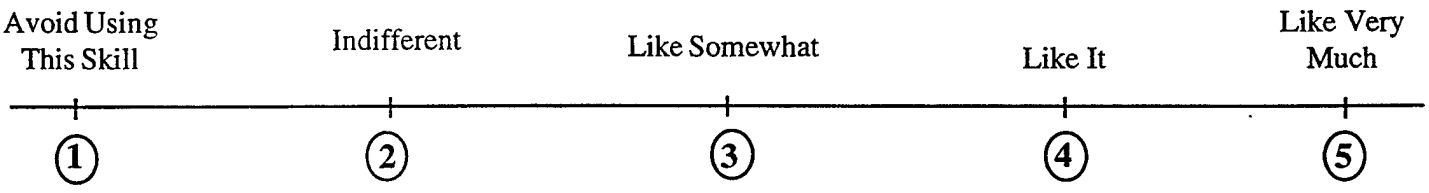
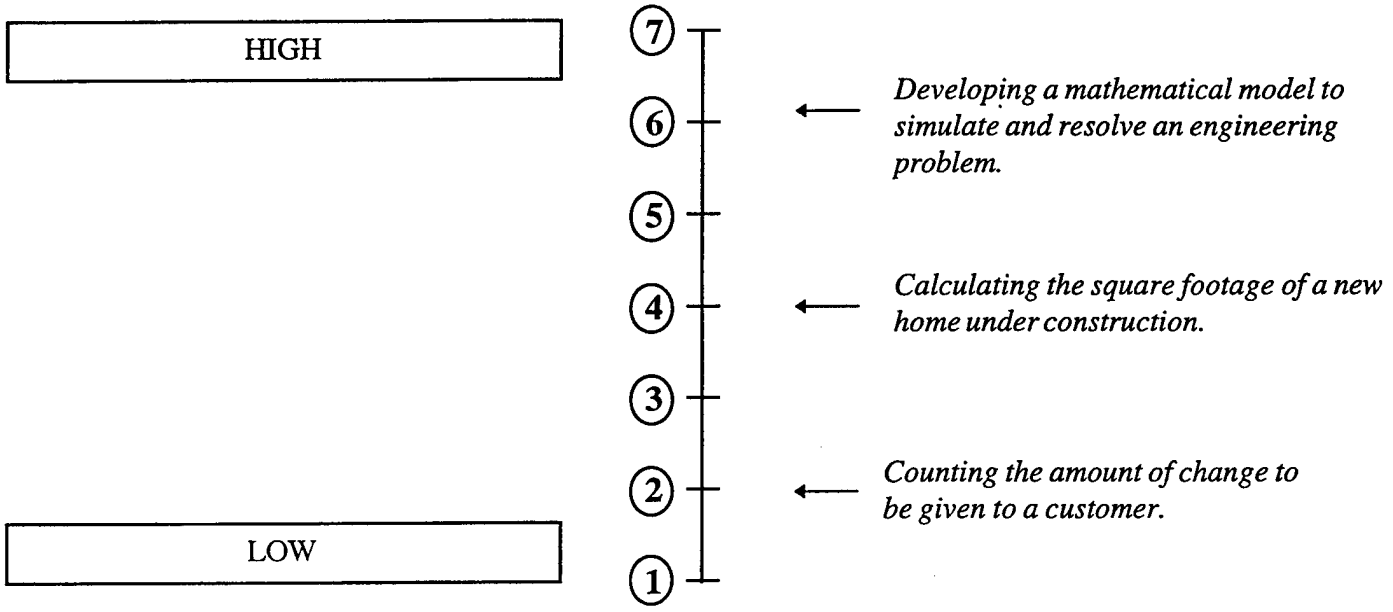


5. Mathematics

Using mathematics to solve problems.

Level

Choose the number that best describes your skill in this area.



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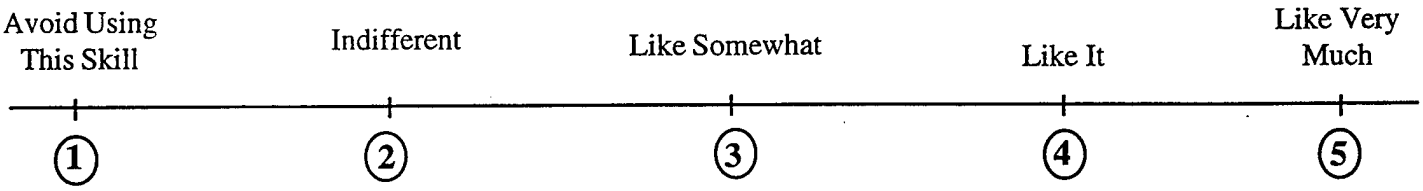
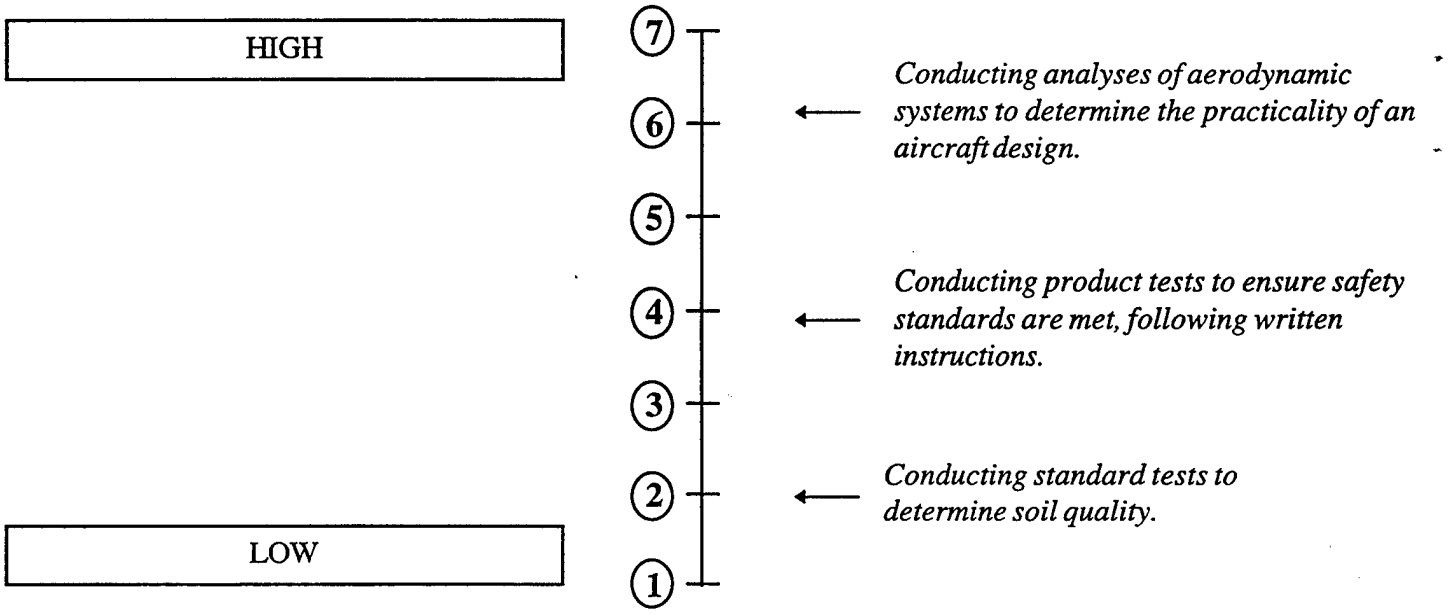


6. Science

Using scientific methods to solve problems.

Level

Choose the number that best describes your skill in this area.



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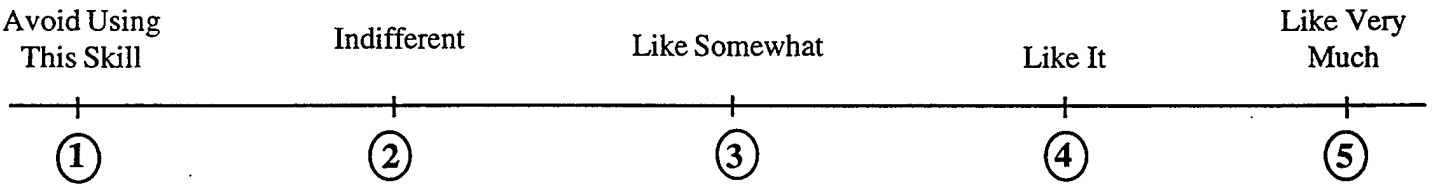
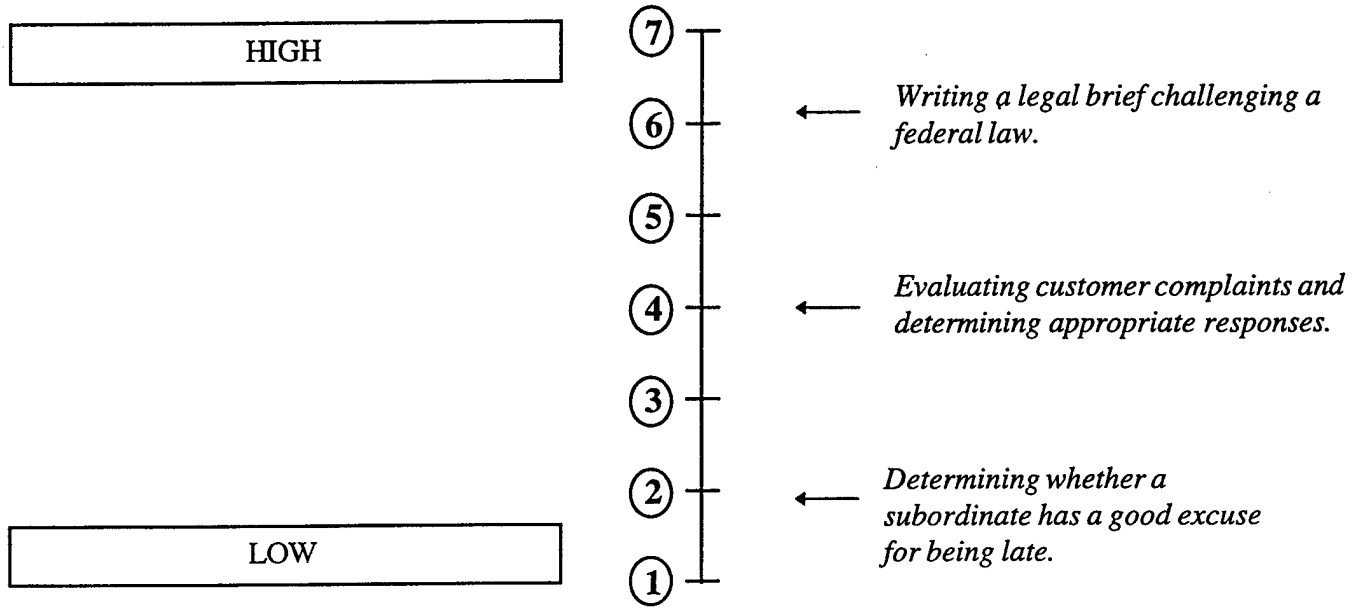


7. Critical Thinking

Using logic and analysis to identify the strengths and weaknesses of different approaches.

Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

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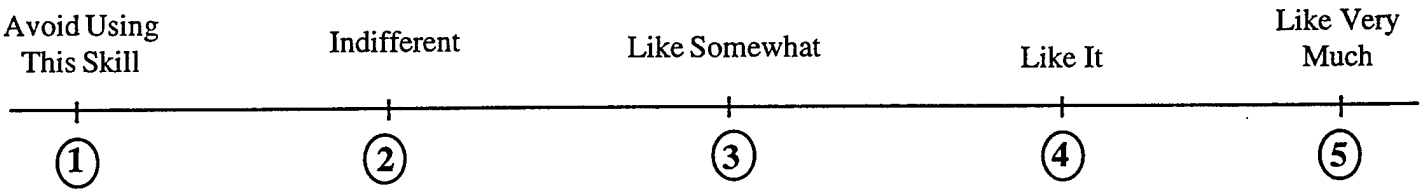
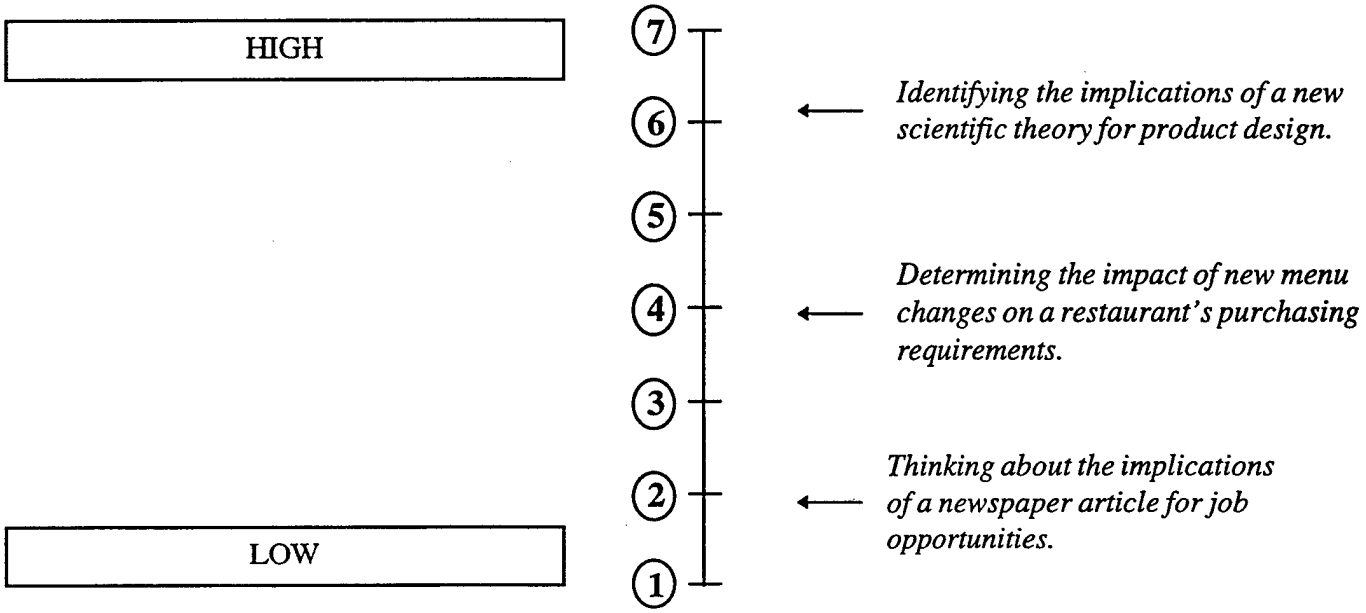


8. Active Learning

Working with new material or information to grasp its implications.

Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

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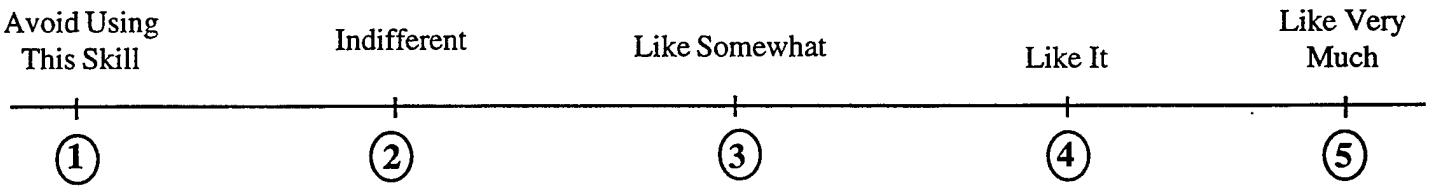
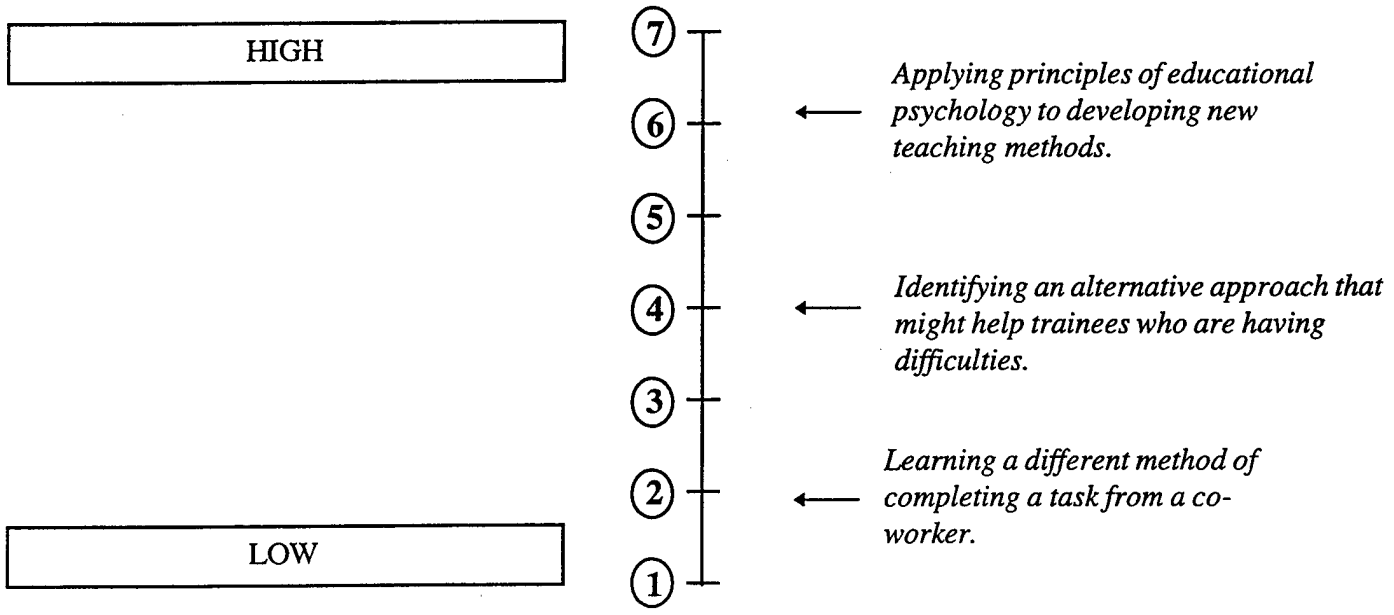


9. Learning Strategies

Using multiple approaches when learning or teaching new things.

Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

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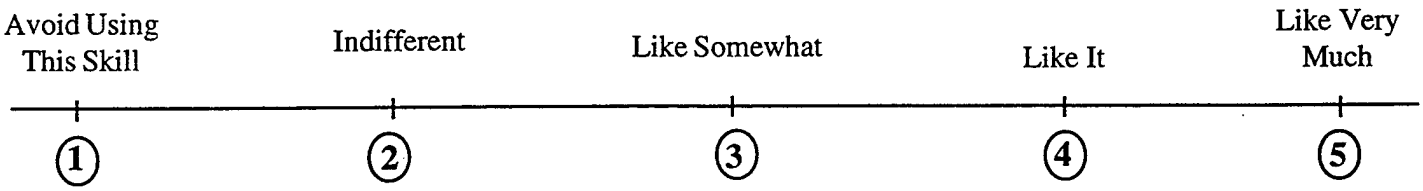
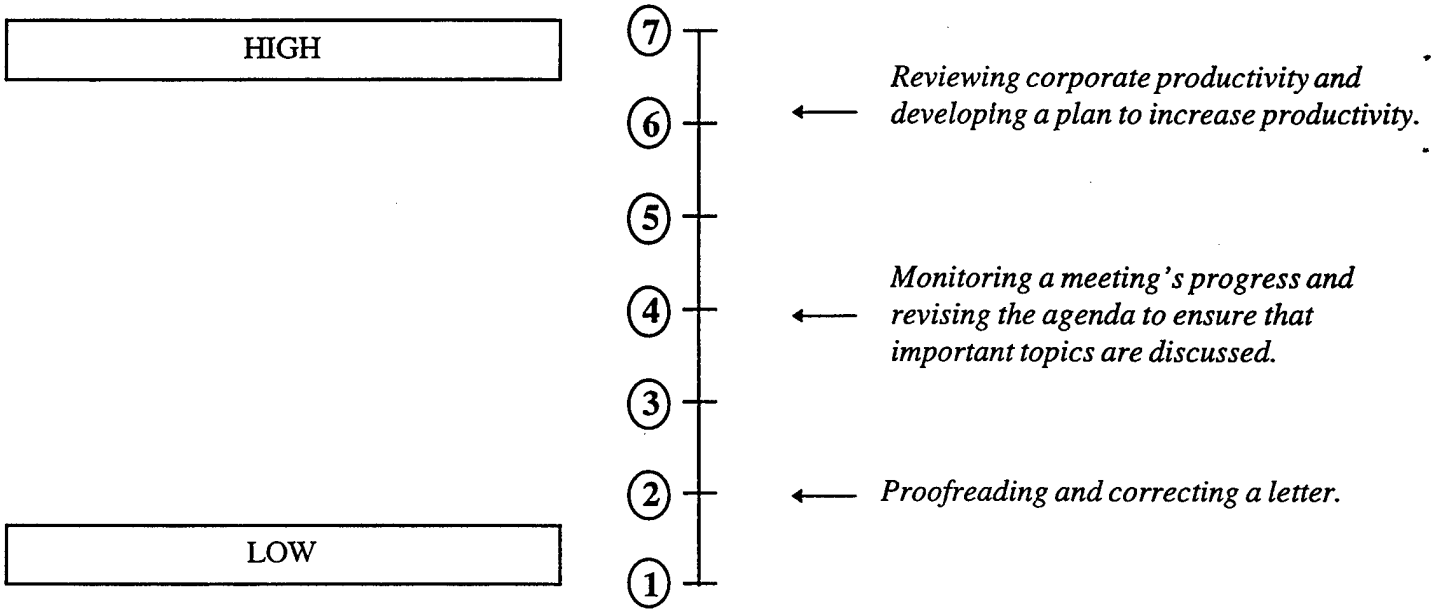


10. Monitoring

Assessing how well one is doing when learning or doing something.

Level

Choose the number that best describes your skill in this area.



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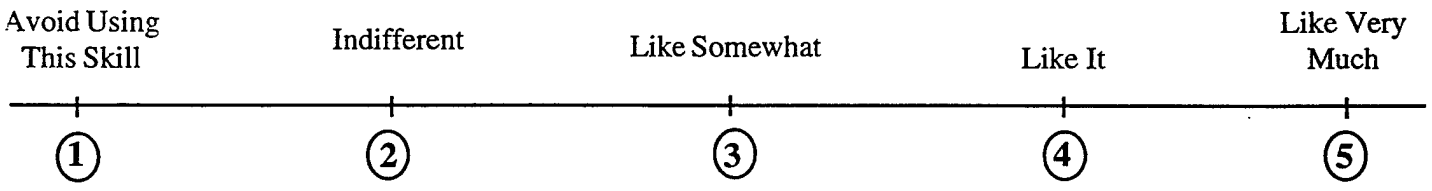
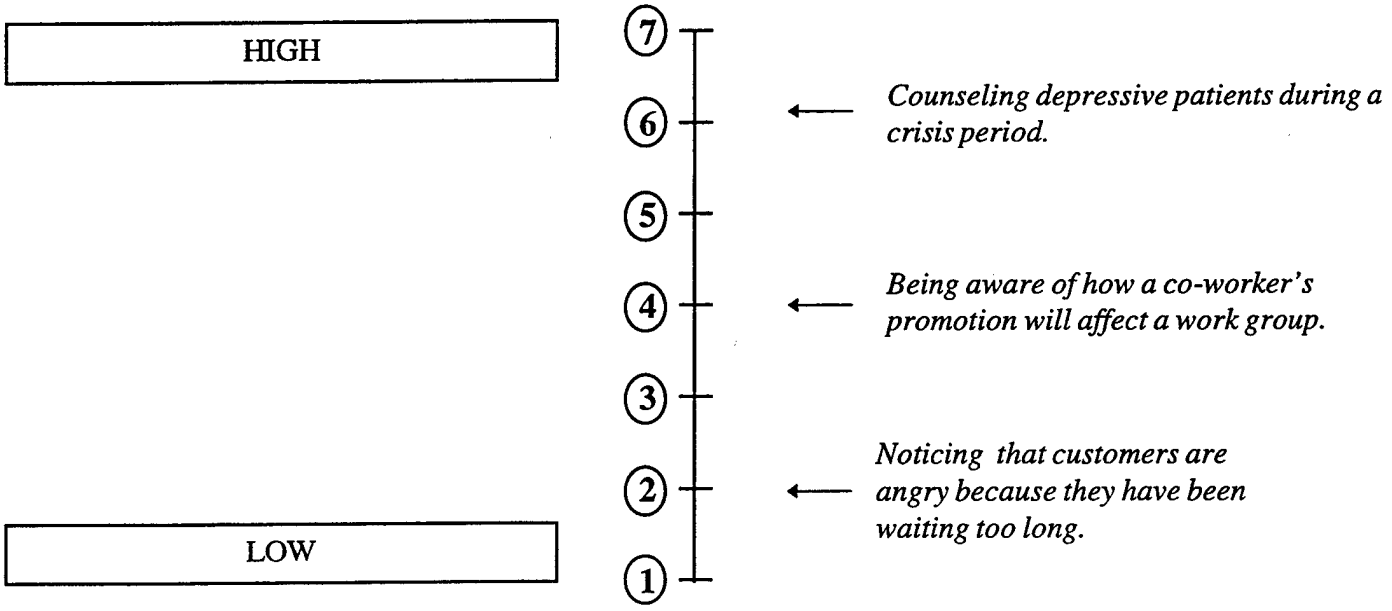


11. Social Perceptiveness

Being aware of others' reactions and understanding why they react the way they do.

Level

Choose the number that best describes your skill in this area.



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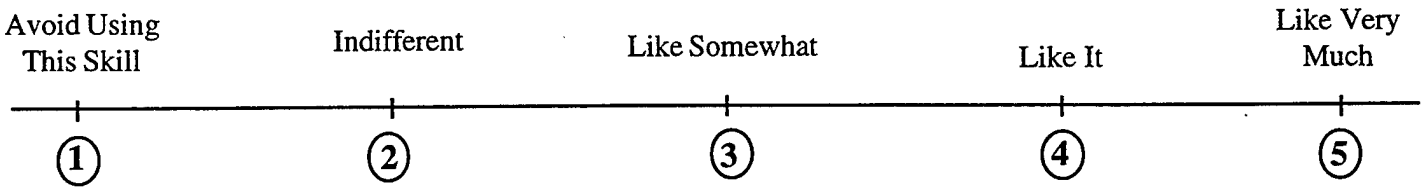
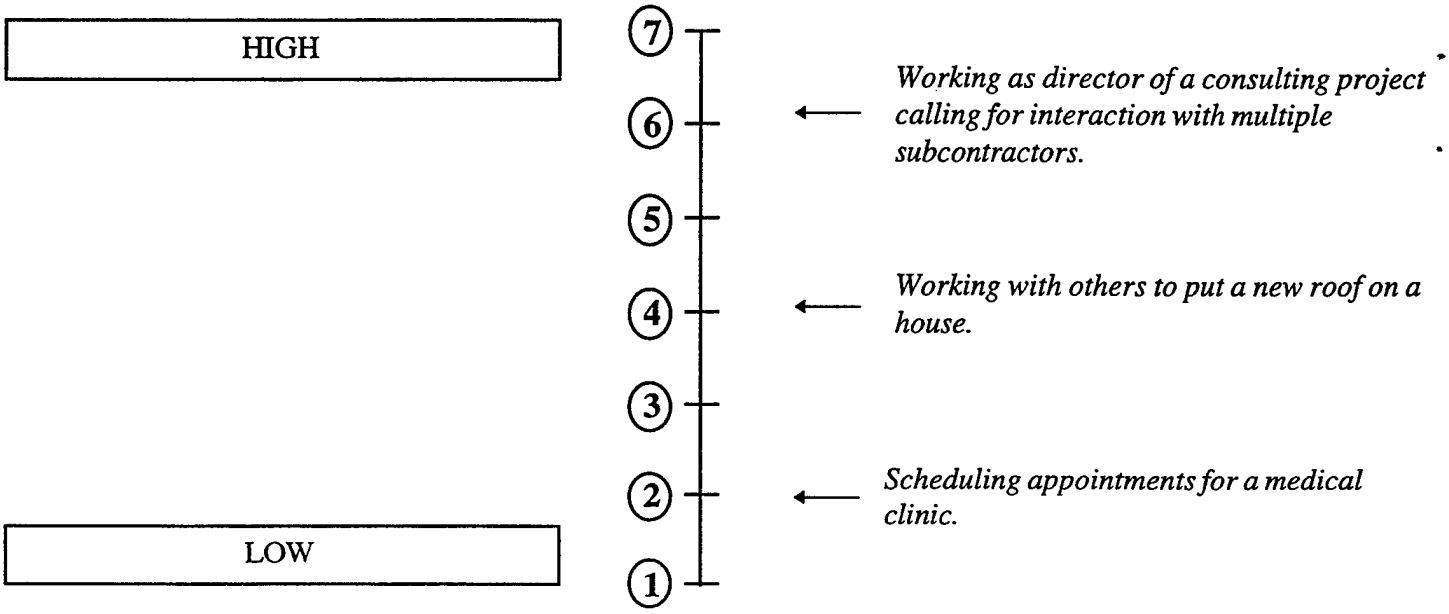


12. Coordination

Adjusting actions in relation to others' actions.

Level

Choose the number that best describes your skill in this area.



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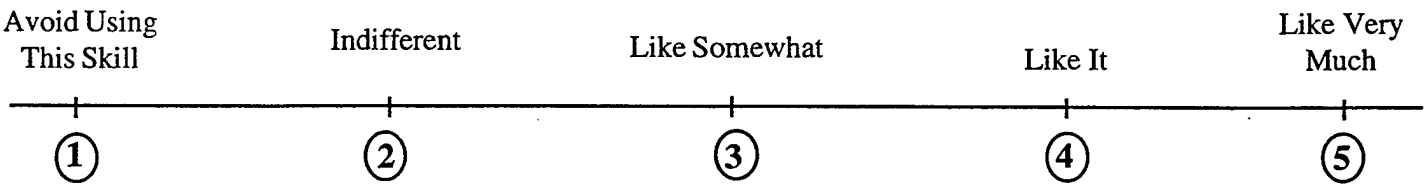
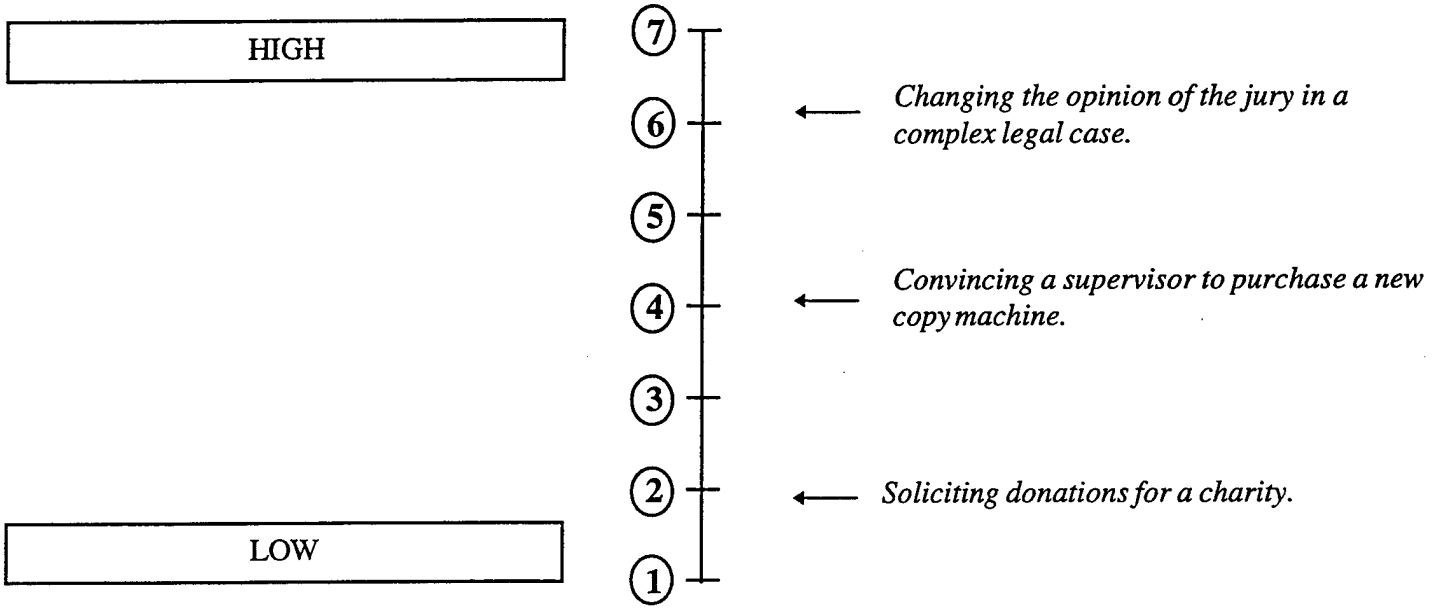


13. Persuasion

Persuading others to approach things differently.

Level

Choose the number that best describes your skill in this area.



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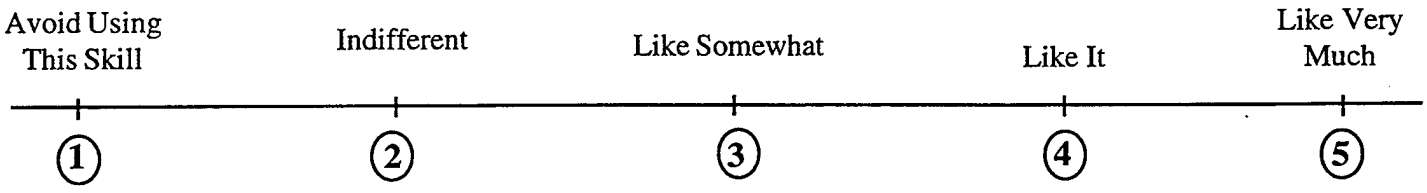
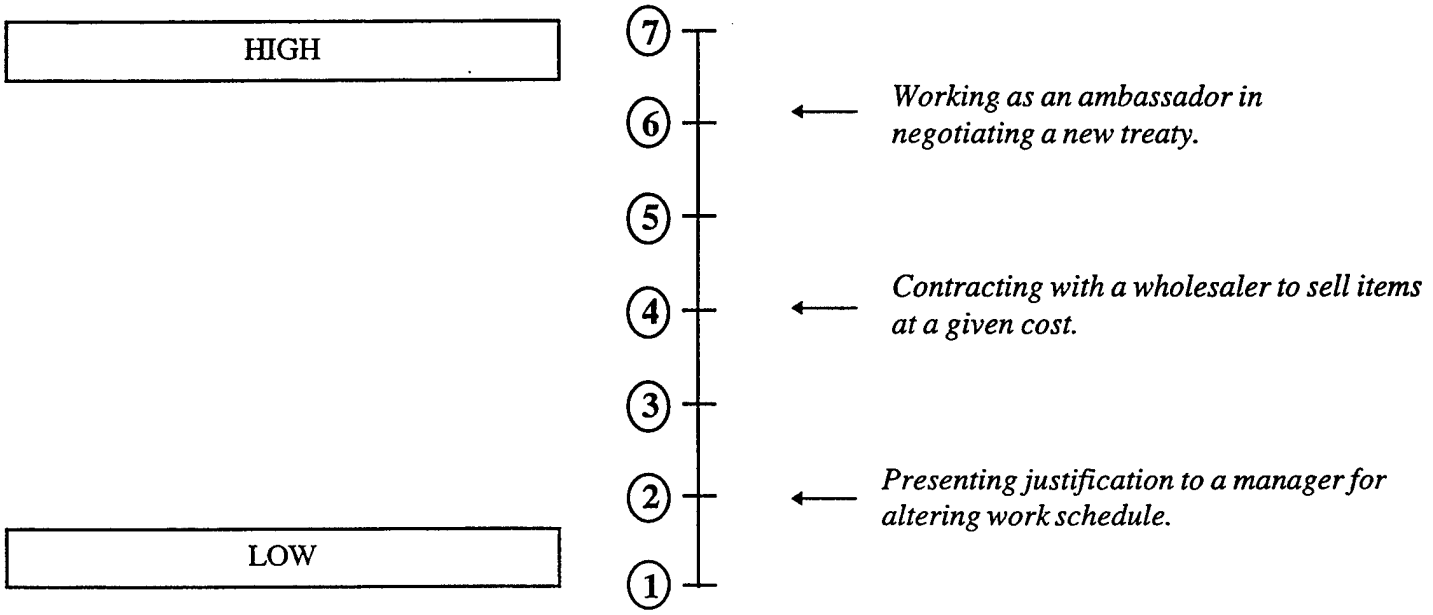


14. Negotiation

Bringing others together and trying to reconcile differences.

Level

Choose the number that best describes your skill in this area.



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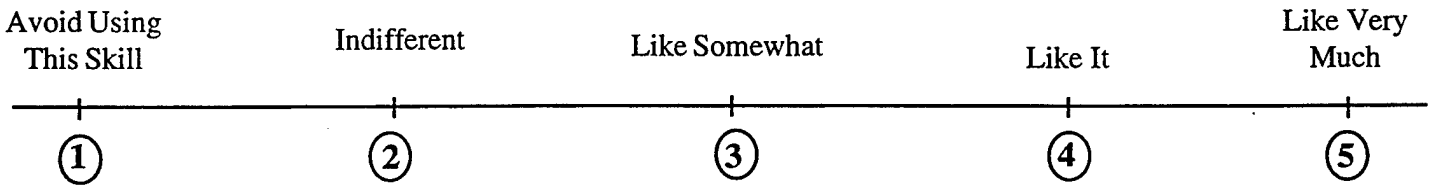
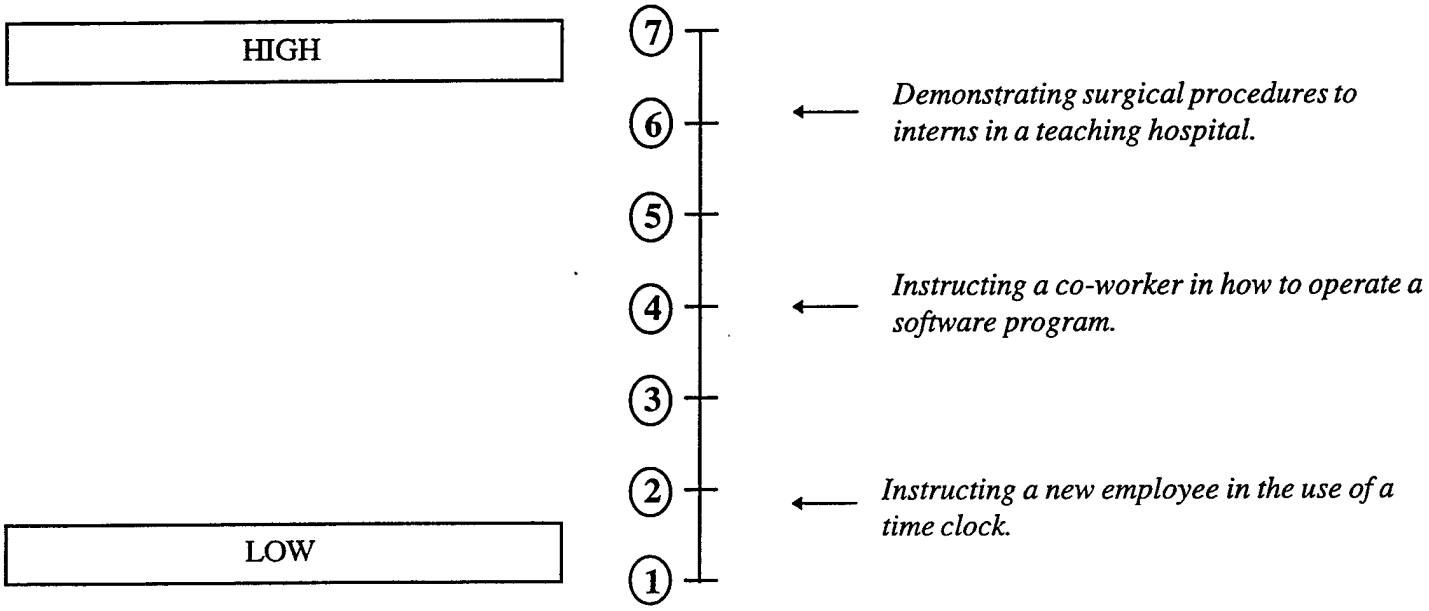


15. Instructing

Teaching others how to do something.

Level

Choose the number that best describes your skill in this area.



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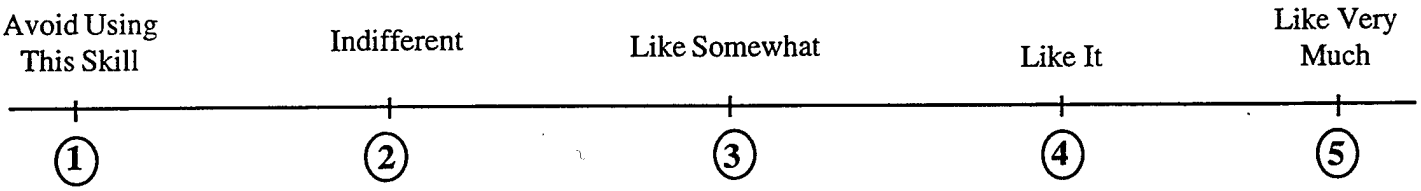
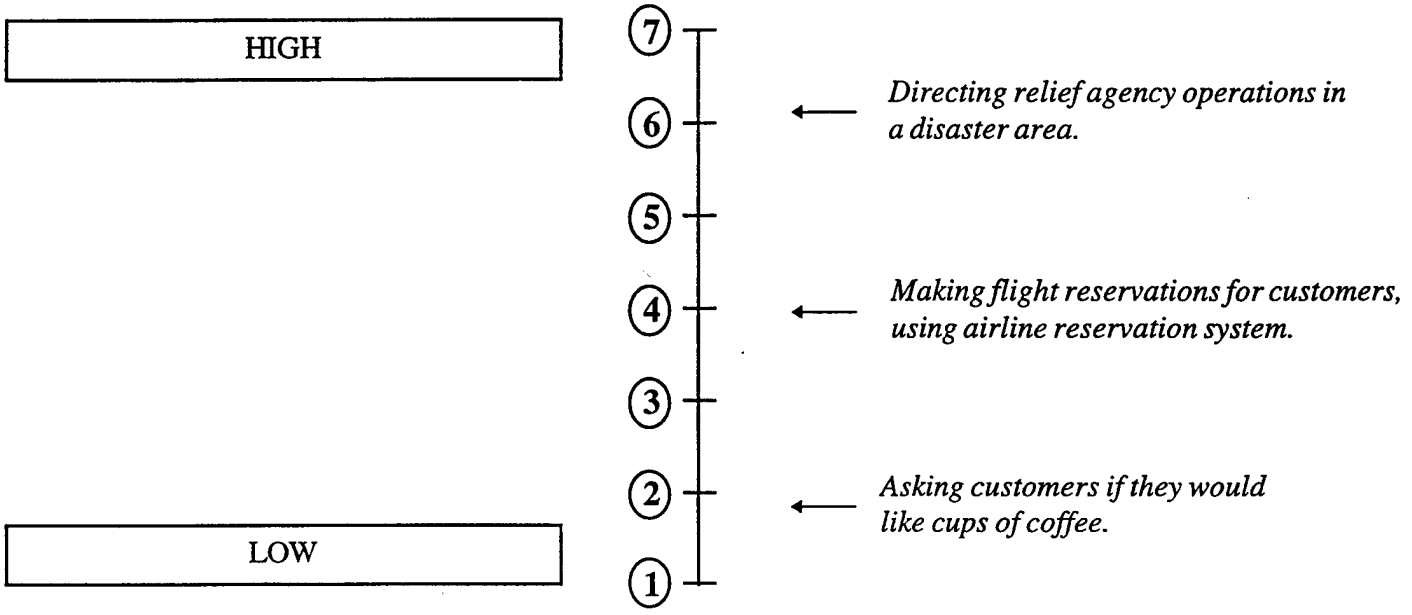


16. Service Orientation

Actively looking for ways to help people.

Level

Choose the number that best describes your skill in this area.



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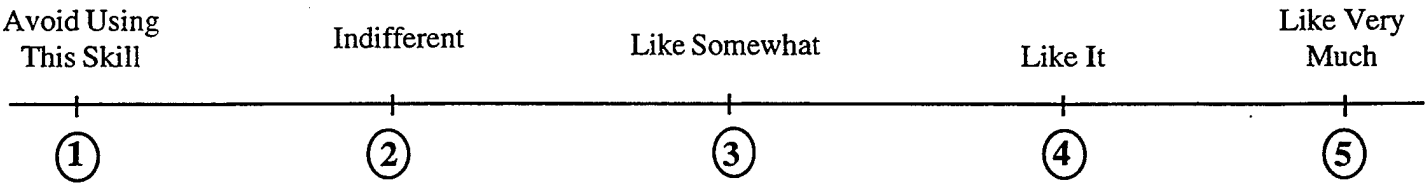
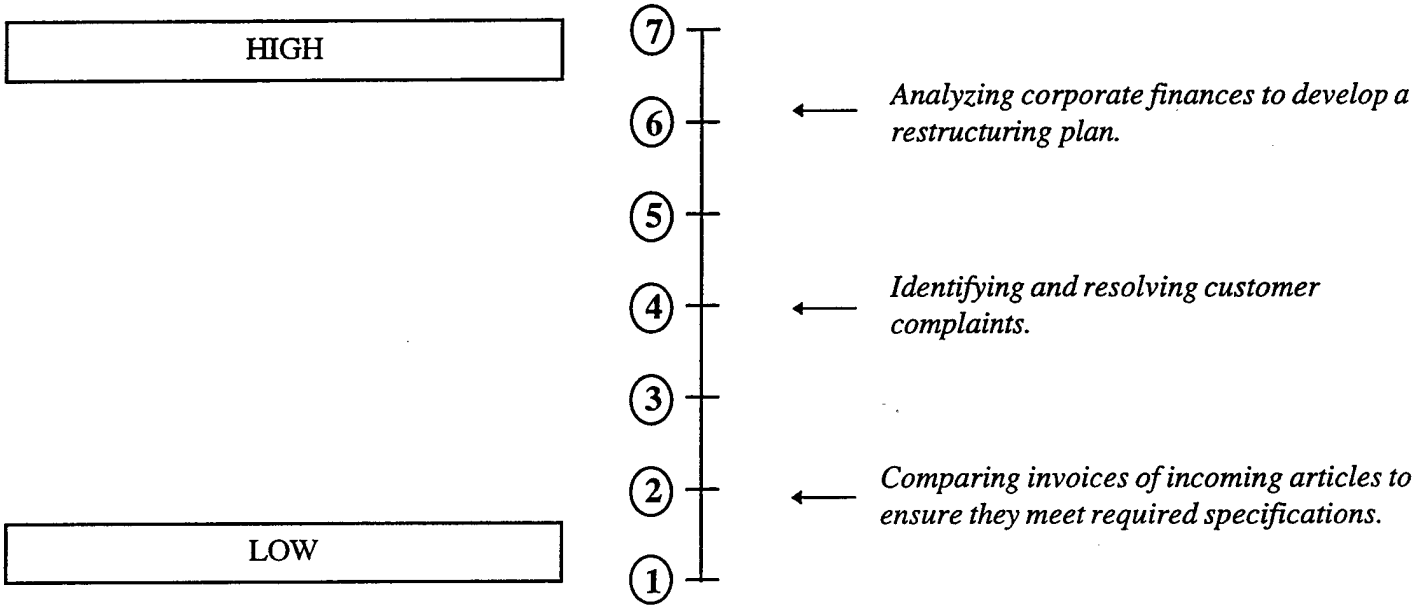


17. Problem Identification

Identifying the nature of problems.

Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

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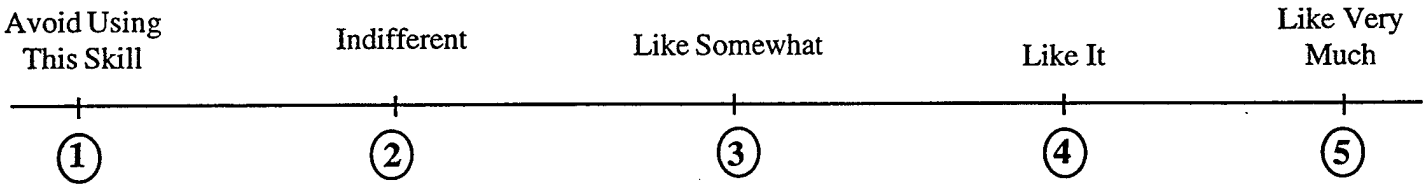
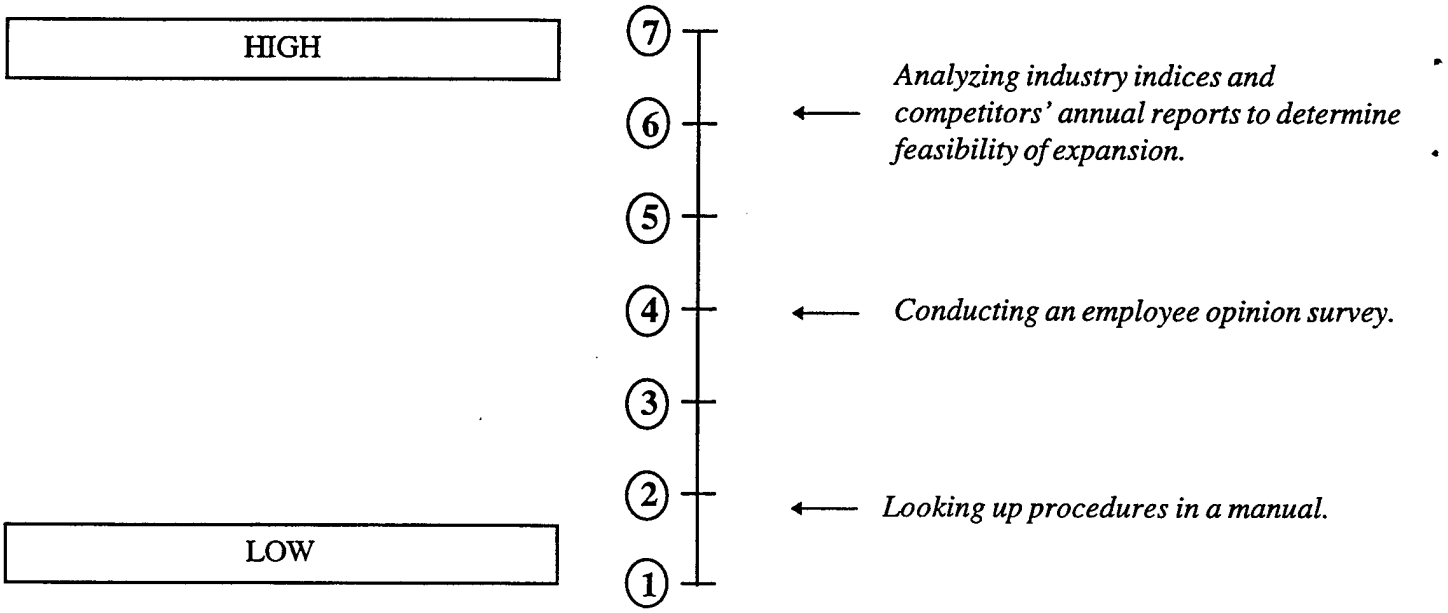


18. Information Gathering

Knowing how to find information and identifying essential information.

Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

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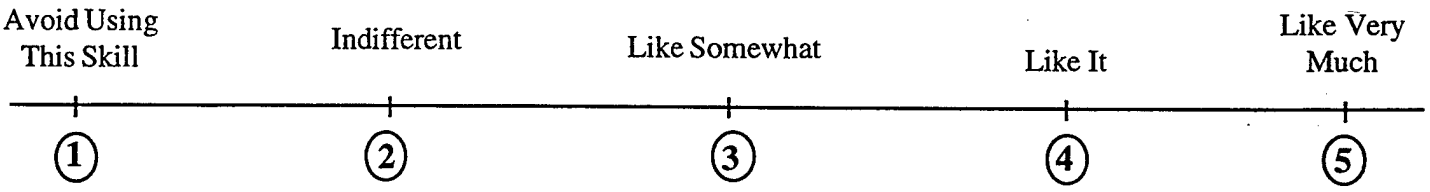
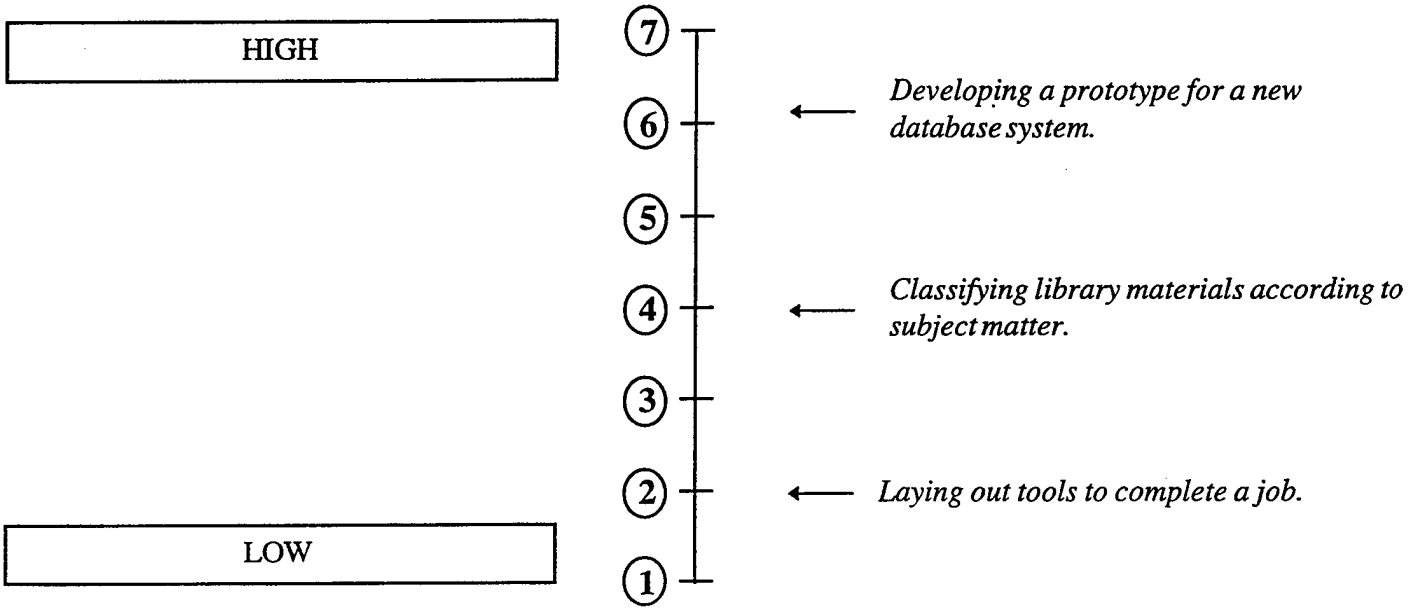


19. Information Organization

Finding ways to structure or classify multiple pieces of information.

Level

Choose the number that best describes your skill in this area.



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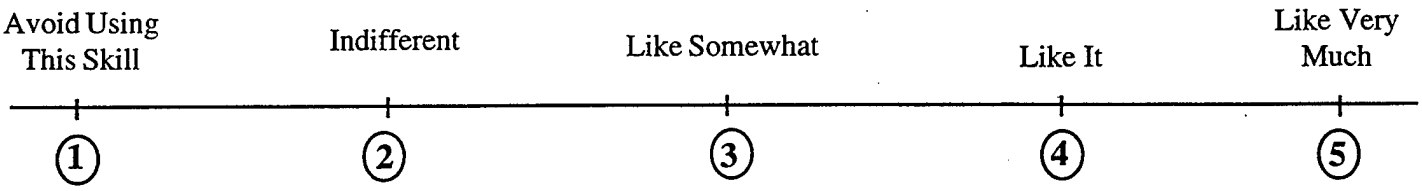
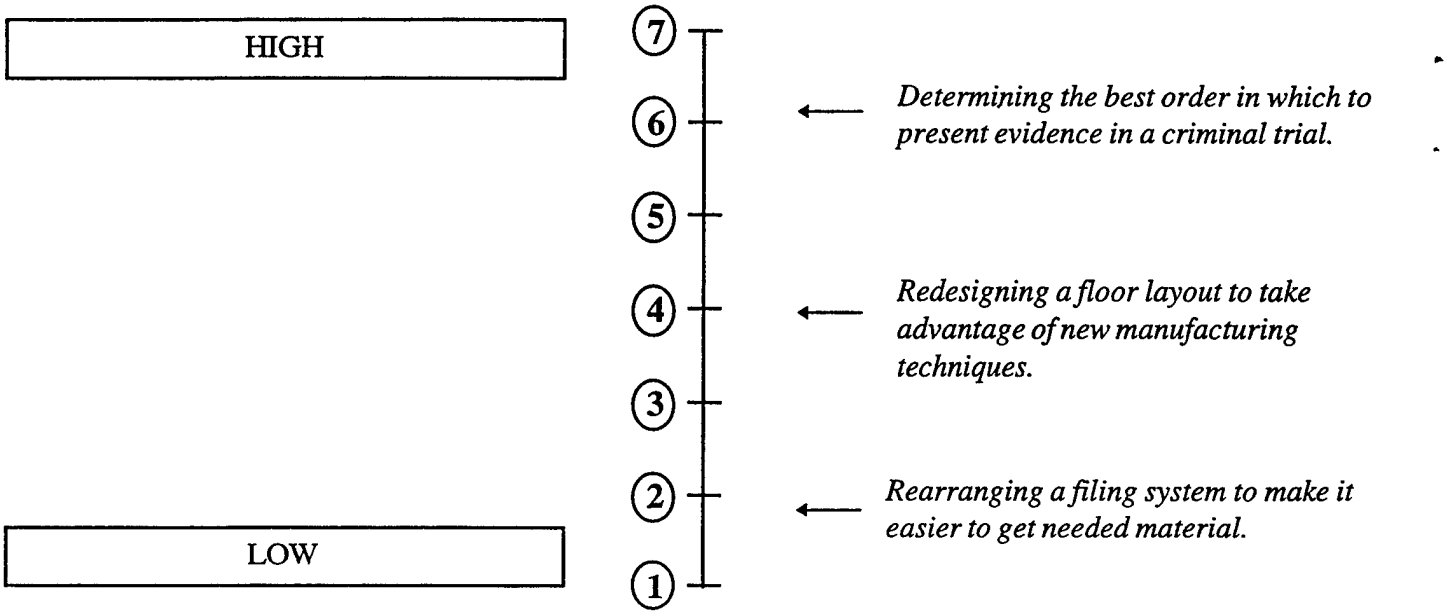


20. Synthesis/ Reorganization

Reorganizing information to get a better approach to problems or tasks.

Level

Choose the number that best describes your skill in this area.



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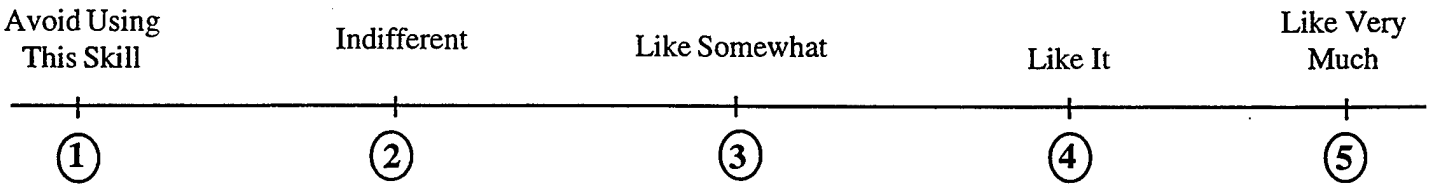
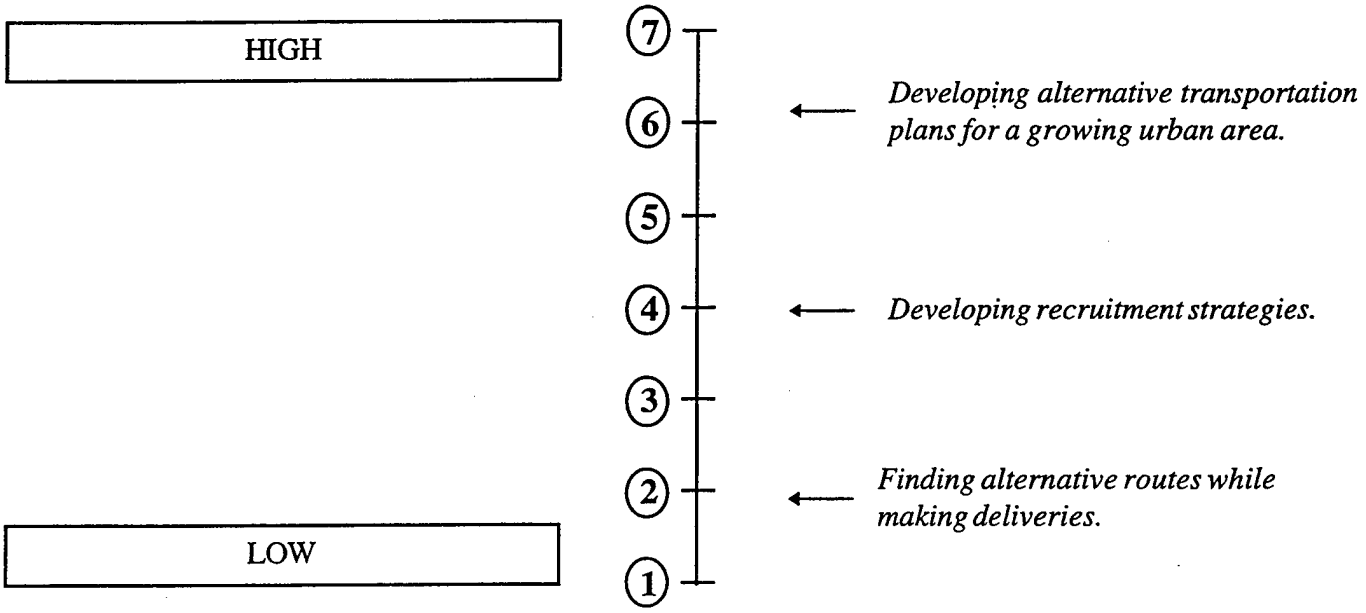


21. Idea Generation

Generating a number of different approaches to problems.

Level

Choose the number that best describes your skill in this area.



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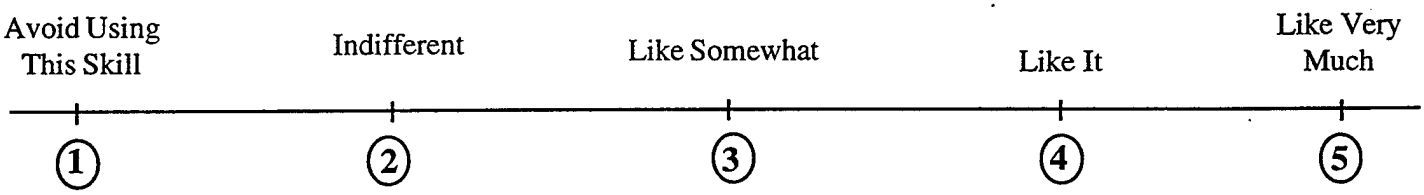
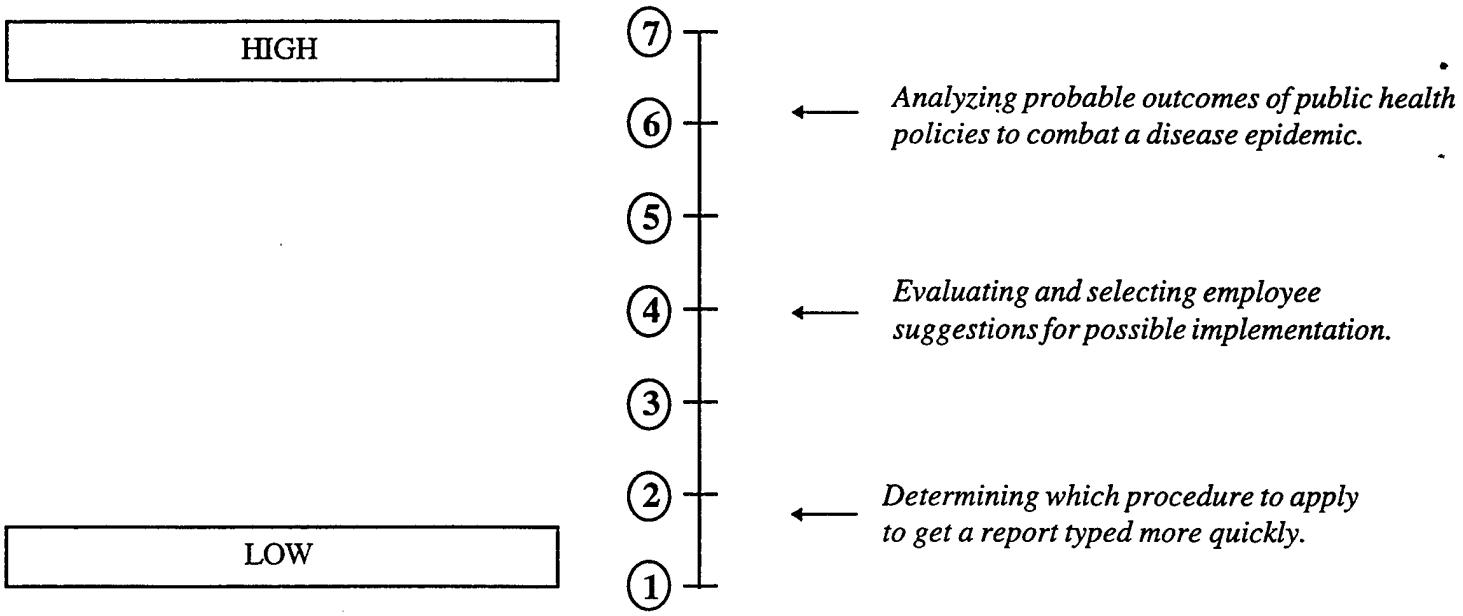


22. Idea Evaluation

Evaluating the likely success of an idea in relation to the demands of the situation.

Level

Choose the number that best describes your skill in this area.



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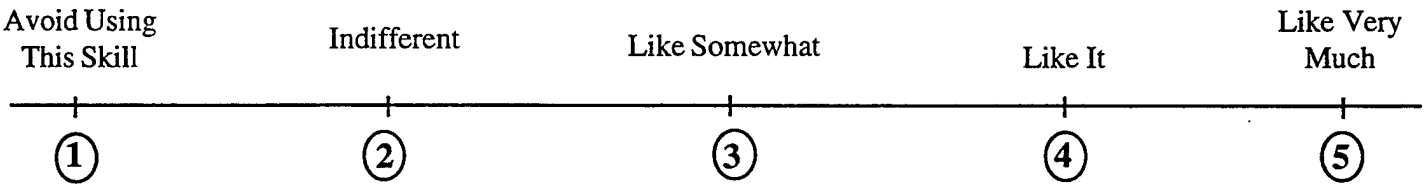
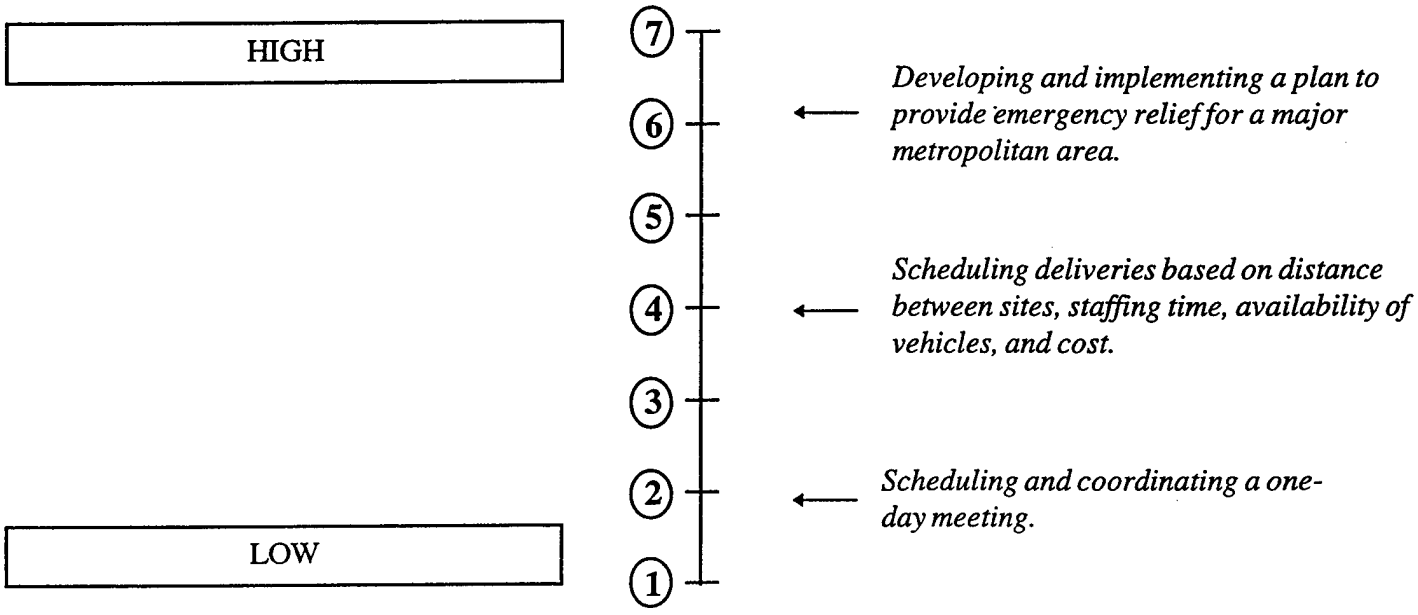


23. Implementation Planning

Developing approaches for implementing an idea.

Level

Choose the number that best describes your skill in this area.



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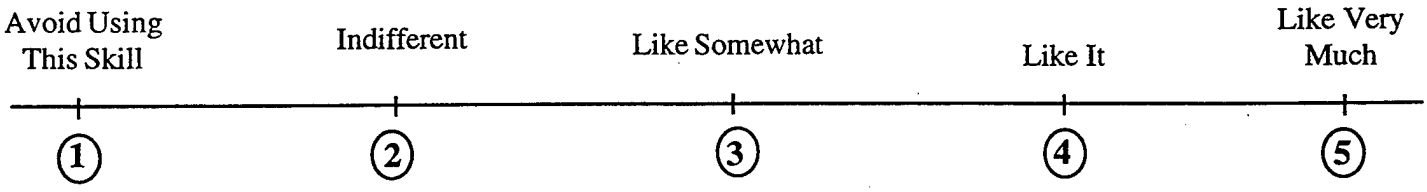
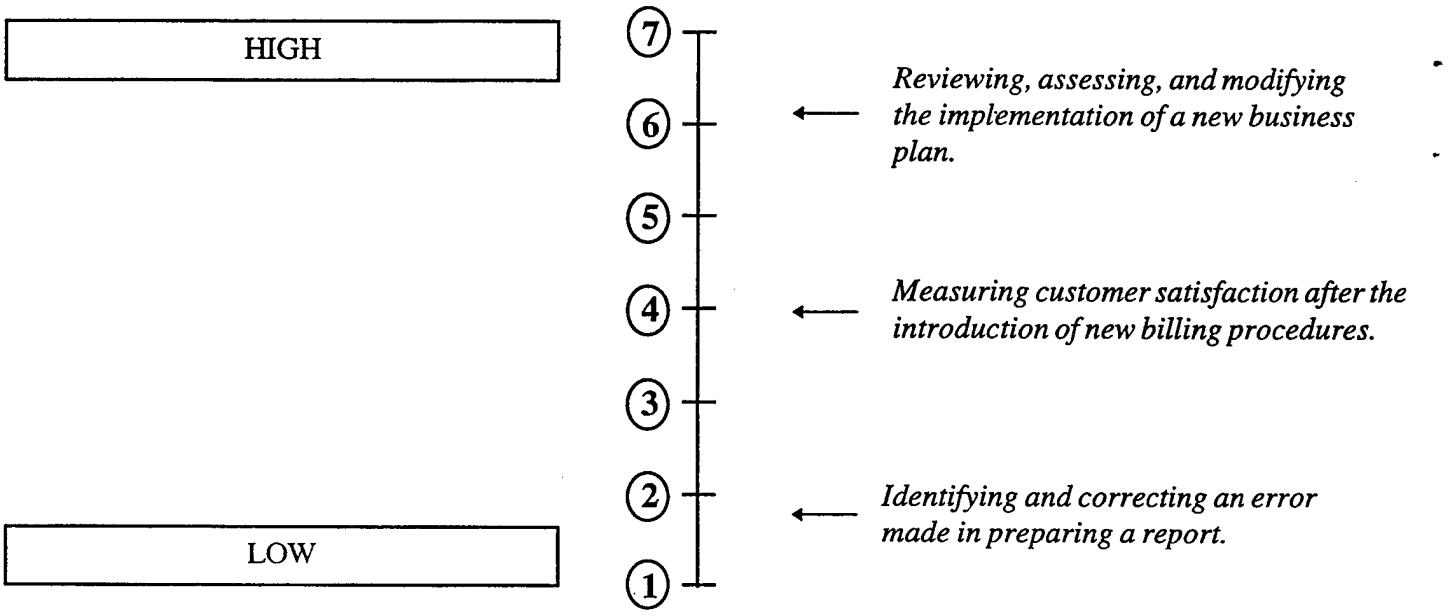


24. Solution Appraisal

Observing and evaluating the outcomes of a problem solution to identify lessons learned or to redirect efforts.

Level

Choose the number that best describes your skill in this area.



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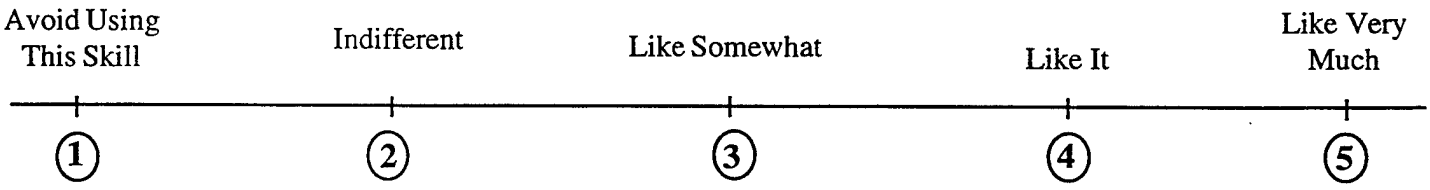
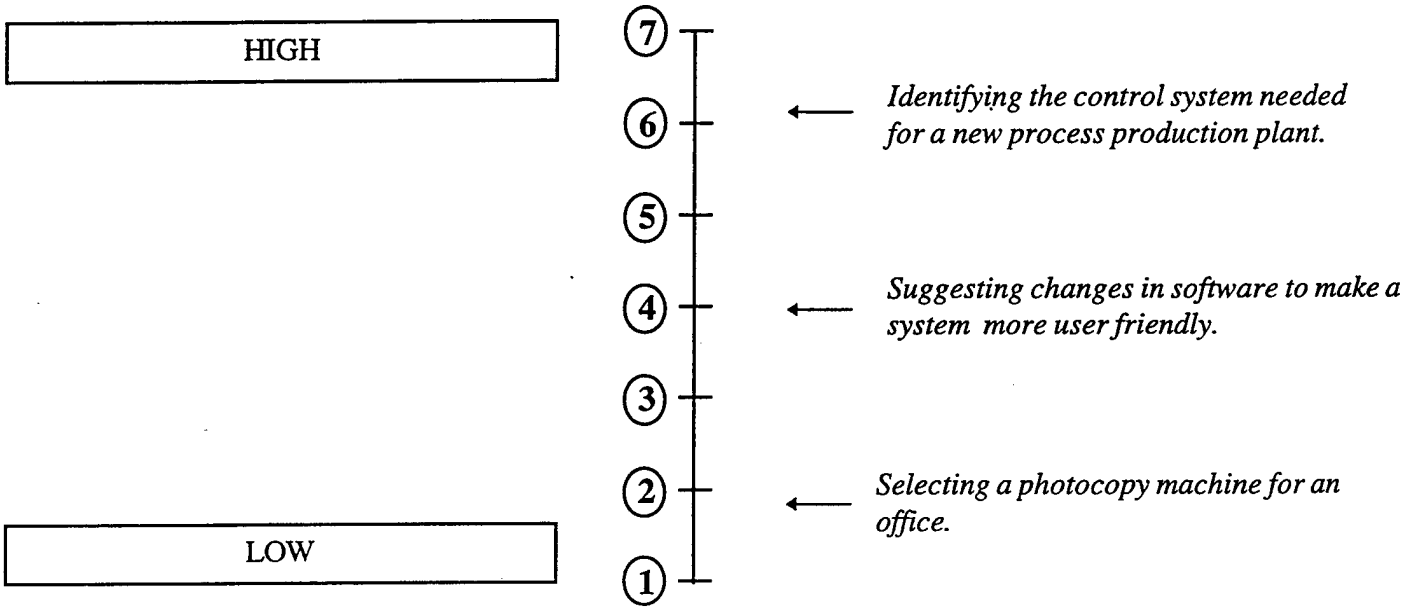


25. Operations Analysis

Analyzing needs and product requirements to create a design.

Level

Choose the number that best describes your skill in this area.



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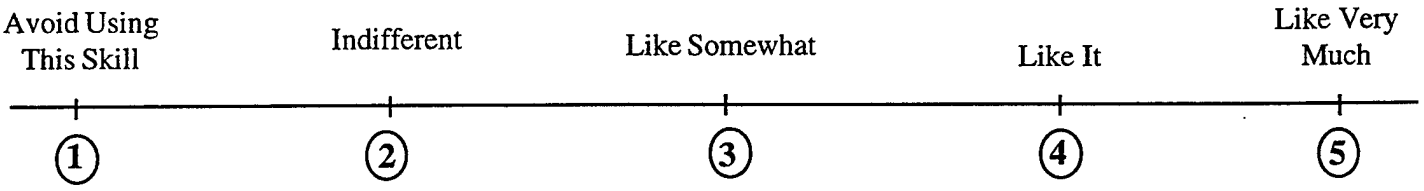
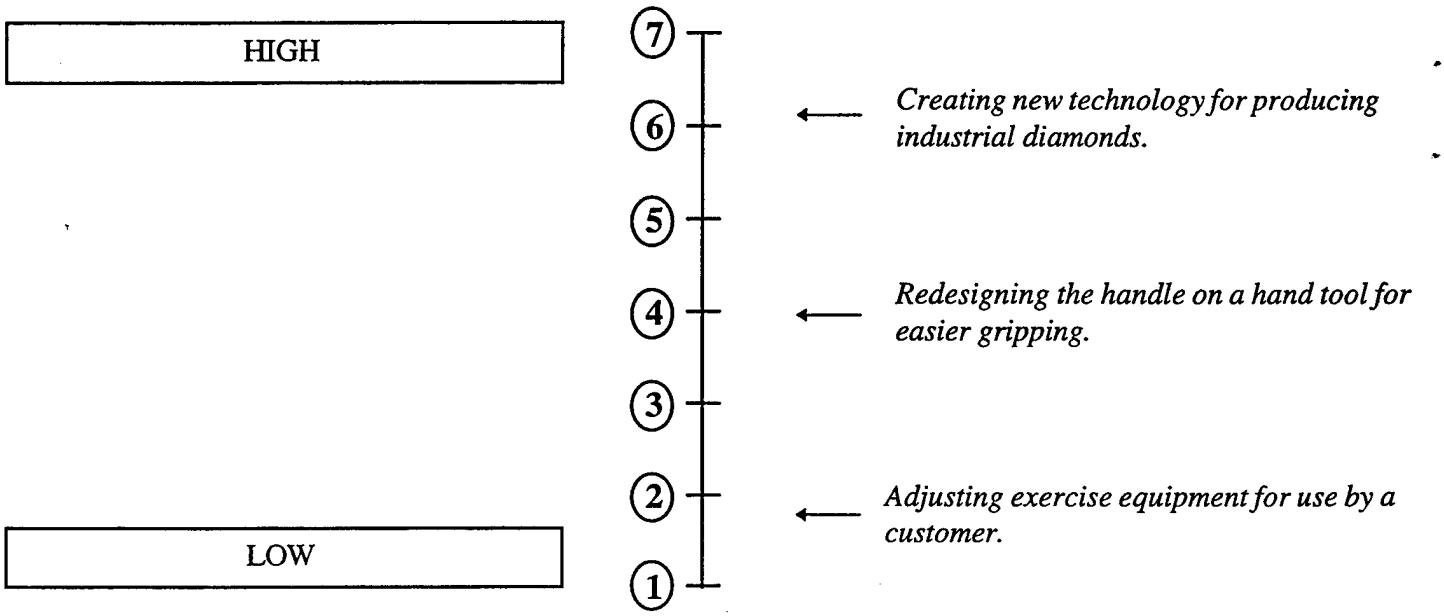


26. Technology Design

Generating or adapting equipment and technology to serve user needs.

Level

Choose the number that best describes your skill in this area.



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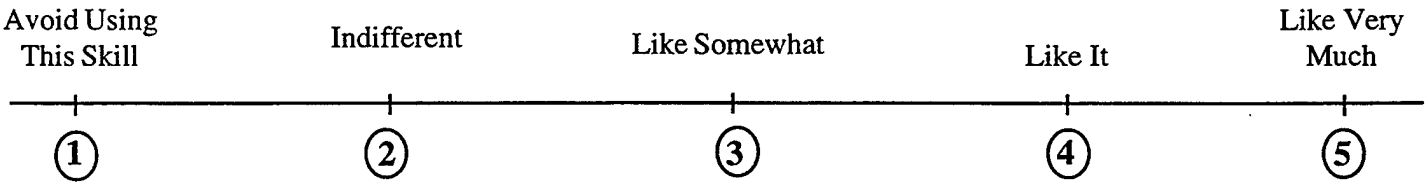
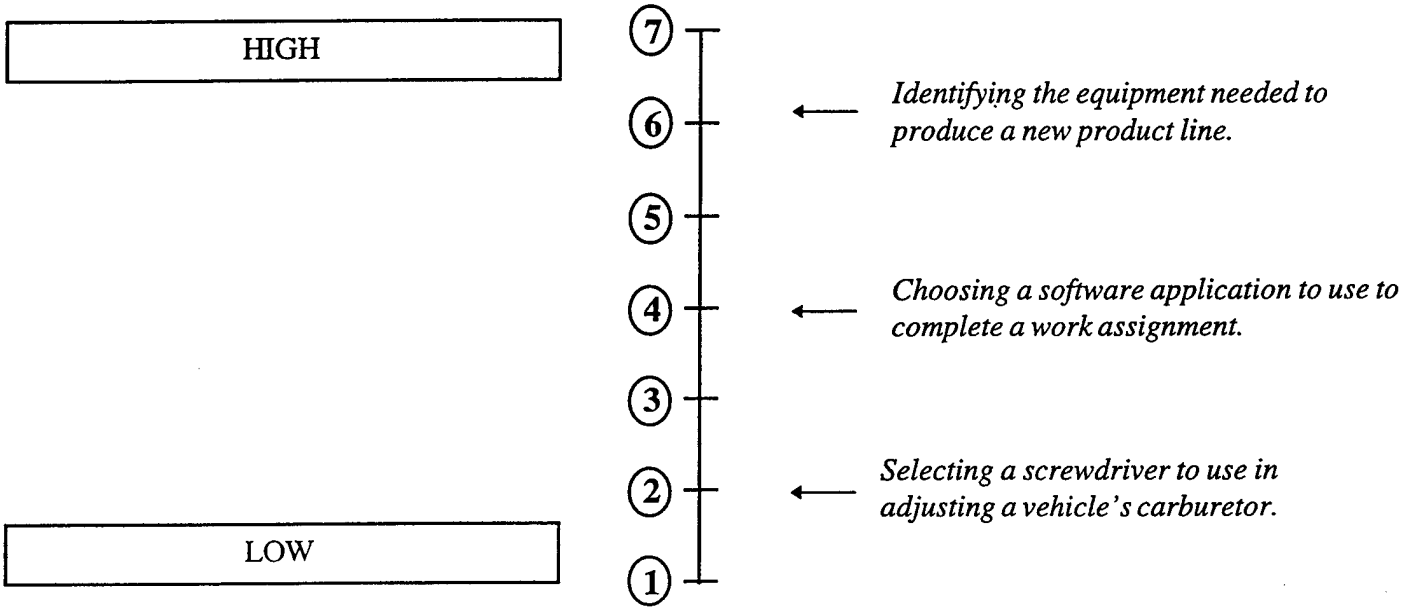


27. Equipment Selection

Determining the kind of tools and equipment needed to do a job.

Level

Choose the number that best describes your skill in this area.



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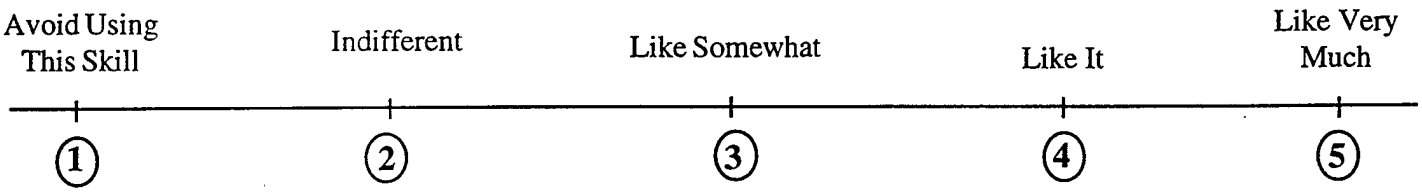
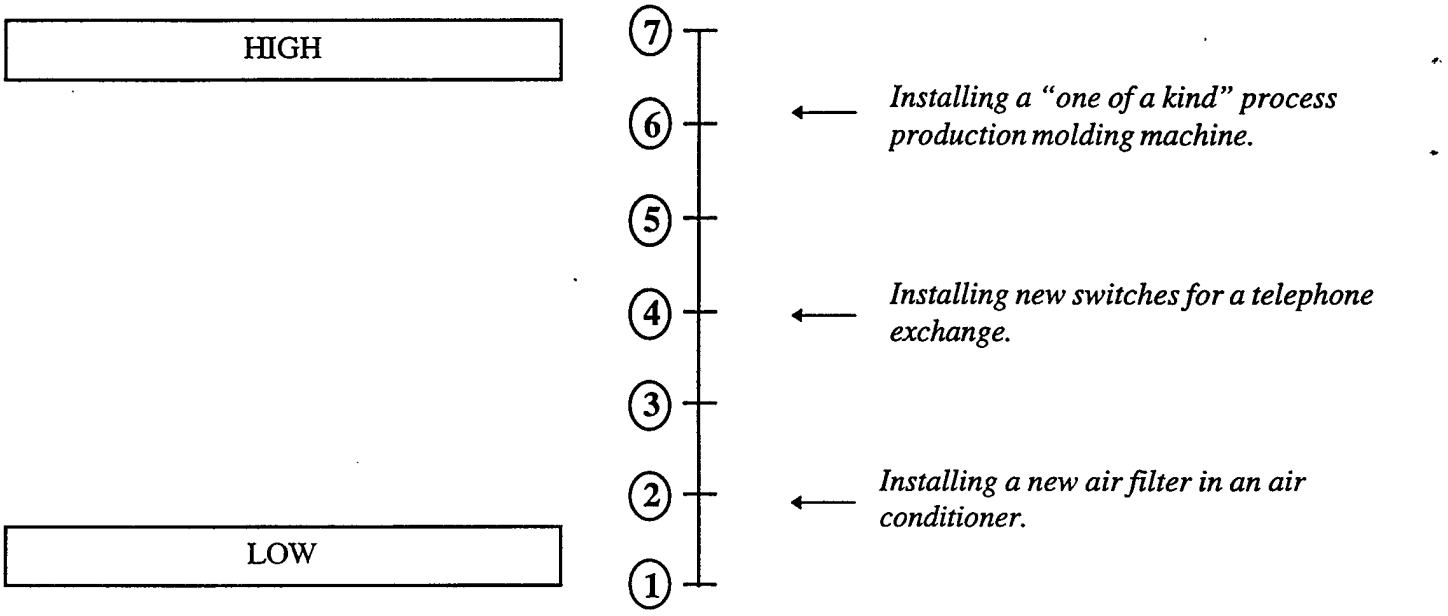


28. Installation

Installing equipment, machines, wiring, or programs to meet specifications.

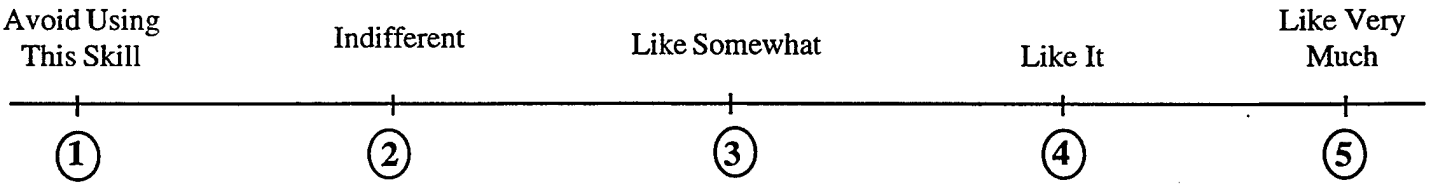
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

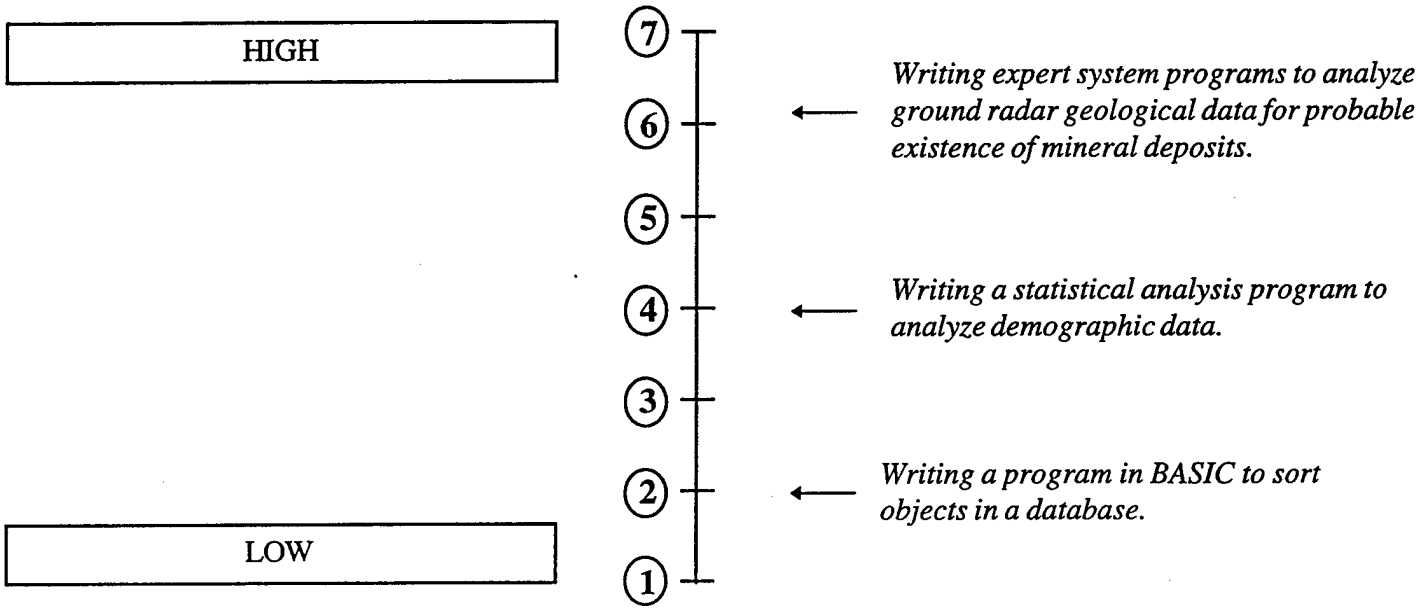


29. Programming

Writing computer programs for various purposes.

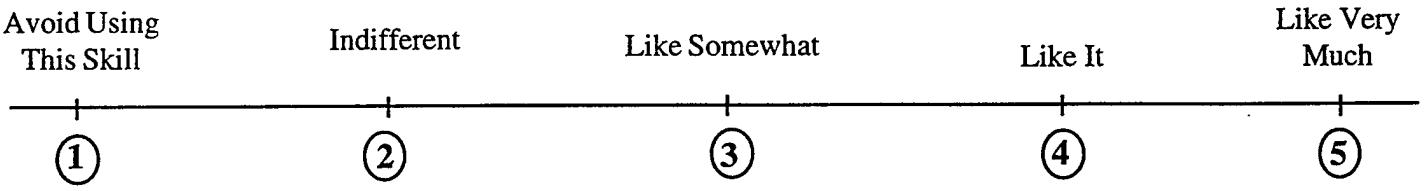
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

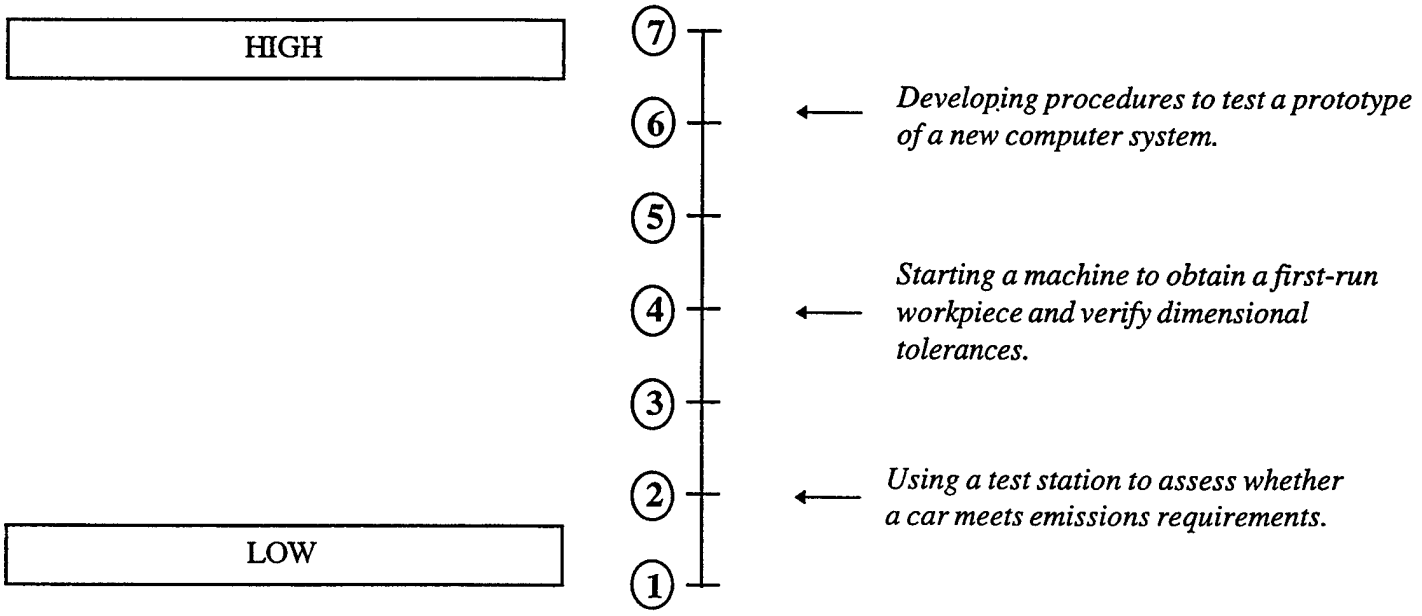


30. Testing

Conducting tests to determine whether equipment, software, or procedures are operating as expected.

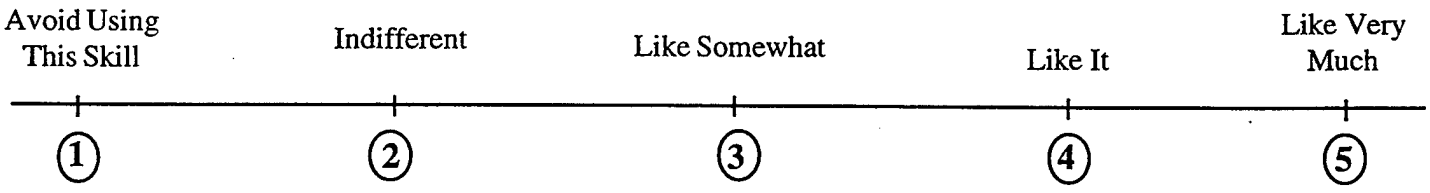
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

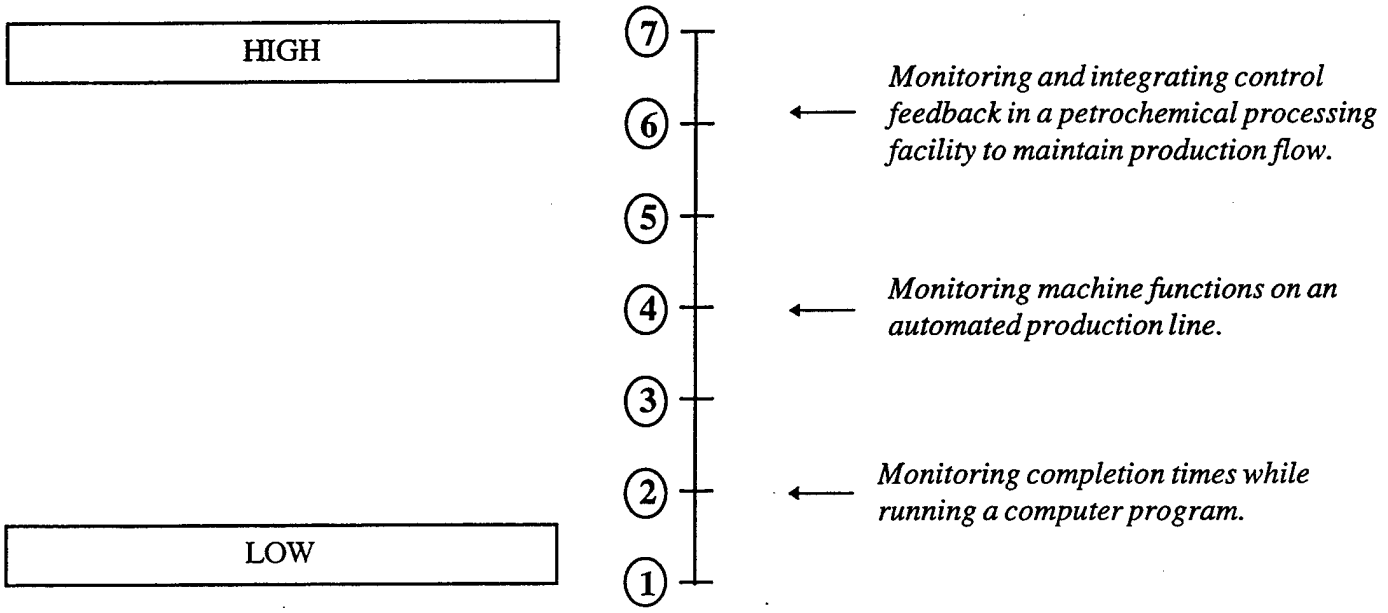


31. Operation Monitoring

Watching gauges, dials, or other indicators to make sure a machine is working properly.

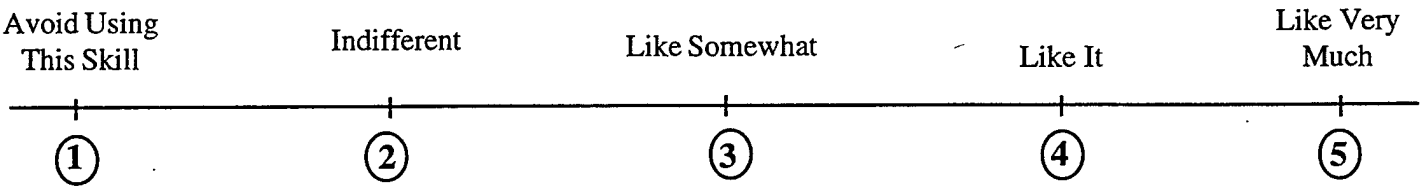
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

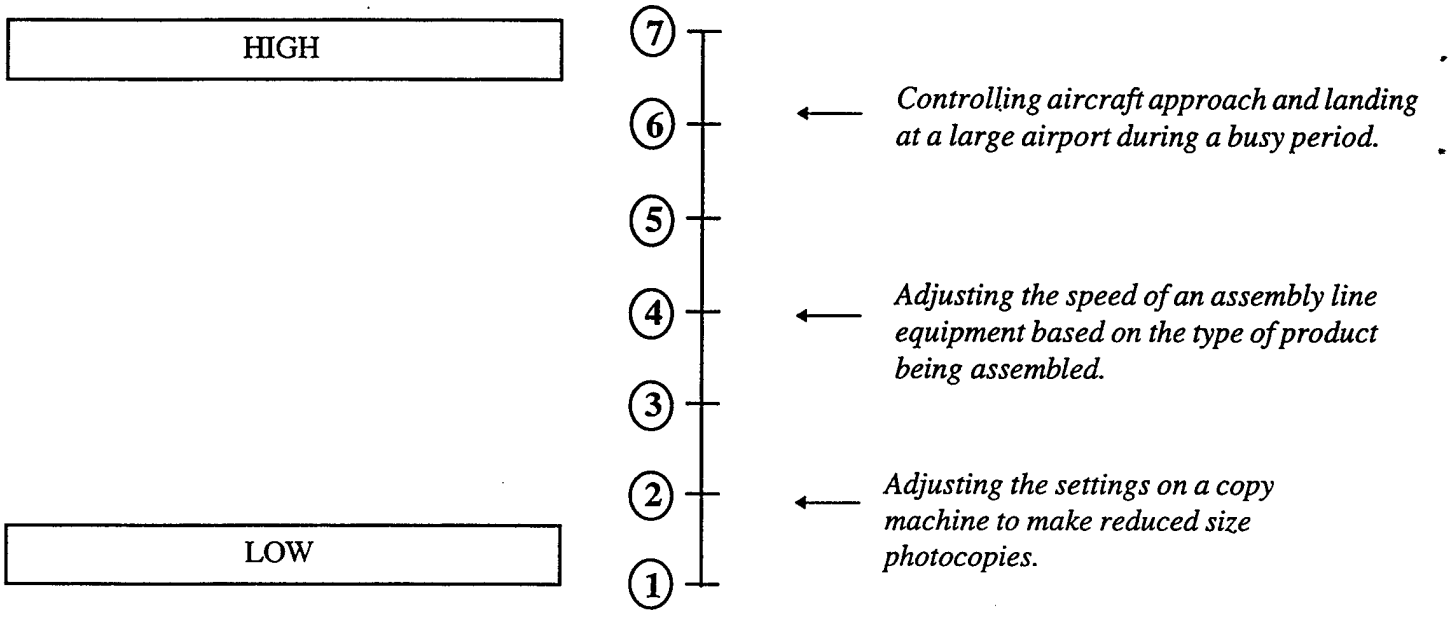


32. Operation and Control

Controlling operations of equipment or systems.

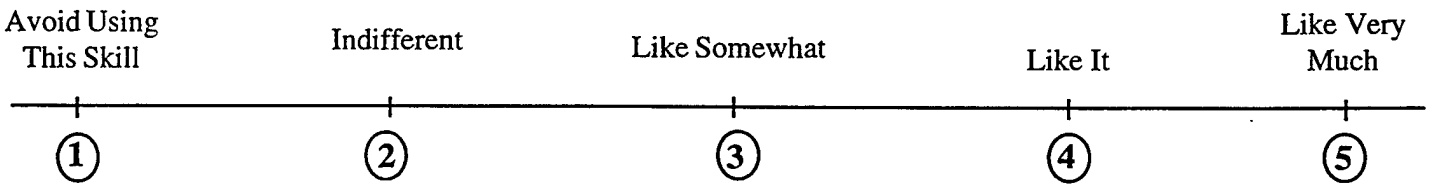
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

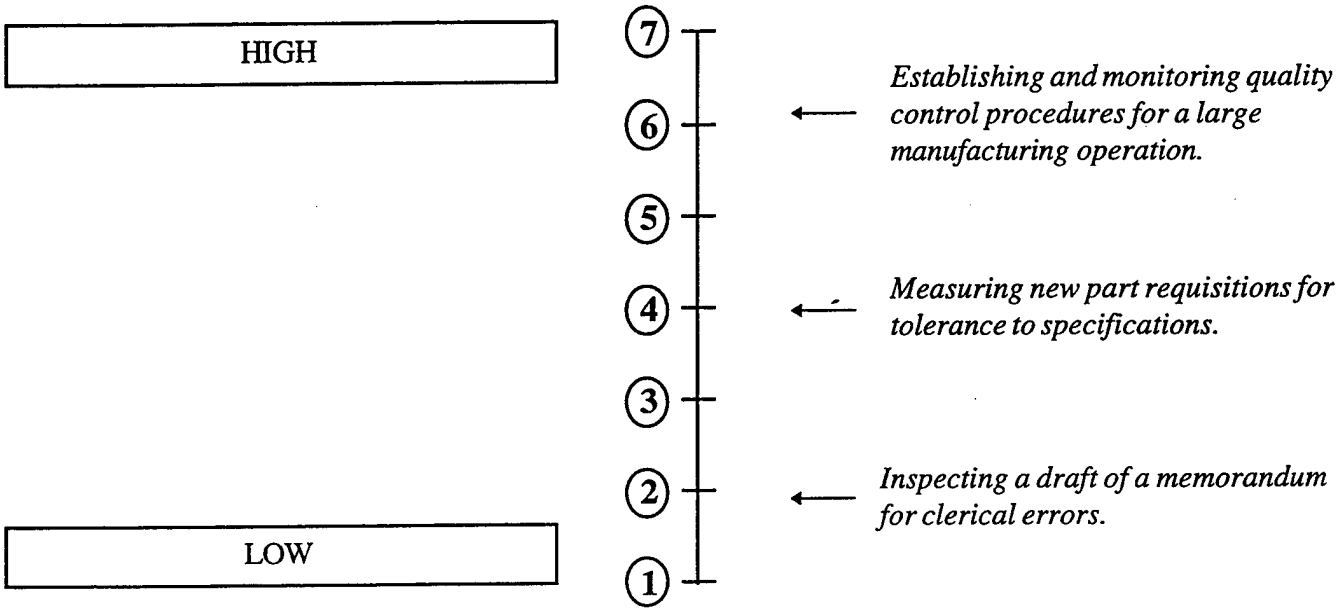


33. Product Inspection

Inspecting and evaluating the quality of products.

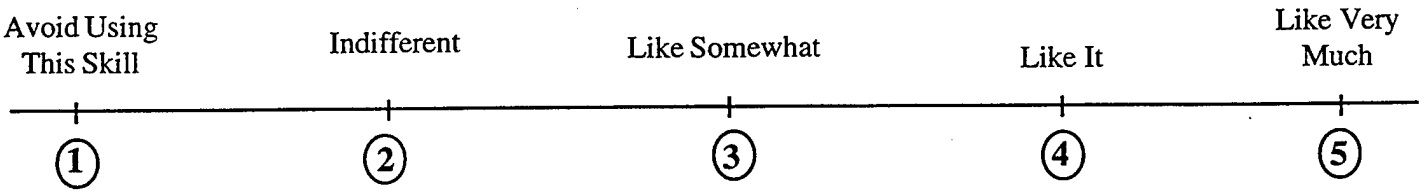
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

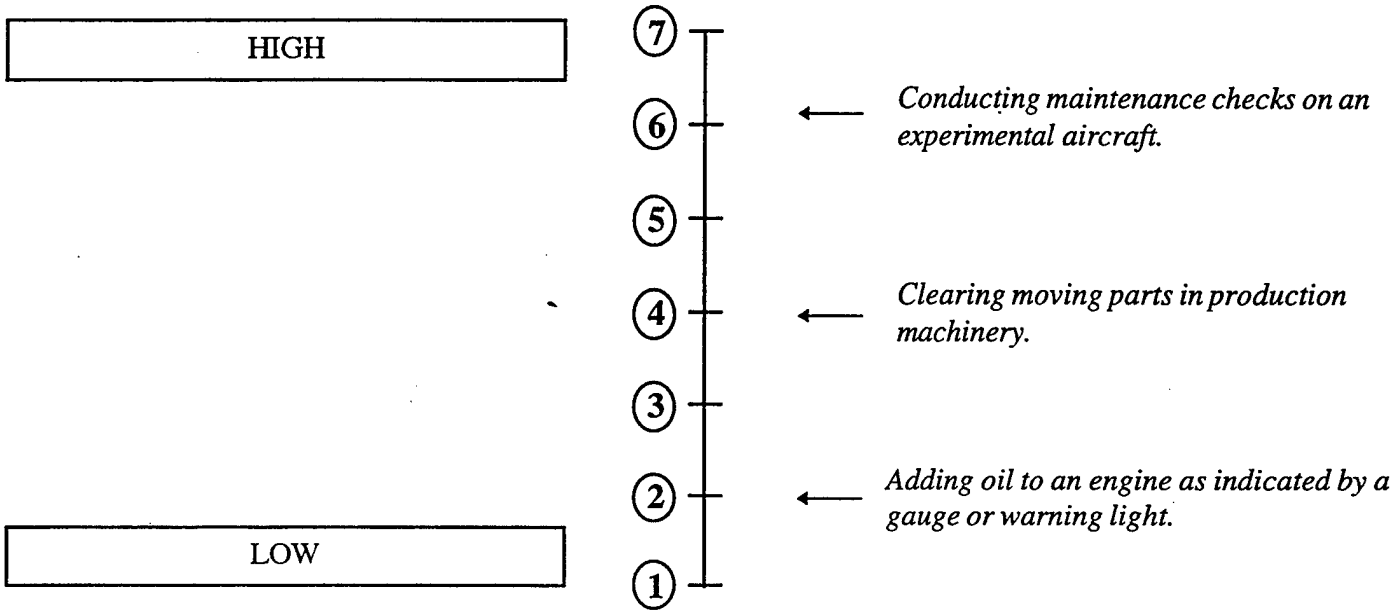


34. Equipment Maintenance

Performing routine maintenance and determining when and what kind of maintenance is needed.

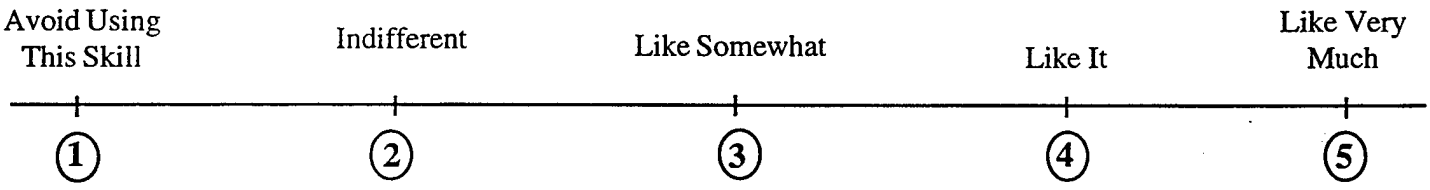
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

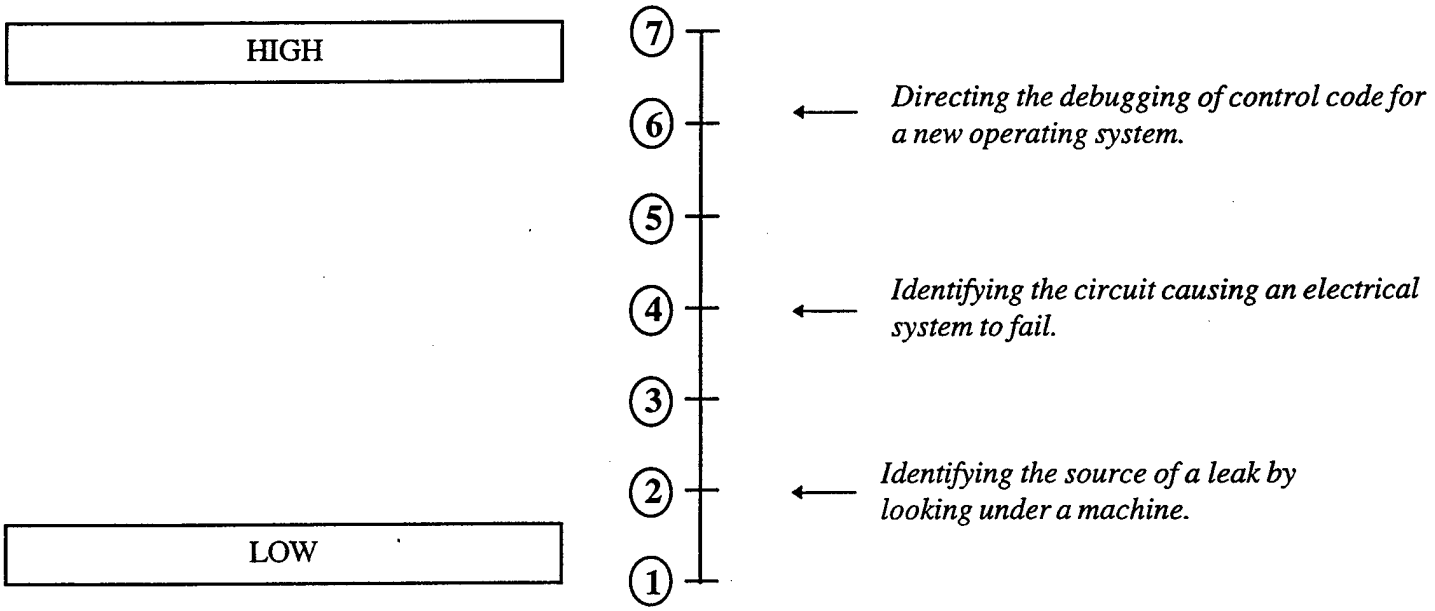


35. Troubleshooting

Determining what is causing an operating error and deciding what to do about it.

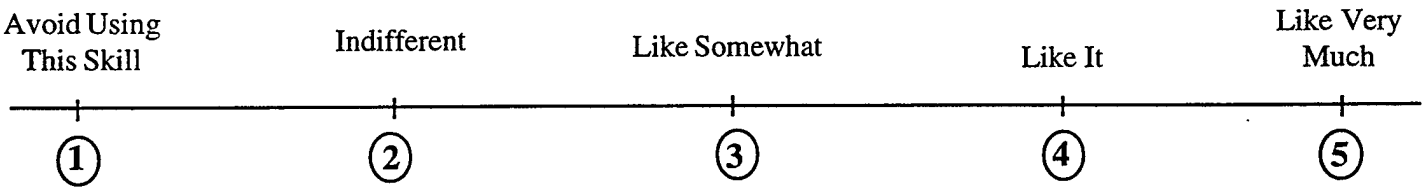
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

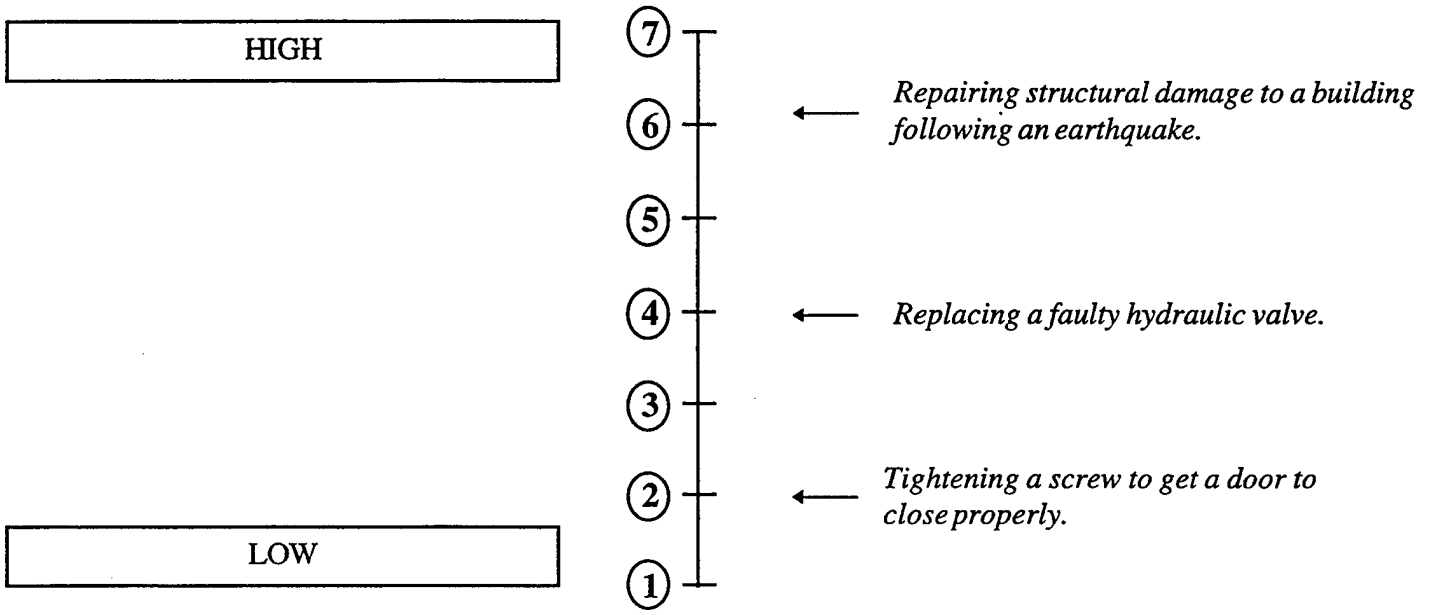


36. Repairing

Repairing machines or systems using the needed tools.

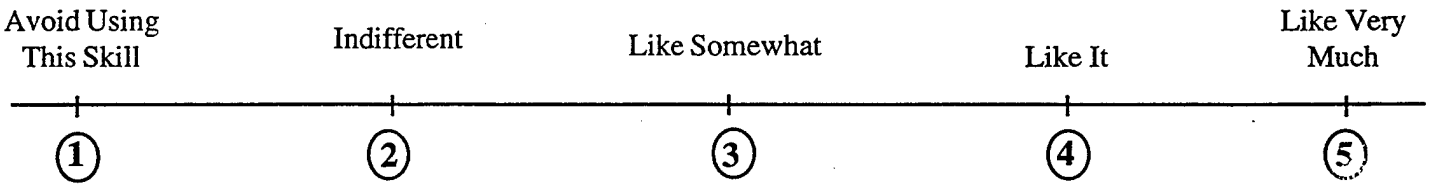
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

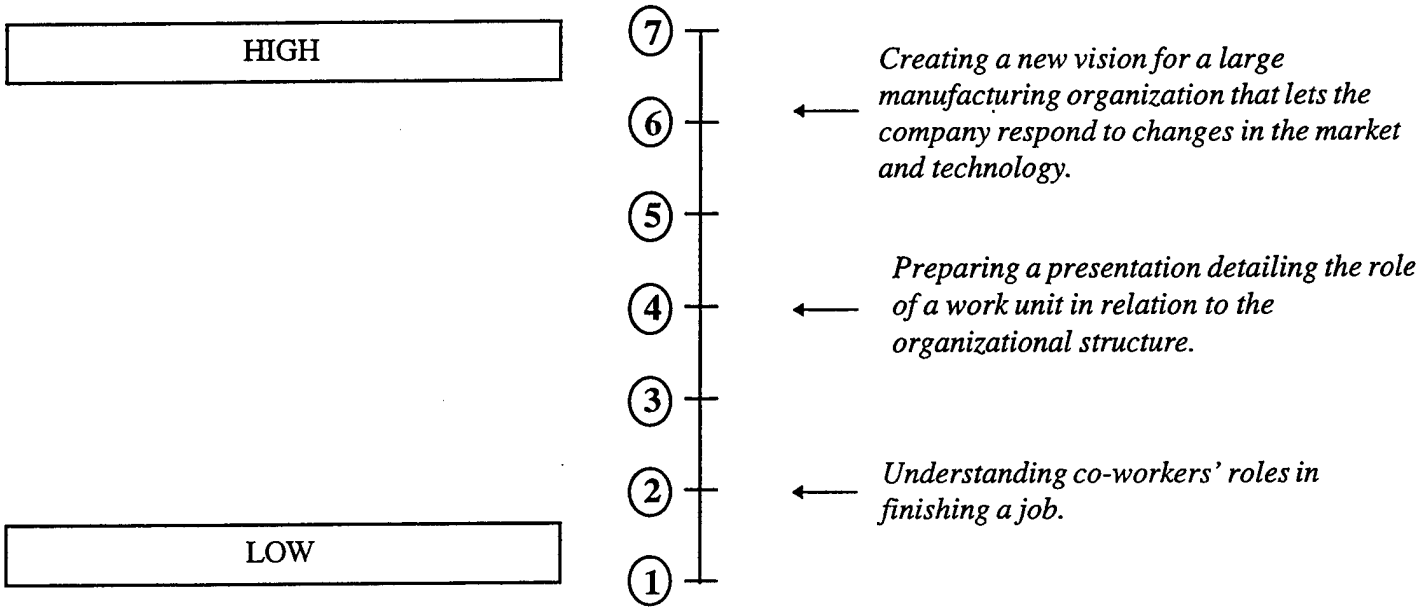


37. Visioning

Developing an image of how a system should work under ideal conditions.

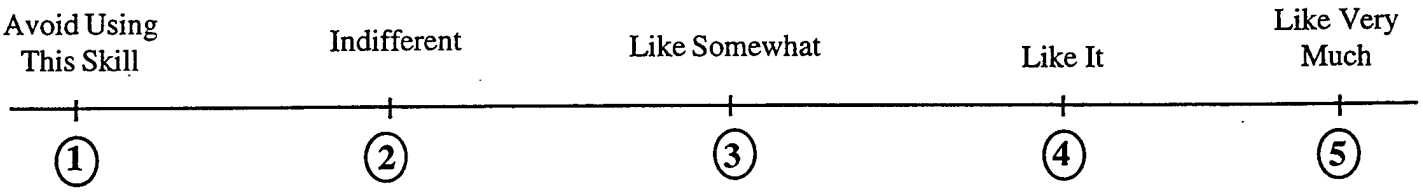
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

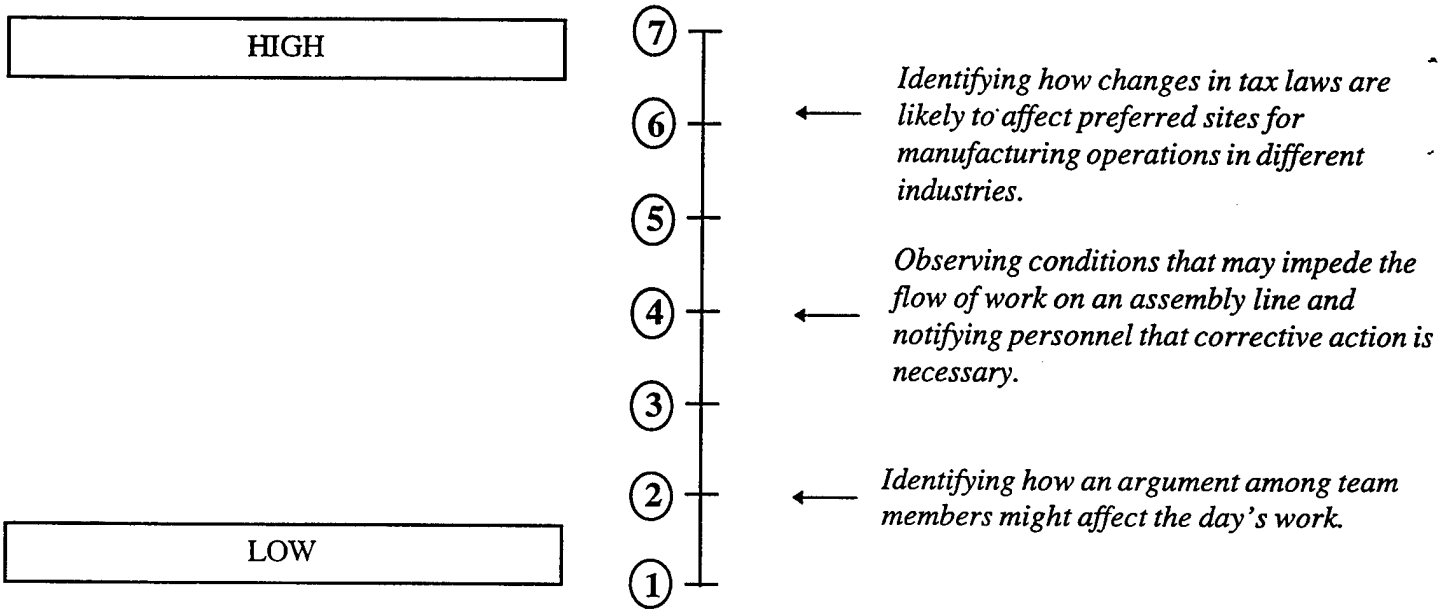


38. Systems Perceptions

Determining when important changes have occurred in a system or when they are likely to occur.

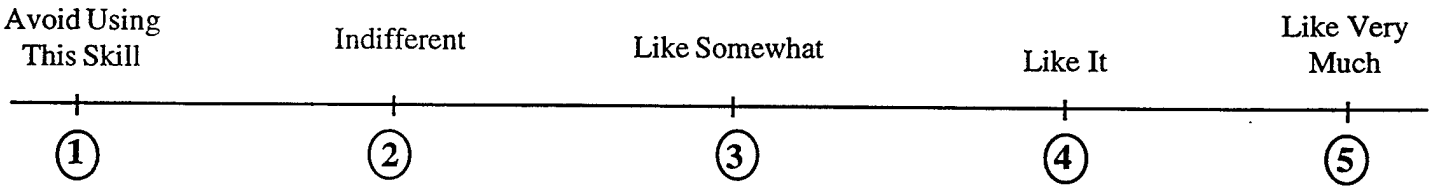
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

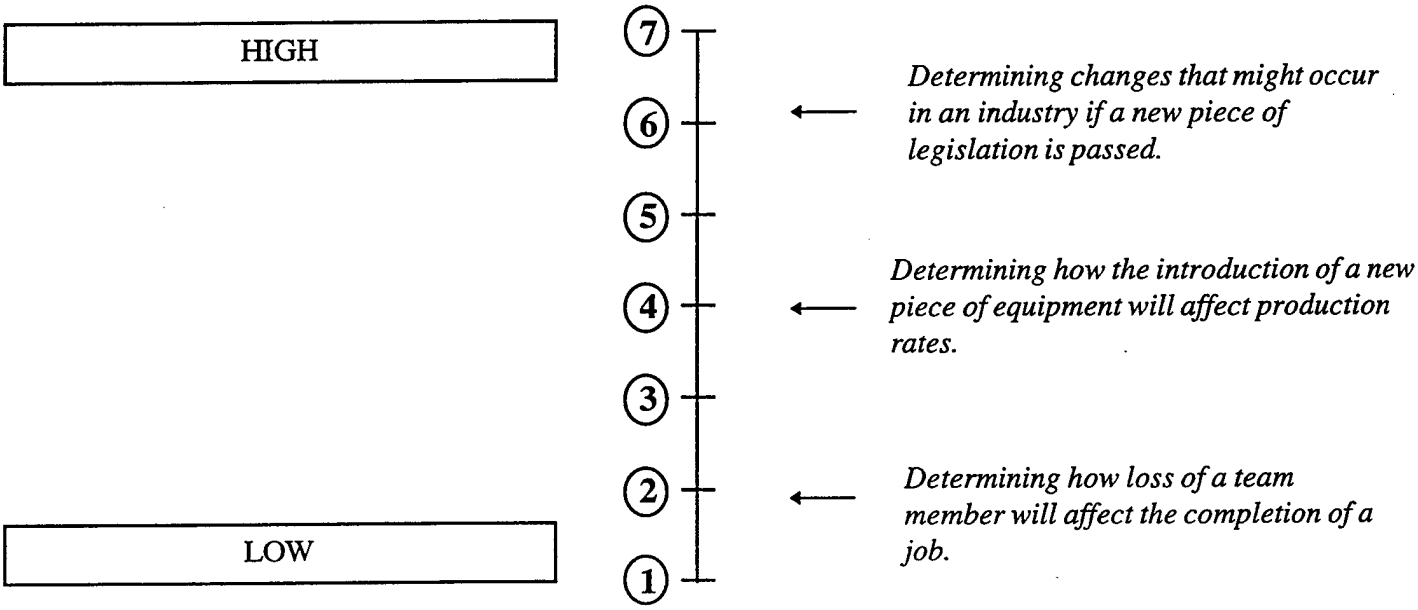


39. Identification of Downstream Consequences

Determining the long-term outcomes of a change in operations.

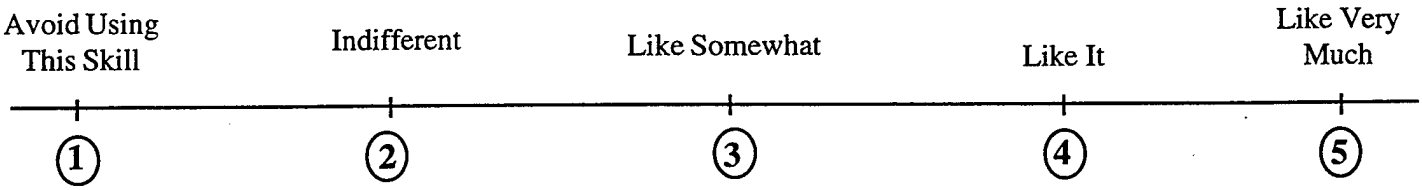
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?



40. Identification of Key Causes

Identifying the things that must be changed to achieve a goal.

Level

Choose the number that best describes your skill in this area.

HIGH

7

6 ← *Identifying the changes in organizational policy needed to encourage research and development efforts.*

5

4 ← *Identifying the major reasons why a client might be unhappy with a product.*

3

2 ← *Determining which route to take to deliver a passenger to a destination quickly.*

LOW

1

Desire to Use This Skill

Would you like to use this skill at work/on the job?

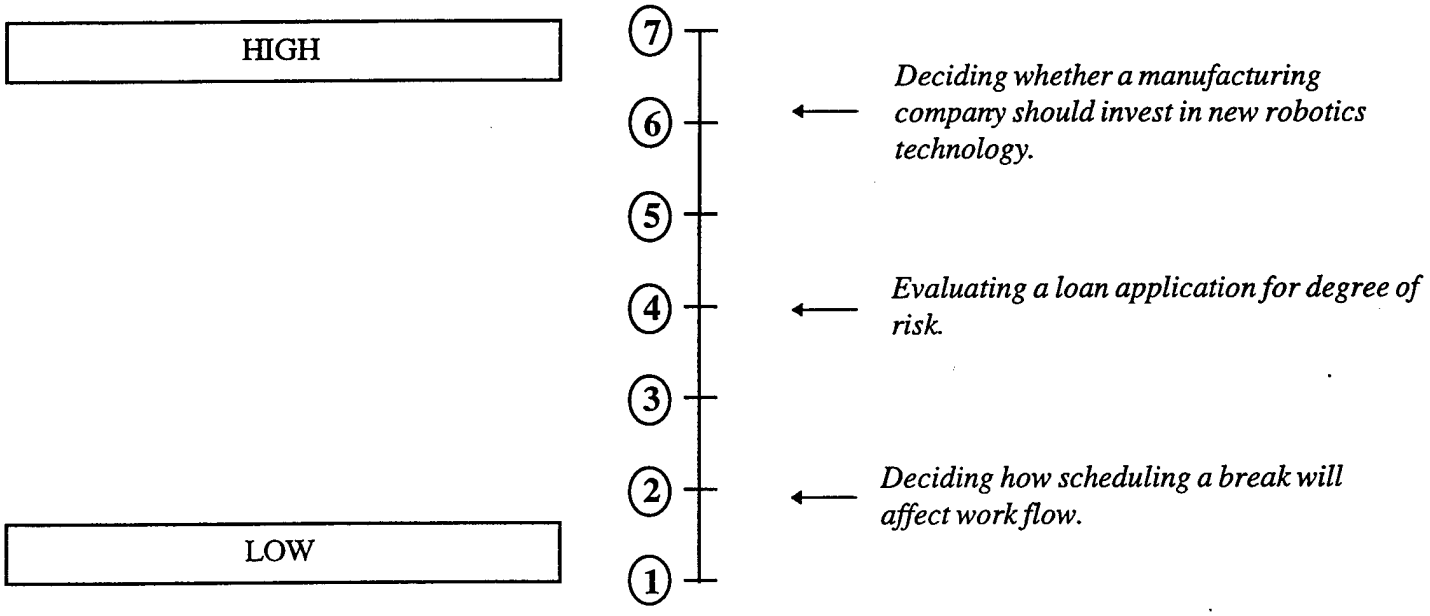
Avoid Using This Skill	Indifferent	Like Somewhat	Like It	Like Very Much
1	2	3	4	5

41. Judgment and Decision Making

Weighing the relative costs and benefits of a potential action.

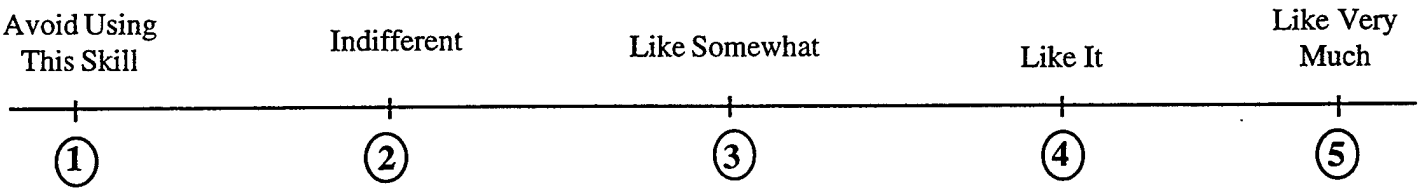
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

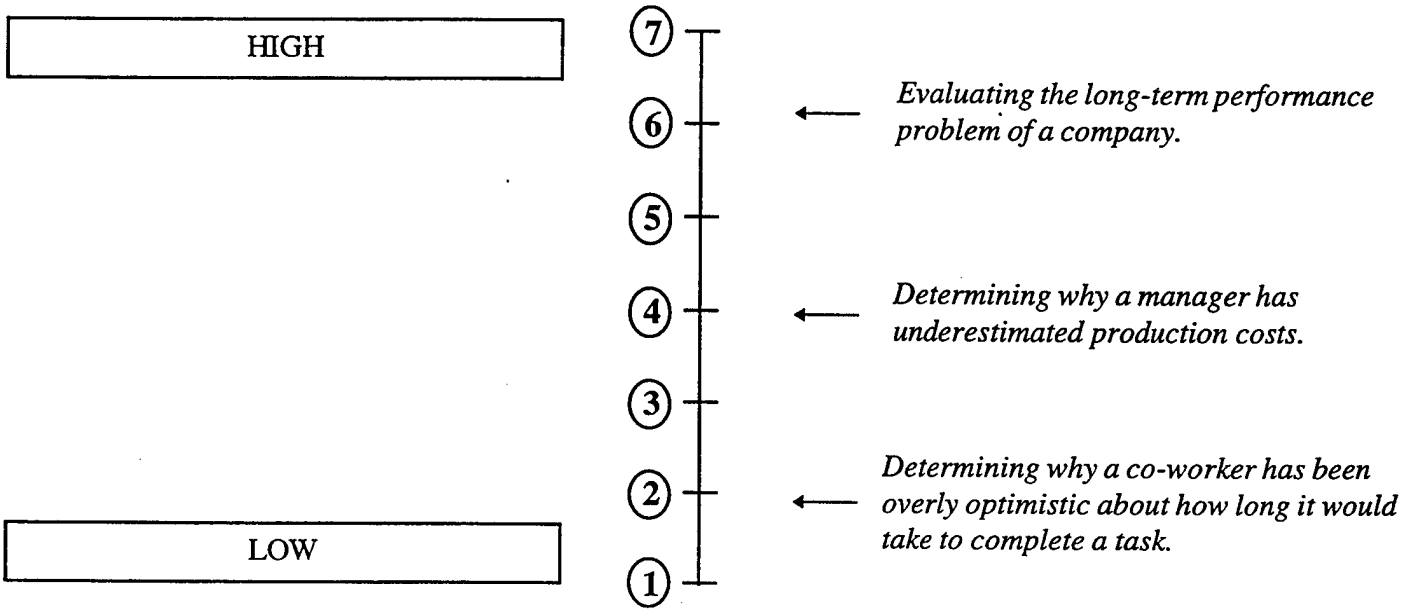


42. Systems Evaluation

Looking at many indicators of system performance, taking into account their accuracy.

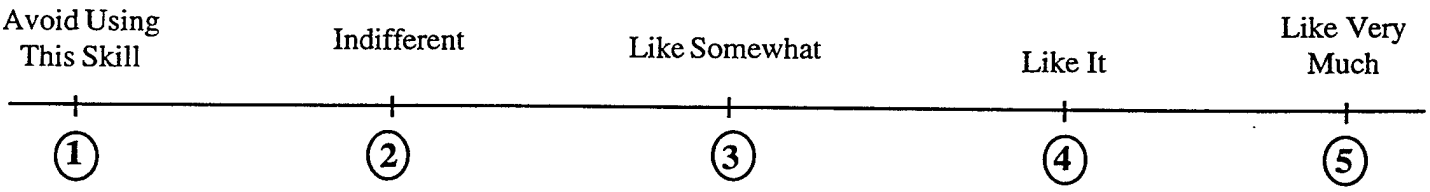
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

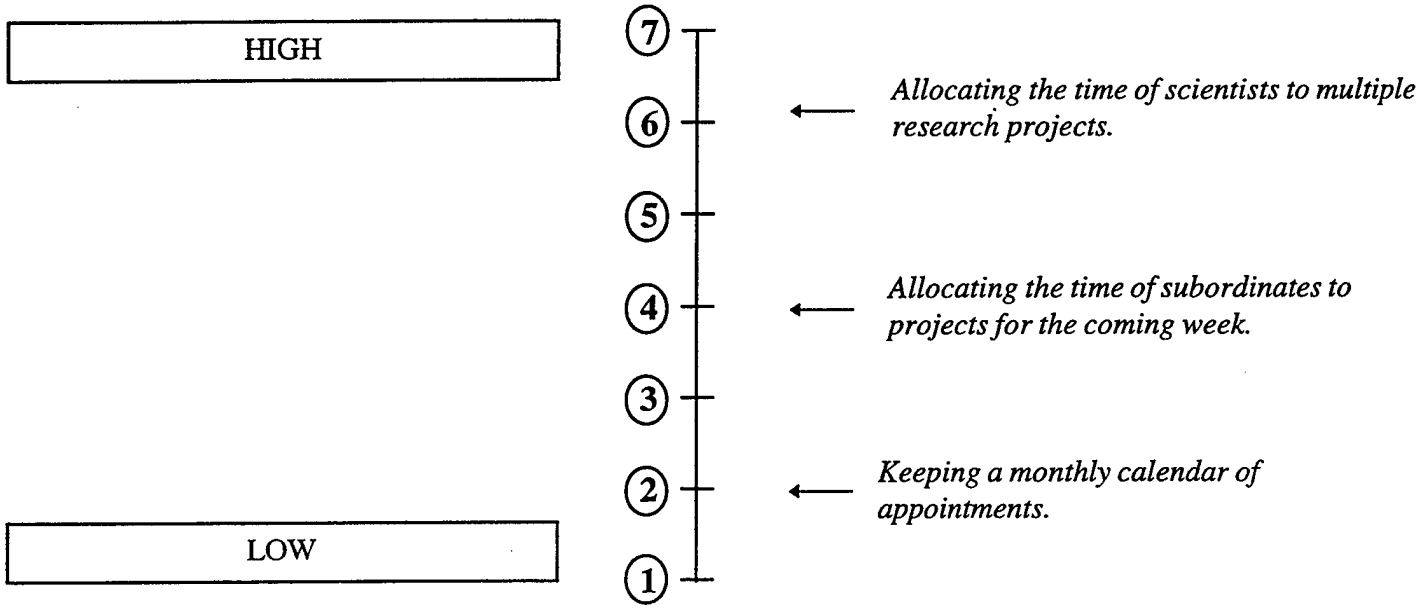


43. Time Management

Managing one's own time and the time of others.

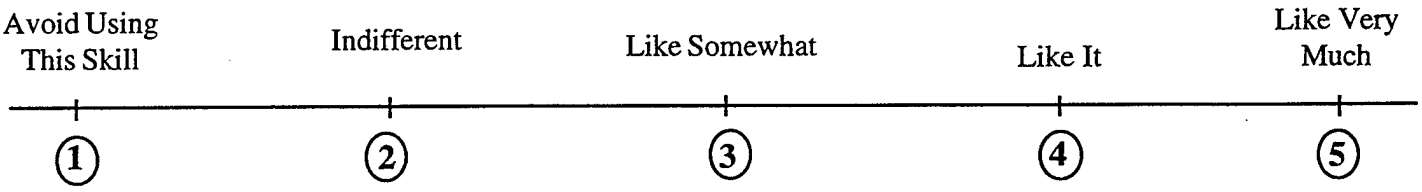
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

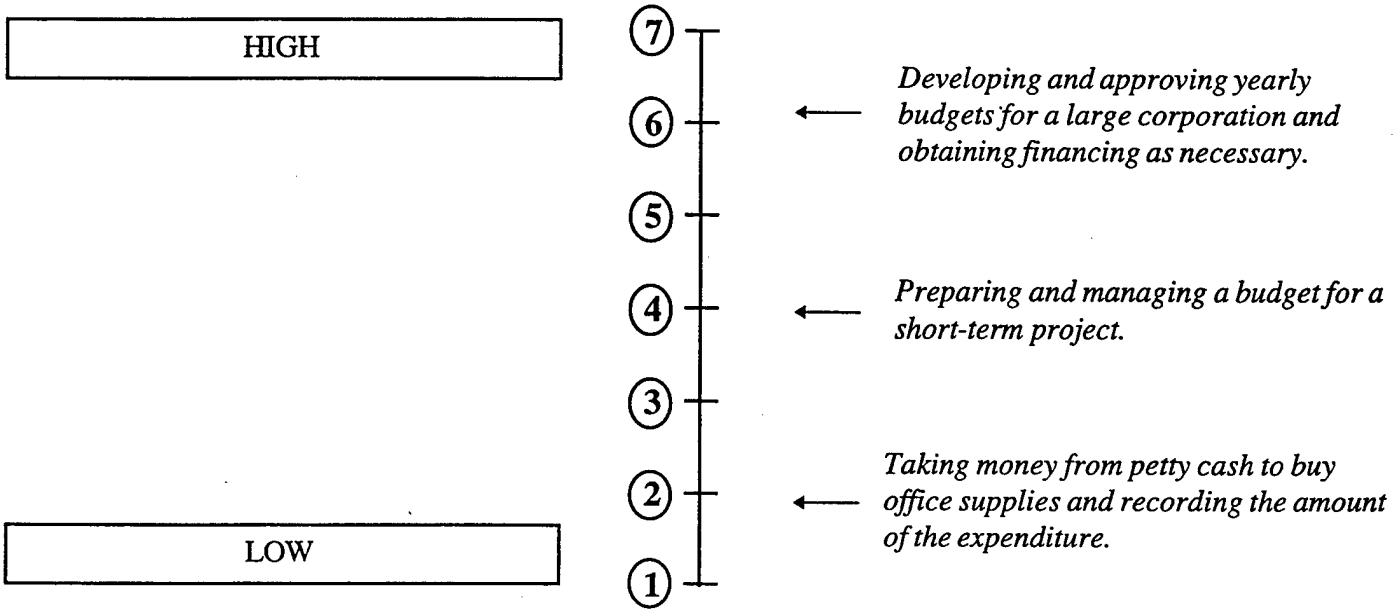


44. Management of Financial Resources

Determining how money will be spent to get the work done, and accounting for these expenditures.

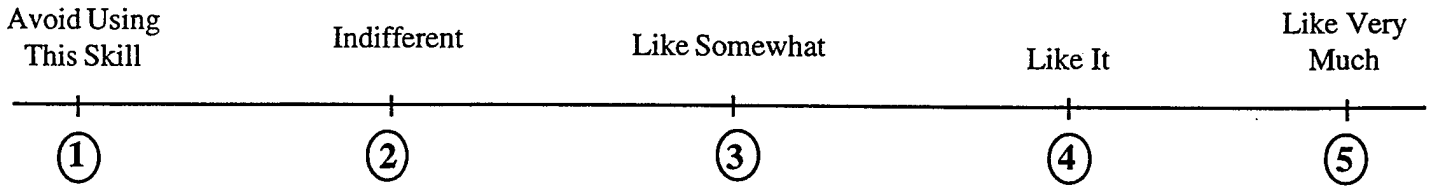
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

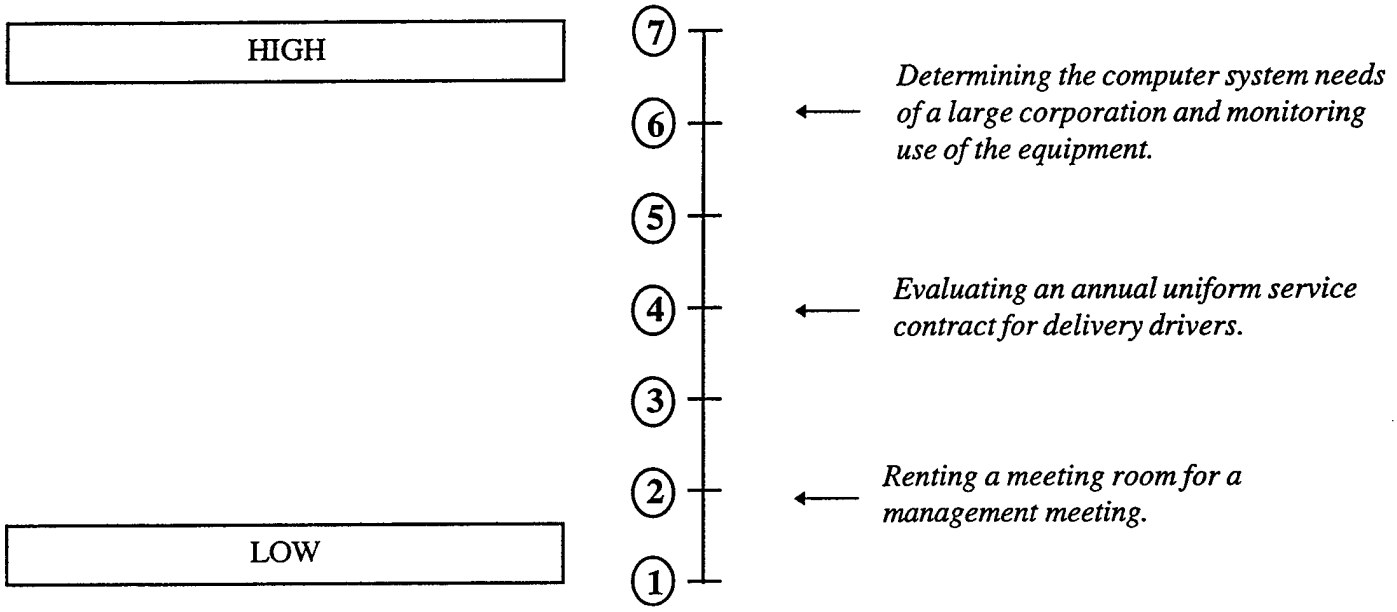


45. Management of Material Resources

Obtaining and seeing to the appropriate use of equipment, facilities, and materials needed to do certain work.

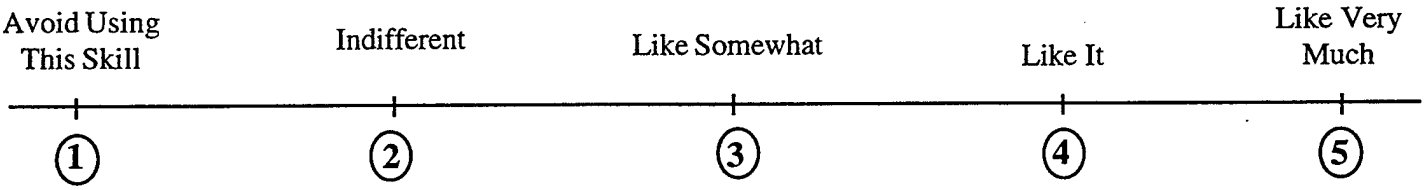
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?

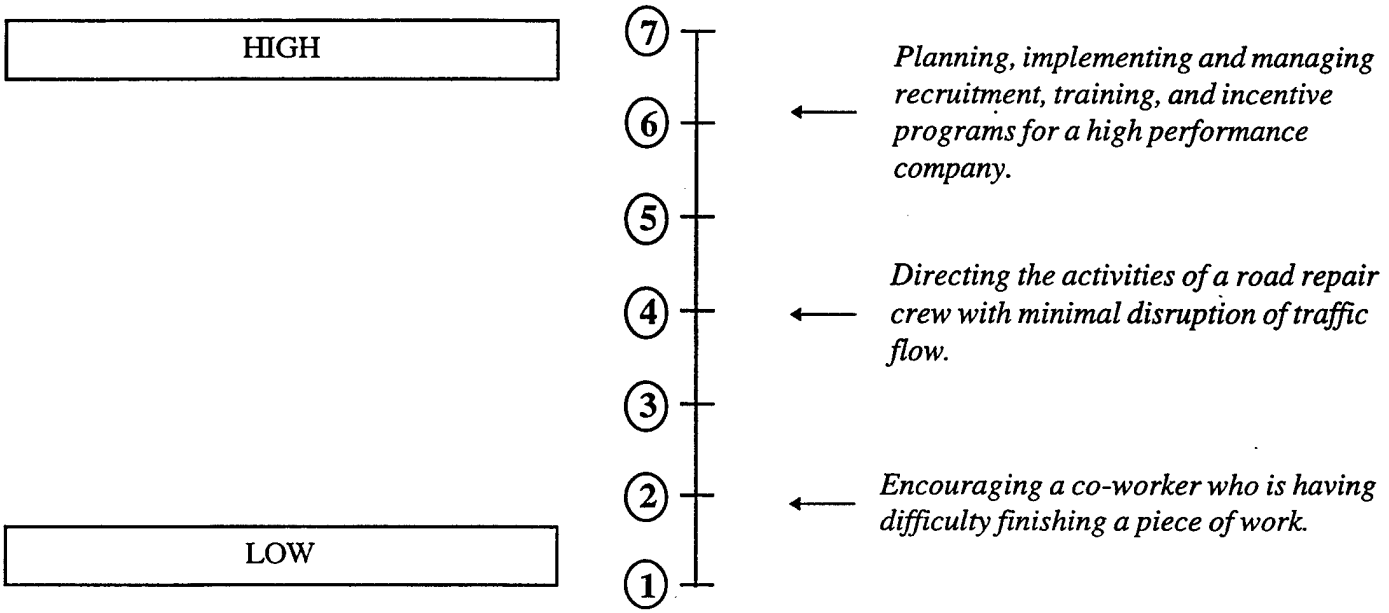


46. Management of Personnel Resources

Motivating, developing, and directing people as they work, identifying the best people for the job.

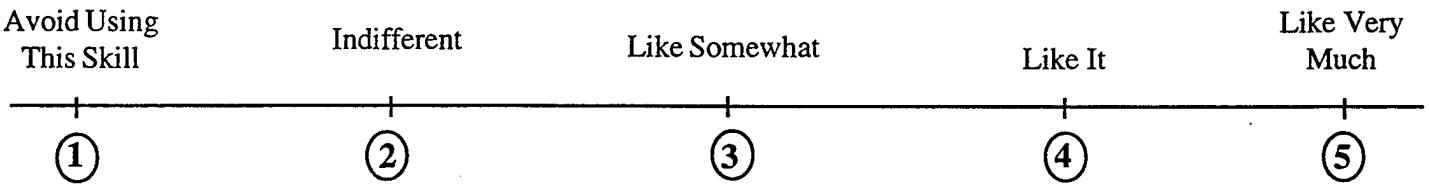
Level

Choose the number that best describes your skill in this area.



Desire to Use This Skill

Would you like to use this skill at work/on the job?



Appendix E - Top 50 Occupation Matches for Hypothetical Skill Profiles

Table 13
Best 50 Matches Based on Profile Correlation for Sales Representative

Rank	Occupational Unit Name and Number	Occupation Skill Percentile[1]	Correlation	Match Based on Level[2]
1	Sales Agents, Financial Services - 43014B	87	.86	
2	Sales Managers - 13011B	89	.85	
3	Sales Agents and Placers, Insurance - 43002	69	.85	Y
4	Sales Agents, Real Estate - 43008	73	.85	Y
5	Government Service Executives - 19005A	99	.84	
6	Sales Consultants - 49999C	57	.84	
7	Community Organization Social Workers - 27305A	91	.84	
8	Lawyers - 28108	94	.84	
9	Labor Relations Specialists - 21511F	86	.83	
10	Wholesale and Retail Buyers, except Farm Products - 21302	75	.83	Y
11	Marketing Managers - 13011C	96	.83	
12	Sales Agents, Securities, and Commodities - 43014A	92	.82	
13	First Line Supervisors, Customer Service - 51002A	78	.82	Y
14	Sales Representatives, Service - 43099A	65	.82	Y
15	Social Workers, Medical and Psychiatric - 27302	91	.82	
16	Employer Relations and Placement Specialists - 21511B	91	.82	
17	Managers and Agents of Artists, Performers, and Athletes - 39999B	66	.81	Y
18	Financial Managers, Branch or Department - 13002B	96	.81	
19	Private Sector Executives - 19005B	99	.81	
20	Advertising Managers - 13011A	95	.81	
21	College and University Administrators - 15005A	98	.81	
22	Directors of Fundraising - 13011D	86	.81	
23	Sales Agents, Advertising - 43023B	71	.81	Y
24	Employee Relations Specialists - 21511C	92	.81	
25	Fashion Designers - 34038A	80	.81	Y
26	Residential Counselors - 27307	72	.80	Y
27	Public Relations Specialists and Publicity Writers - 34008	90	.80	
28	Floral Designers - 34038F	53	.80	
29	Human Services Workers - 27308	70	.80	Y

[1]Hypothetical Sales Representative Skill Percentile is 75.
[2]Y indicates a match based on overall level.

Table 13 (Continued)
Best 50 Matches Based on Profile Correlation for Sales Representative

Rank	Occupational Unit Name and Number	Occupation Skill Percentile	Correlation	Match Based on Level
30	Paralegal Personnel - 28305	80	.79	Y
31	Social Service Managers and Directors - 19999B	80	.79	Y
32	Special Agents, Insurance - 21505	66	.79	Y
33	Interior Designers - 34041	77	.79	Y
34	Employee Training Specialists - 21511D	91	.79	
35	Gambling Establishment Managers - 19999E	71	.79	Y
36	Personal and Home Care Aides - 68035	69	.79	Y
37	Directors, Religious Activities and Education - 27505	88	.79	
38	Personal Finance Advisors - 21199B	59	.78	
39	Association Managers and Administrators - 19999C	85	.78	Y
40	Legislative Assistants - 21999B	76	.78	Y
41	Equal Opportunity Representatives - 21911F	67	.78	Y
42	Detectives and Investigators, except Public - 63035	73	.78	Y
43	Purchasing Agents and Contract Specialists - 21308A	82	.78	Y
44	Social Workers - 27305B	82	.78	Y
45	First-Line Supervisors and Manager/Supervisors, Sales and Related Workers - 41002	72	.78	Y
46	Postmasters and Mail Superintendents - 15002	91	.78	
47	Sales Agents, Selected Business Services - 43017	67	.77	Y
48	Fund Raisers and Solicitors - 43099B	67	.77	Y
49	Commercial Art Directors - 34038E	89	.77	
50	Personnel Recruiters - 21511E	80	.77	Y

Table 14
Best 50 Matches Based on Profile Correlation for Industrial/Organizational Psychologist

Rank	Occupational Unit Name and Number	Occupation Skill Percentile[1]	Correlation	Match Based on Level [2]
1	Economists - 27102A	98	.88	Y
2	Educational Psychologists - 27108D	94	.85	Y
3	Association Managers and Administrators - 19999C	85	.85	
4	Job and Occupational Analysts - 21511A	91	.85	Y
5	Industrial-Organizational Psychologists - 27108J	93	.82	Y
6	Employer Relations and Placement Specialists - 21511B	91	.82	Y
7	Human Resources Managers - 13005A	91	.82	Y
8	Budget Analysts - 21117	94	.81	Y
9	Credit Analysts - 21105	73	.81	
10	Legislative Assistants - 21999B	76	.80	
11	Social Sciences Teachers, Postsecondary - 31210	90	.80	Y
12	Labor Relations Specialists - 21511F	86	.80	
13	Operations and Systems Researchers and Analysts, except Computer - 25302	97	.80	Y
14	Foresters - 24302A	97	.80	Y
15	Clinical Psychologists - 27108G	86	.80	
16	Sociologists - 27199B	89	.80	Y
17	Farm and Home Management Advisors - 31323	88	.80	Y
18	Equal Opportunity Representatives - 21911F	67	.79	
19	Insurance Adjusters, Examiners, and Investigators - 53302	71	.79	
20	Health Specialties Teachers, Postsecondary - 31212	95	.79	Y
21	Market Research Analysts - 27102B	87	.79	Y
22	Health Service Coordinators - 32996A	79	.79	
23	Public Relations Specialists and Publicity Writers - 34008	90	.79	Y
24	Urban and Regional Planners - 27105	96	.79	Y
25	Landscape Architects - 22308	92	.79	Y
26	Anthropologists - 27199C	84	.79	
27	Managers and Agents Land Leasing and Development - 15011A	92	.79	Y
28	Dietitians and Nutritionists - 32521	95	.79	Y

[1]Hypothetical I/O Psychologist Skill Percentile is 97.
[2]Y indicates a match based on overall level.

Table 14 (Continued)
Best 50 Matches Based on Profile Correlation for Industrial/Organizational Psychologist

Rank	Occupational Unit Name and Number	Occupation Skill Percentile	Correlation	Match Based on Level
29	Sales Agents, Securities, and Commodities - 43014A	92	.79	Y
30	Mathematical Sciences Teachers, Postsecondary - 31224	89	.78	Y
31	Employee Assistance Specialists - 13005E	81	.78	
32	Law Clerks - 28302	79	.78	
33	Lawyers - 28108	94	.78	Y
34	Intelligence Specialists - 27199F	88	.78	Y
35	Tax Examiners, Collectors, and Revenue Agents - 21914	74	.78	
36	Developmental Psychologists - 27108A	92	.78	Y
37	Museum Research Workers - 31511C	87	.78	Y
38	Medical Scientists - 24311	99	.77	Y
39	Labor Relations Managers - 13005C	70	.77	
40	Sales Agents, Financial Services - 43014B	87	.77	Y
41	Paralegal Personnel - 28305	80	.77	
42	Pathologists - 32102U	87	.77	Y
43	Government Service Executives - 19005A	99	.77	Y
44	Social Psychologists - 27108E	76	.77	
45	Chemistry Teachers, Postsecondary - 31204	95	.77	Y
46	Social Workers, Medical and Psychiatric - 27302	91	.77	Y
47	Commercial and Industrial Designers - 34038B	91	.77	Y
48	Soil Conservationists - 24302B	93	.76	Y
49	Public Health Educators - 31517A	74	.76	
50	Life Sciences Teachers, Postsecondary - 31202	94	.76	Y

Table 15
Best 50 Matches Based on Profile Correlation for Air Conditioning System Technician

Rank	Occupational Unit Name and Number	Occupation Skill Percentile[1]	Correlation	Match Based on Level [2]
1	Aircraft Mechanics - 85323A	66	.75	
2	Diesel Engine Mechanics - 85311A	61	.73	
3	Welder-Fitters - 93914C	39	.71	
4	Aircraft Systems Assemblers, Precision - 93102C	66	.71	
5	Grinding, Honing, Lapping, and Deburring Machine Set-Up Operators - 91114A	43	.69	
6	Pump Installers and Servicers - 85999B	45	.69	
7	Helpers, Electricians and Power-Line Transmission Installers - 98313	12	.68	
8	Paper Goods Machine Setters and Set-Up Operators - 92914	41	.67	
9	Welders and Cutters - 93914B	25	.67	
10	Farm Equipment Mechanics - 85321	64	.67	
11	Marine Services Technicians - 85116C	63	.66	
12	Electromechanical Equipment Assemblers-Precision - 93111A	43	.66	
13	Aircraft Engine Specialists - 85326	67	.66	
14	Maintenance Repairers, General Utility - 85132	59	.66	
15	Electrical Power-Line Installers and Repairers - 85723	65	.66	
16	Sawing Machine Tool Setters and Set-Up Operators, Metal and Plastic - 91102	30	.65	
17	Boilermakers - 89135	62	.65	
18	Aircraft Body and Bonded Structure Repairers - 85323B	39	.65	
19	Aircraft Electricians - 85728A	66	.65	
20	Extruding and Drawing Machine Setters and Set-Up Operators, Metal and Plastic - 91311	49	.65	
21	Station Installers and Repairers, Telephone - 85726	61	.65	
22	Machinery Maintenance Mechanics, Water or Power Generation Plant - 85118	53	.65	
23	Millwrights and Machinery Erectors - 85123B	55	.65	
24	Metal Molding, Coremaking, and Casting Machine Setters and Set-Up Operators - 91908	42	.65	
25	Rail Car Repairers - 85317	42	.65	
26	Telegraph and Teletype Installers and Maintainers - 85508	46	.64	

[1]Hypothetical Air Conditioning System Technician Skill Percentile is 88.
[2]Y indicates a match based on overall level.

Table 15 (Continued)
Best 50 Matches Based on Profile Correlation for Air Conditioning System Technician

Rank	Occupational Unit Name and Number	Occupation Skill Percentile	Correlation	Match Based on Level
27	Battery Assemblers - 93905A	10	.64	
28	Electromechanical Technicians - 93111B	61	.64	
29	Textile Machine Setters and Set-Up Operators - 92702	57	.64	
30	Paperhangers - 87502A	51	.63	
31	Shear and Slitter Machine Setters and Set-Up Operators, Metal and Plastic - 91308	49	.63	
32	Precision Instrument Repairers - 85905	59	.63	
33	Central Office and PBX Installers and Repairers - 85502	61	.63	
34	Sawing Machine Operators and Tenders - 92308	18	.63	
35	Machine Builders and Other Precision Machine Assemblers - 93105	63	.63	
36	Marine Engine Mechanics - 85116B	42	.63	
37	Powerhouse, Substation, and Relay Electricians - 85721	61	.63	
38	Truck and Trailer Body Repairers - 85305C	53	.62	
39	Coil Winders, Tapers, and Finishers - 93908	40	.62	
40	Construction Installation Workers - 87899A	20	.62	
41	Marine Machinists, Maintenance - 85116A	58	.62	
42	Electricians - 87202A	56	.62	
43	Helpers, Mechanics and Repairers - 98102	36	.62	
44	Extruding, Forming, Pressing, and Compacting Machine Setters and Set-Up Operators - 92968	24	.62	
45	Stone Sawyers - 92941B	26	.62	
46	Miners and Petroleum and Gas Workers - 87989A	40	.62	
47	Electric Motor and Switch Assemblers and Repairers - 85714A	63	.62	
48	Electronic Semiconductor Sawyers, Abraiders, and Polishers - 92902E	36	.61	
49	Meter Mechanics - 85928B	37	.61	
50	Mechanical Door Repairers - 85928C	29	.61	

Table 16
Best 50 Matches Based on Profile Correlation for Computer Programmer

Rank	Occupational Unit Name and Number	Occupation Skill Percentile[1]	Correlation	Match Based on Level[2]
1	Programmers, Numerical Tool and Process Control - 25111	80	.72	Y
2	Computer Engineers - 22127	99	.65	
3	Computer Security Specialists - 21999A	78	.62	Y
4	Data Base Administrators - 25103A	91	.61	
5	Electronic Drafters - 22514B	91	.61	
6	Systems Analysts, Electronic Data Processing - 25102	98	.59	
7	Data Processing Auditors - 21114C	89	.58	
8	Electrical Engineers - 22126A	96	.57	
9	Aeronautical and Astronautical Engineers - 22102	99	.57	
10	Mechanical Engineers - 22135	93	.57	
11	Architectural Drafters - 22514A	63	.54	
12	Wood Technologists - 24302C	87	.54	
13	Electrical Engineering Technicians - 22505C	72	.54	Y
14	Nuclear Engineers - 22117	99	.52	
15	Astronomers - 24102B	80	.52	Y
16	Mathematical Technicians - 25323	81	.51	Y
17	Biological and Agricultural Technologists - 24502A	77	.51	Y
18	Computer Programmers - 25105	96	.51	
19	Biochemists - 24308A	90	.50	
20	Geographic Information System Specialist - 25103B	88	.50	
21	Animal Scientists - 24305A	89	.50	
22	Electronics Engineering Technicians - 22505A	76	.50	Y
23	Agricultural Technicians and Technologists - 22599D	72	.49	Y
24	Agricultural Engineers - 22123	99	.48	
25	Industrial Engineering Technicians and Technologists - 22508	93	.48	
26	Chemical Engineers - 22114	99	.48	
27	Mechanical Drafters - 22514D	92	.48	
28	Civil Drafters - 22514C	60	.47	
29	Marine Architects - 22305	96	.47	
30	Statisticians - 25312	93	.47	
31	Industrial Safety and Health Engineers - 22132A	94	.46	

[1]Hypothetical Computer Programmer Skill Percentile is 75.
[2]Y indicates a match based on overall level.

Table 16 (Continued)
Best 50 Matches Based on Profile Correlation for Computer Programmer

Rank	Occupational Unit Name and Number	Occupation Skill Percentile	Correlation	Match Based on Level
32	Model Makers - 89114A	83	.44	Y
33	Precision Instrument Makers - 89105	64	.44	
34	Civil Engineers, Including Traffic - 22121	97	.44	
35	Camera Operators - 89713	36	.43	
36	Production Engineers - 22197	98	.43	
37	Laser Technicians and Technologists - 22599F	67	.42	Y
38	Mining Engineers, Including Mine Safety - 22108	99	.42	
39	Food Scientists - 24305C	82	.42	Y
40	Welding Engineers - 22105C	95	.42	
41	Data Communications Analysts - 25199A	97	.41	
42	Tool and Die Makers - 89102	49	.41	
43	Geophysicists - 24111B	85	.41	Y
44	Mechanical Engineering Technicians and Technologists - 22511	84	.41	Y
45	Aeronautical Technicians and Technologists - 22599C	86	.41	
46	Product Safety Engineers - 22132C	84	.41	Y
47	Ceramic Engineers - 22105A	97	.41	
48	Geologists - 24111A	96	.41	
49	Brattice Builders - 87121	33	.41	
50	Artificial Breeding Technicians - 24502B	19	.41	

Table 17
Best 50 Matches Based on Profile Correlation for Assembly Line Worker

Rank	Occupational Unit Name and Number	Occupation Skill Percentile[1]	Correlation	Match Based on Level [2]
1	Textile Machine Setters and Set-Up Operators - 92702	57	.78	
2	Conveyor Operators and Tenders - 97951	35	.77	Y
3	Helpers and Laborers, Semi-Skilled - 98999B	31	.75	Y
4	Helpers, Mechanics and Repairers - 98102	36	.75	Y
5	Soldering and Brazing Machine Setters and Set-Up Operators - 91708	38	.75	Y
6	Millwrights and Machinery Erectors - 85123B	55	.74	
7	Forging Machine Setters and Set-Up Operators, Metal and Plastic - 91317	39	.74	Y
8	Extruding, Forming, Pressing, and Compacting Machine Setters and Set-Up Operators - 92968	24	.74	
9	Paper Goods Machine Setters and Set-Up Operators - 92914	41	.73	Y
10	Forming Machine Operators and Tenders, Metal and Plastic - 91321	28	.73	Y
11	Combination Machine Tool Operators and Tenders, Metal and Plastic - 91508	40	.73	Y
12	Sawing Machine Operators and Tenders - 92308	18	.72	
13	Letterpress Setters and Set-Up Operators - 92515	48	.72	
14	Sewing Machine Operators, Nongarment - 92721	18	.72	
15	Fiber Product Machine Cutters - 92941A	19	.72	
16	Sawing Machine Tool Setters and Set-Up Operators, Metal and Plastic - 91102	30	.71	Y
17	Woodworking Machine Operators and Tenders, except Sawing - 92314	47	.71	Y
18	Extruding and Drawing Machine Setters and Set-Up Operators, Metal and Plastic - 91311	49	.71	
19	Machine Builders and Other Precision Machine Assemblers - 93105	63	.71	
20	Combination Machine Tool Setters and Set-Up Operators, Metal and Plastic - 91505	69	.71	
21	Heat Treating, Annealing, and Tempering Machine Operators and Tenders, Metal and Plastic - 91932	31	.71	Y

[1]Hypothetical Assembly Line Worker Skill Percentile is 37.
[2]Y indicates a match based on overall level.

Table 17 (Continued)
Best 50 Matches Based on Profile Correlation for Assembly Line Worker

Rank	Occupational Unit Name and Number	Occupation Skill Percentile	Correlation	Match Based on Level
22	Metal Molding, Coremaking, and Casting Machine Operators and Tenders - 91911	57	.71	
23	Machine Adjusters/Replacers - 85119B	45	.70	Y
24	Industrial Truck and Tractor Operators - 97947	21	.70	
25	Paving, Surfacing, and Tamping Equipment Operators - 87708	22	.70	
26	Pressing Machine Operators and Tenders, Textile, Garment, and Related Materials - 92728	35	.70	Y
27	Rail Yard Engineers, Dinkey Operators, and Hostlers - 97308	29	.70	Y
28	Boiler Operators and Tenders, Low Pressure - 92926	30	.70	Y
29	Welding Machine Operators and Tenders - 91705	36	.69	Y
30	Pantograph Engravers - 93951A	19	.69	
31	Train Crew Members - 97317A	43	.69	Y
32	Mine Cutting and Channeling Machine Operators - 87943	32	.69	Y
33	Operating Engineers - 97956	39	.69	Y
34	Extruding and Forming Machine Operators and Tenders, Synthetic or Glass Fibers - 92708	25	.69	
35	Power-Generating Plant Operators, except Auxiliary Equipment Operators - 95021	45	.69	Y
36	Auxiliary Equipment Operators, Power - 95023	30	.69	Y
37	Molders and Casters - 93944D	29	.68	Y
38	Stone Sawyers - 92941B	26	.68	
39	Head Sawyers - 92305	9	.68	
40	Tank Car and Truck Loaders - 97905	31	.68	Y
41	Printing Press Machine Operators and Tenders - 92543	50	.68	
42	Rolling Machine Setters and Set-Up Operators, Metal and Plastic - 91314	63	.68	
43	Motion Picture Projectionists - 92905	11	.67	
44	Cutting and Slicing Machine Operators and Tenders - 92944	14	.67	
45	Chemical Equipment Tenders - 92938	36	.67	Y
46	Helpers, Extractive Workers - 98323	14	.67	
47	Railroad Brake Repairers - 87714C	36	.67	Y
48	Metal Pourers and Casters, Basic Shapes - 93941	27	.67	Y
49	Numerical Control Machine Tool Operators and Tenders, Metal and Plastic - 91502	47	.67	Y
50	Offset Lithographic Press Setters and Set-Up Operators - 92512	47	.67	Y

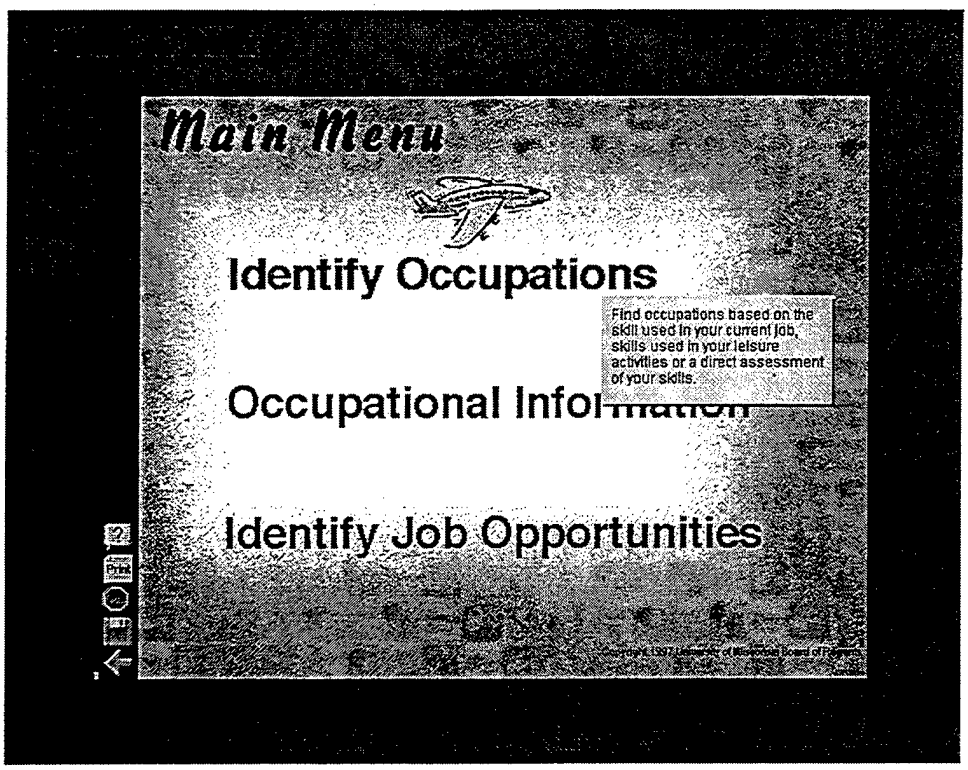
Table 18
Best 50 Matches Based on Profile Correlation of a Subset of Skills for Sales Representative

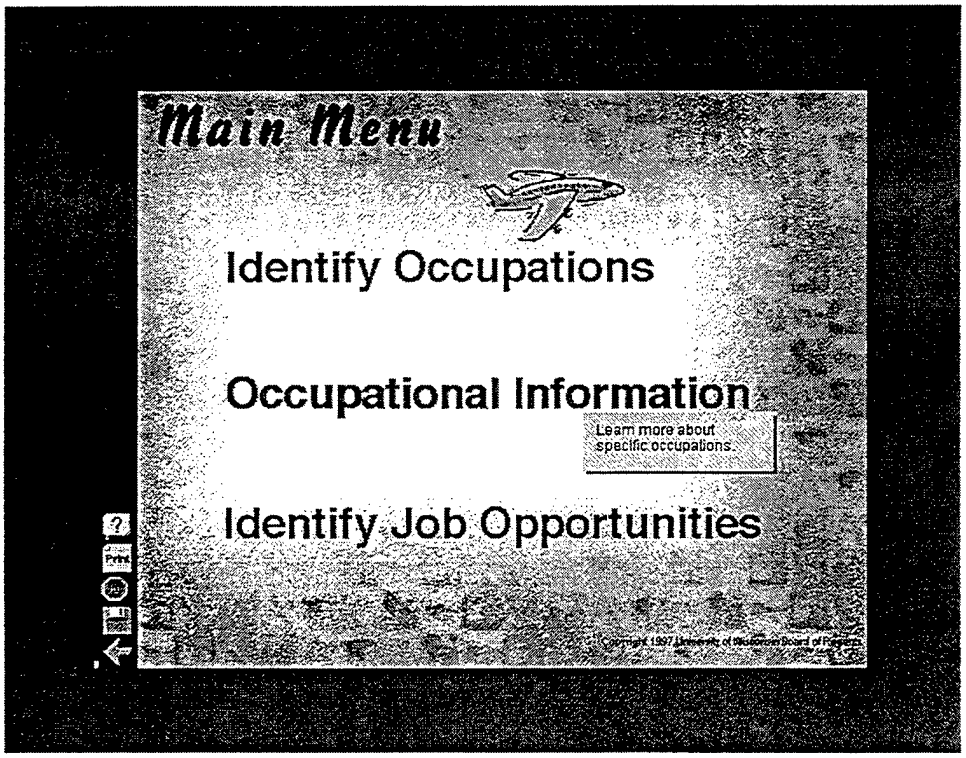
Rank	Occupational Unit Name and Number	Occupation Skill Percentile[1]	Correlation	Match Based on Level[2]
1	Wholesale and Retail Buyers, except Farm Products - 21302	70	.93	Y
2	Service Establishment Managers - 19999D	74	.92	Y
3	First-Line Supervisors and Manager/Supervisors, Sales and Related Workers - 41002	72	.90	Y
4	Directors, Religious Activities and Education - 27505	87	.90	
5	Sales Agents, Securities, and Commodities - 43014A	89	.89	
6	Medicine and Health Services Managers - 15008B	89	.89	
7	Association Managers and Administrators - 19999C	86	.89	
8	Sales Agents, Financial Services - 43014B	84	.89	Y
9	Human Resources Managers - 13005A	88	.88	
10	First Line Supervisors, Customer Service - 51002A	78	.88	Y
11	Managers and Agents of Artists, Performers, and Athletes - 39999B	71	.87	Y
12	Fund Raisers and Solicitors - 43099B	67	.87	Y
13	Transportation Managers - 15023A	87	.87	
14	Gambling Establishment Managers - 19999E	69	.86	Y
15	Employee Training Specialists - 21511D	86	.86	
16	Floral Designers - 34038F	47	.86	
17	Financial Managers, Branch or Department - 13002B	95	.86	
18	First-Line Supervisors and Manager/Supervisors, Helpers, Laborers, and Material Movers, Hand - 81017	70	.86	Y
19	First Line Supervisors, Administrative Support - 51002B	86	.86	
20	Welfare Eligibility Workers and Interviewers - 53502	60	.85	
21	Personal and Home Care Aides - 68035	69	.85	Y
22	Government Service Executives - 19005A	98	.85	
23	Postmasters and Mail Superintendents - 15002	89	.85	
24	Private Sector Executives - 19005B	98	.85	

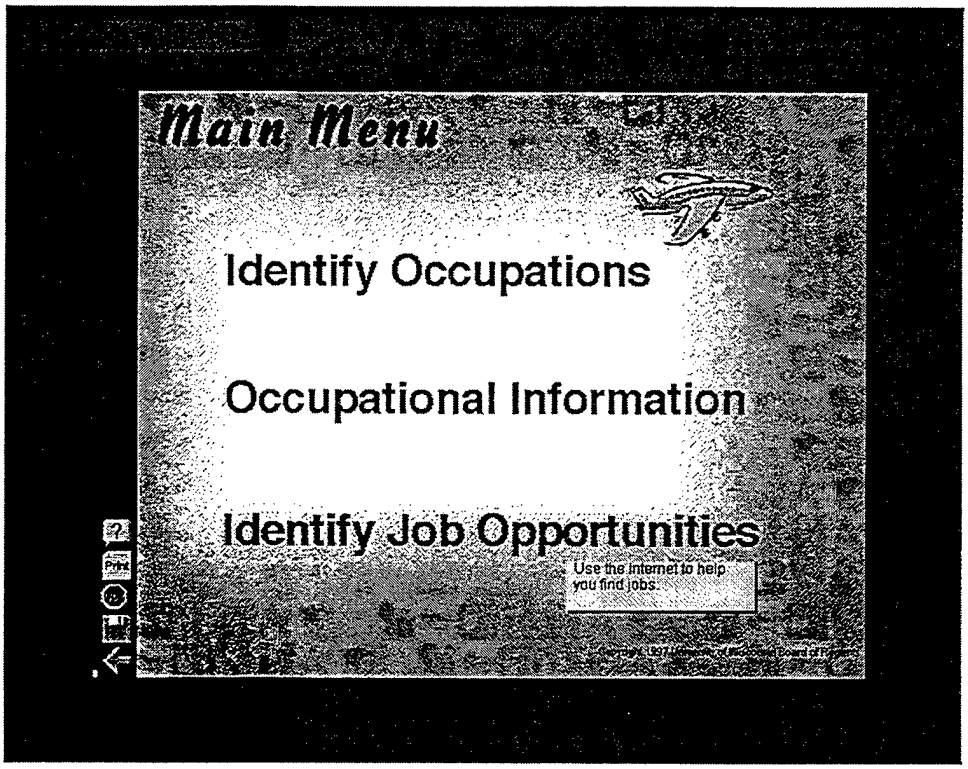
[1]Hypothetical Sales Representative Skill Percentile is 75.
[2]Y indicates a match based on overall level.

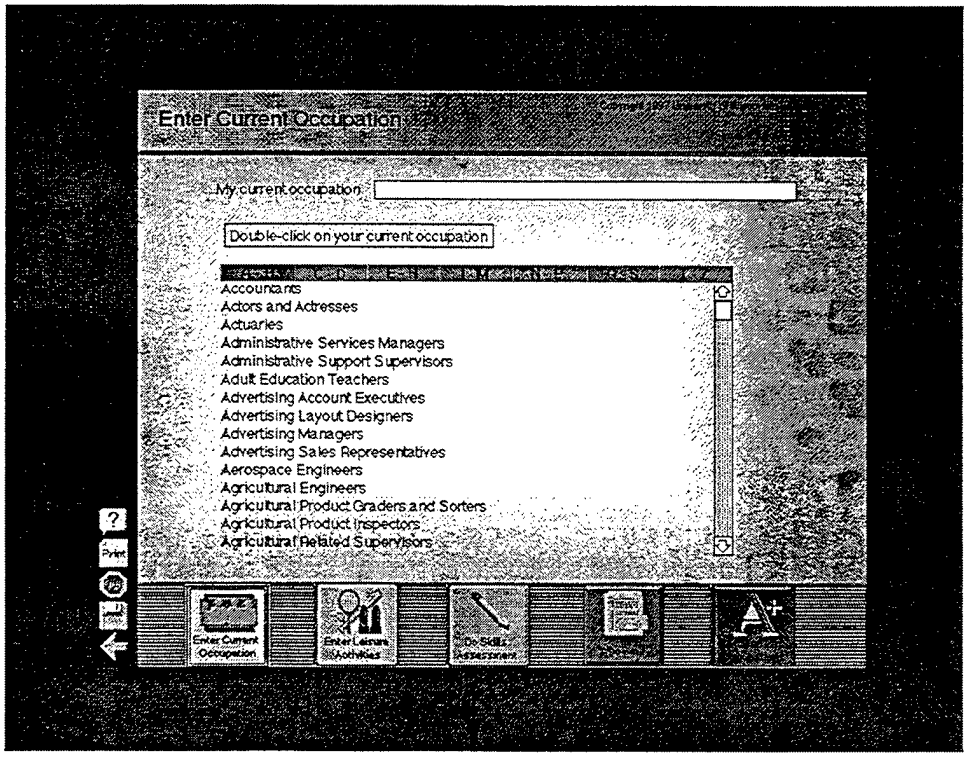
Table 18 (Continued)
Best 50 Matches Based on Profile Correlation of a Subset of Skills for Sales Representative

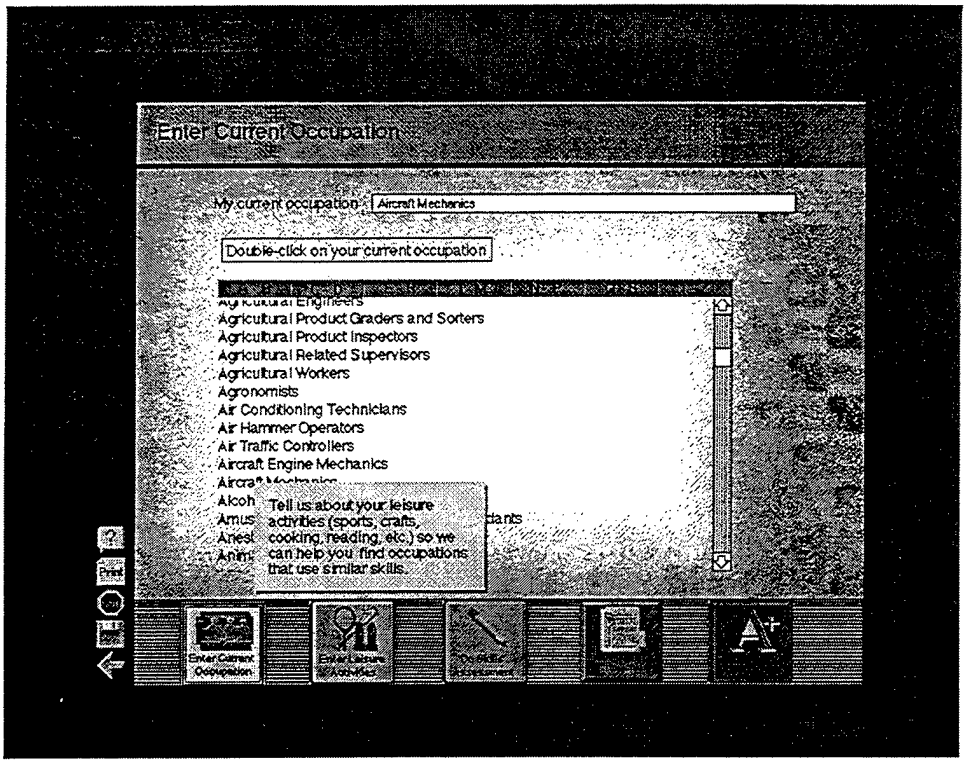
Rank	Occupational Unit Name and Number	Occupation Skill Percentile	Correlation	Match Based on Level
25	College and University Administrators - 15005A	97	.85	
26	Sales Agents, Real Estate - 43008	73	.85	Y
27	Sales Managers - 13011B	87	.85	
28	Social Workers, Medical and Psychiatric - 27302	93	.85	
29	Special Agents, Insurance - 21505	63	.85	
30	General Administrative Managers - 13014B	83	.85	Y
31	Educational Program Directors - 15005B	97	.85	
32	Budget Analysts - 21117	93	.84	
33	Purchasing Managers - 13008	84	.84	Y
34	First-Line Supervisors and Manager/Supervisors, Transportation and Material-Moving Machine and Vehicle Operat - 81011	85	.84	
35	Community Organization Social Workers - 27305A	90	.84	
36	Marketing Managers - 13011C	95	.84	
37	Personal Finance Advisors - 21199B	58	.84	
38	Treasurers, Controllers, and Chief Financial Officers - 13002A	95	.84	
39	Training and Development Managers - 13005B	74	.84	Y
40	Sales Agents and Placers, Insurance - 43002	67	.83	Y
41	Coaches and Scouts - 34058A	68	.83	Y
42	Social Service Managers and Directors - 19999B	77	.83	Y
43	Lawyers - 28108	91	.83	
44	Health Service Coordinators - 32996A	80	.83	Y
45	Police and Detective Supervisors - 61005	94	.83	
46	Property Managers - 15011B	91	.83	
47	Employee Relations Specialists - 21511C	89	.82	
48	Purchasing Agents and Contract Specialists - 21308A	82	.82	Y
49	Financial Examiners - 21911J	68	.82	Y
50	Nursing Directors - 15008A	94	.82	

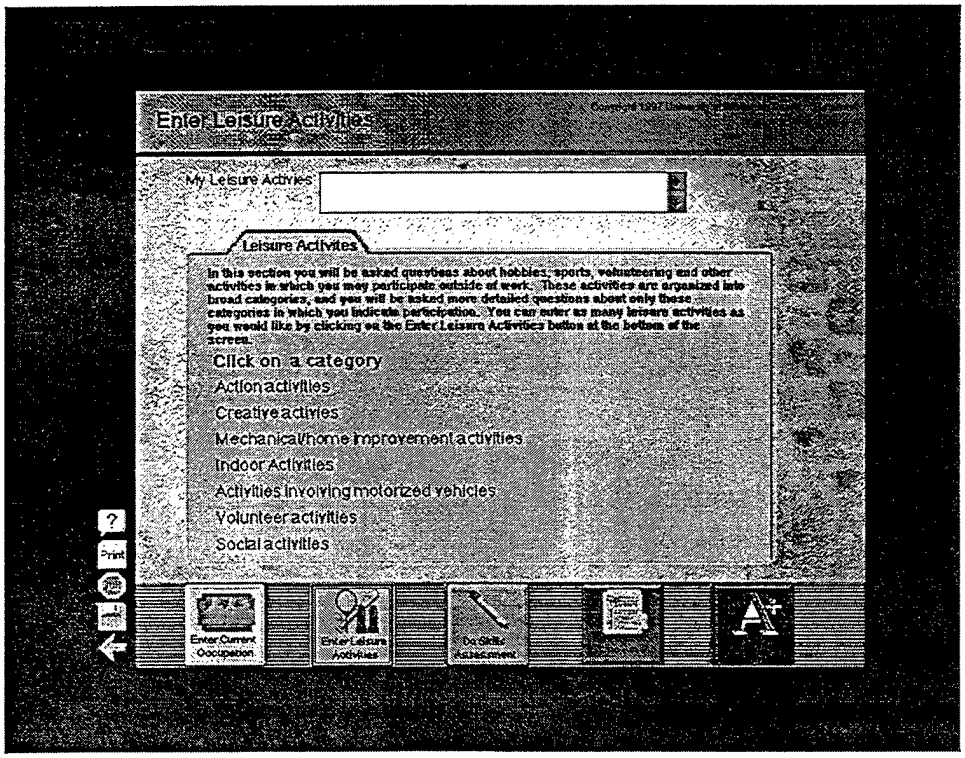

Main Menu
Identify Occupations
Find occupations based on the skill used in your current job, skills used in your leisure activities or a direct assessment of your skills.
Occupational Information
Identify Job Opportunities
Print

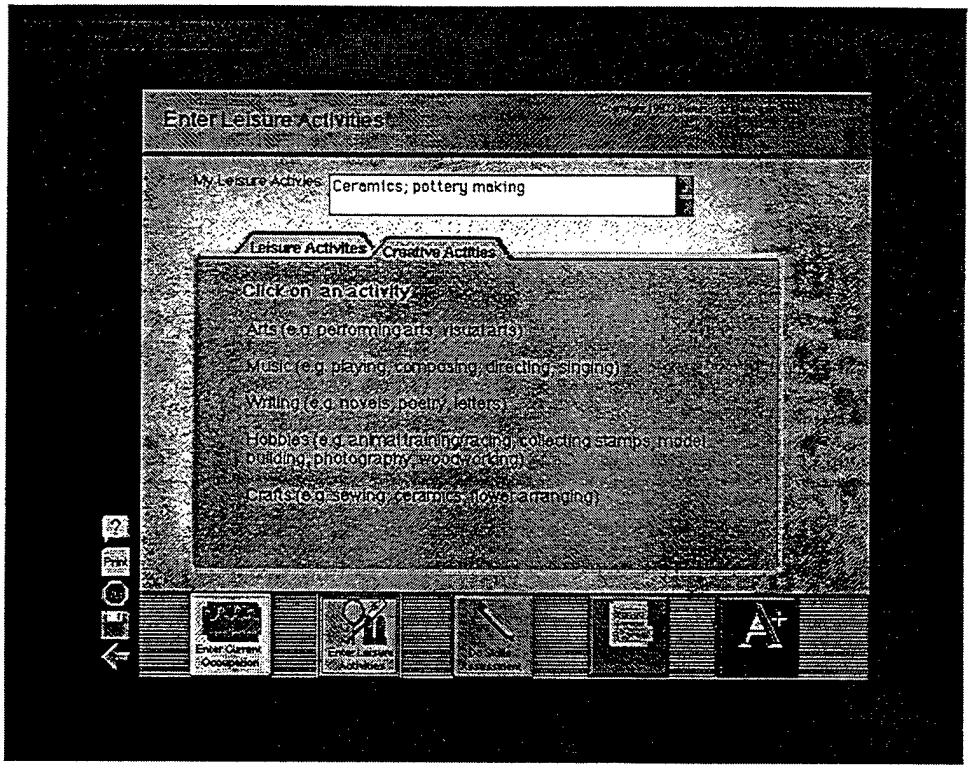

Main Menu
Identify Occupations
Occupational Information
Learn more about specific occupations.
Identify Job Opportunities
Print

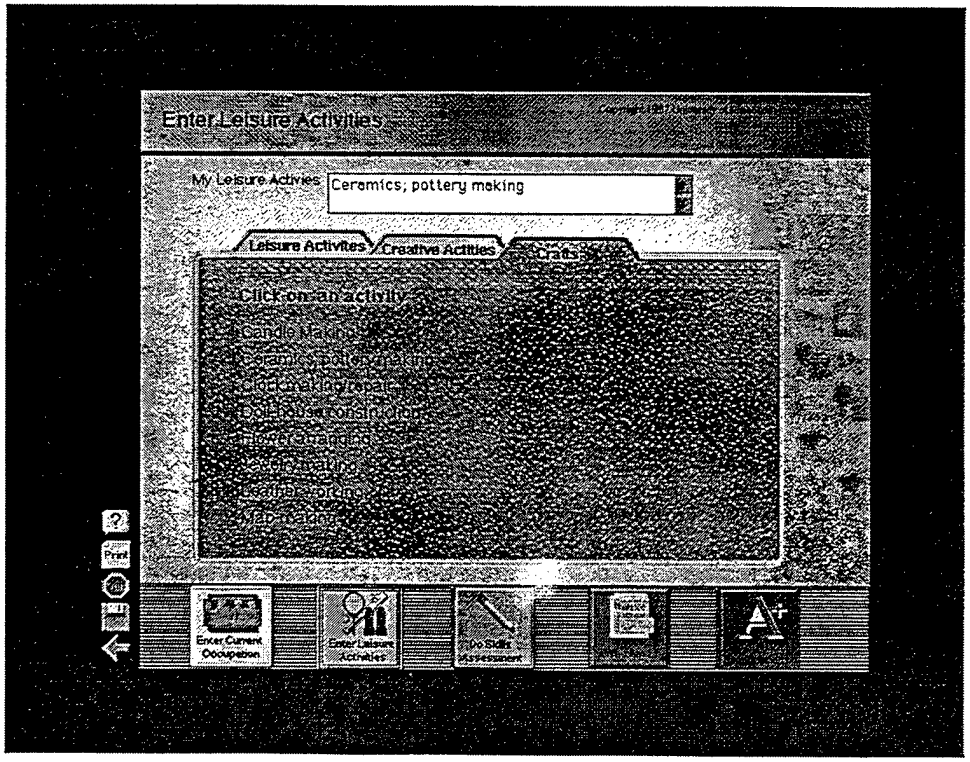

Main Menu
Identify Occupations
Occupational Information
Identify Job Opportunities
Use the internet to help you find jobs.

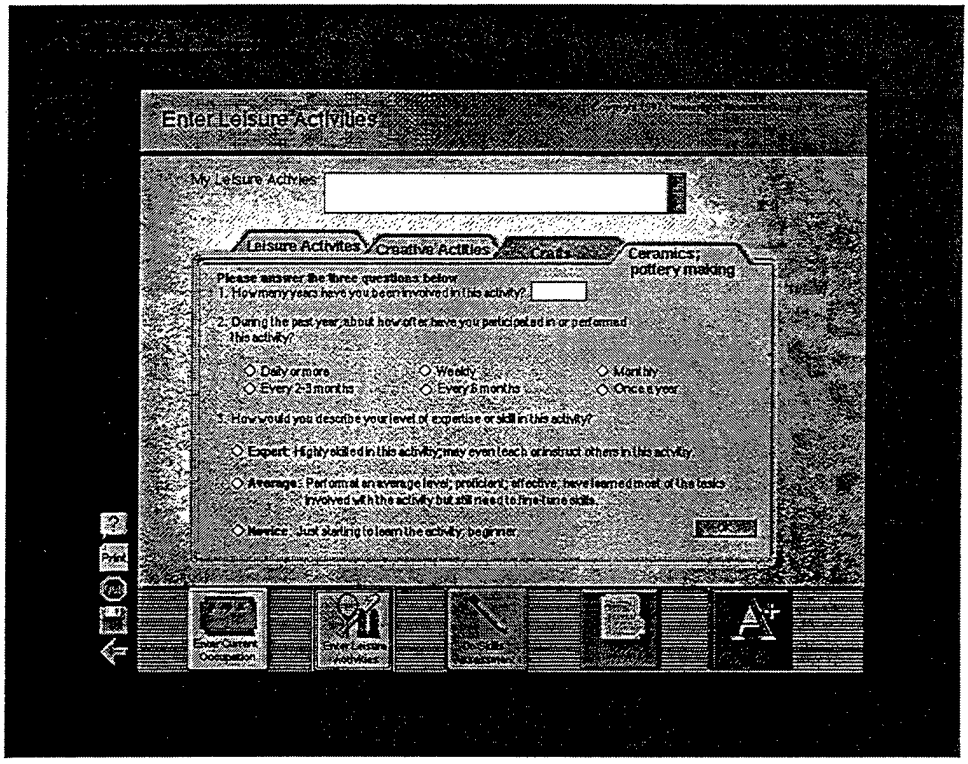

Enter Current Occupation
My current occupation:
Double-click on your current occupation
Accountants
Actors and Actresses
Actuaries
Administrative Services Managers
Administrative Support Supervisors
Adult Education Teachers
Advertising Account Executives
Advertising Layout Designers
Advertising Managers
Advertising Sales Representatives
Aerospace Engineers
Agricultural Engineers
Agricultural Product Graders and Sorters
Agricultural Product Inspectors
Agricultural Related Supervisors

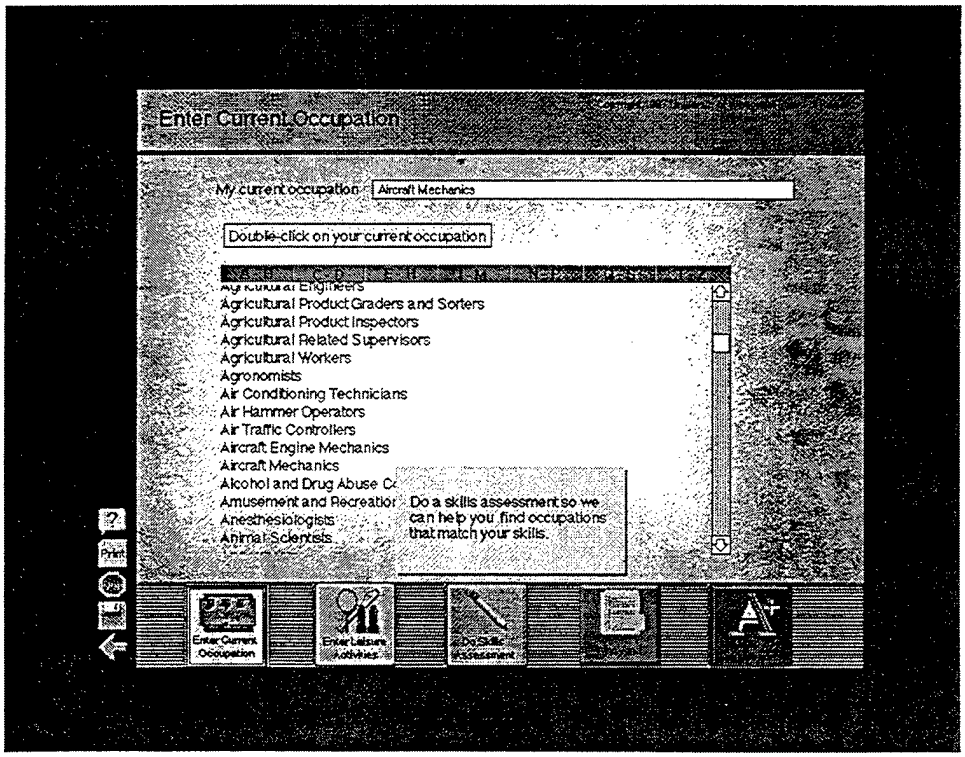

Enter Current Occupation
My current occupation: Aircraft Mechanics
Double-click on your current occupation
Agricultural Product Graders and Sorters
Agricultural Product Inspectors
Agricultural Related Supervisors
Agricultural Workers
Agronomists
Air Conditioning Technicians
Air Hammer Operators
Air Traffic Controllers
Aircraft Engine Mechanics
Tell us about your leisure activities (sports, crafts, cooking, reading, etc.) so we can help you find occupations that use similar skills.
Print
Enter Current Occupation
Enter Leisure Activities
Do Skills Assessment

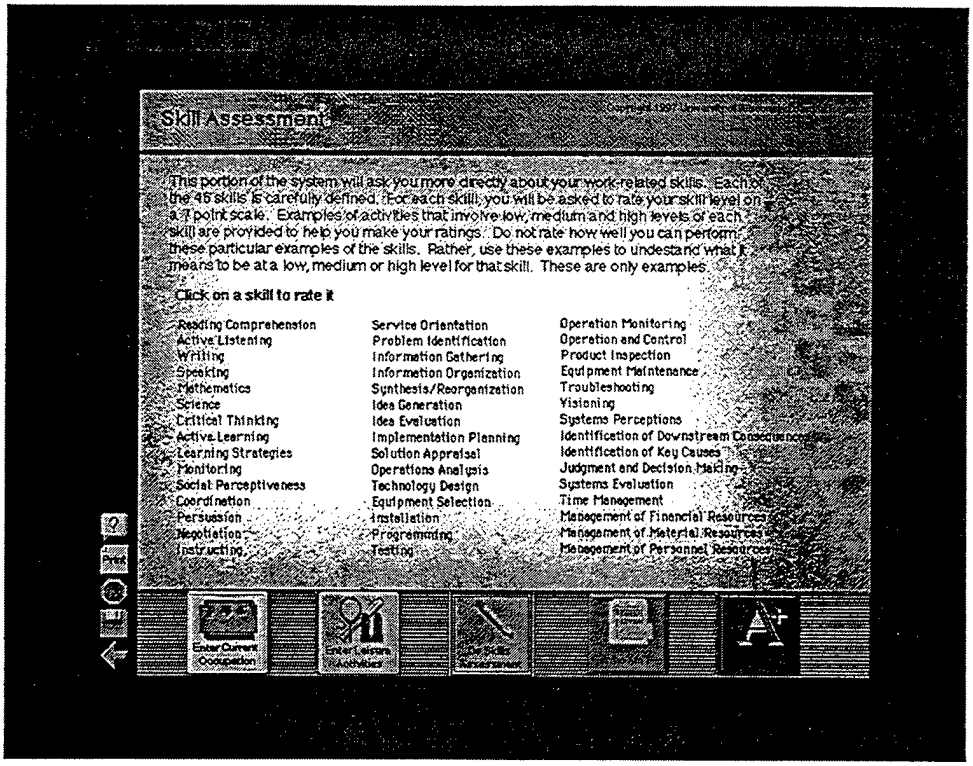

Enter Leisure Activities
My Leisure Activities:
Leisure Activities
In this section you will be asked questions about hobbies, sports, volunteering and other activities in which you may participate outside of work. These activities are organized into broad categories, and you will be asked more detailed questions about only those categories in which you indicate participation. You can enter as many leisure activities as you would like by clicking on the Enter Leisure Activities button at the bottom of the screen.
Click on a category
Action activities
Creative activities
Mechanical/home improvement activities
Indoor Activities
Activities involving motorized vehicles
Volunteer activities
Social activities
Print
Enter Current Occupation
Enter Leisure Activities
Do Skills Assessment

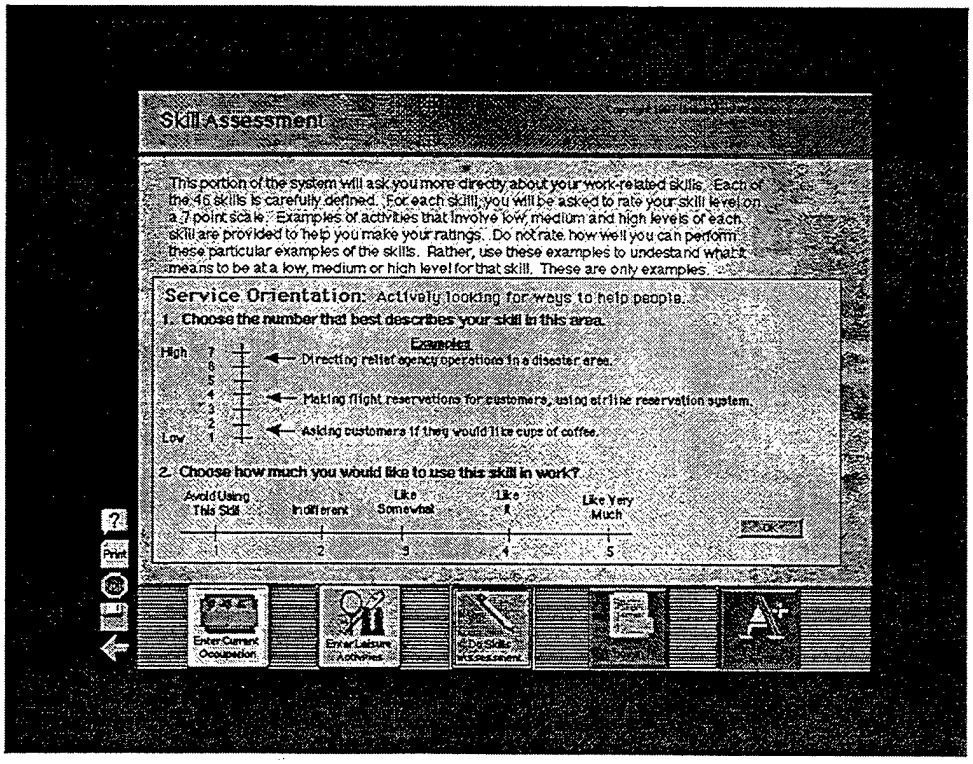

Enter Leisure Activities
My Leisure Activities
Ceramics; pottery making
Leisure Activities
Creative Activities
Click on an activity
Arts (e.g. performing arts, visual arts)
Music (e.g. playing, composing, directing, singing)
Writing (e.g. novels, poetry, letters)
Hobbies (e.g. animal training/racing, collecting stamps, model building, photography, woodworking)
Crafts (e.g. sewing, ceramics, flower arranging)
Enter Current Occupation
Enter Leisure Activities
Print

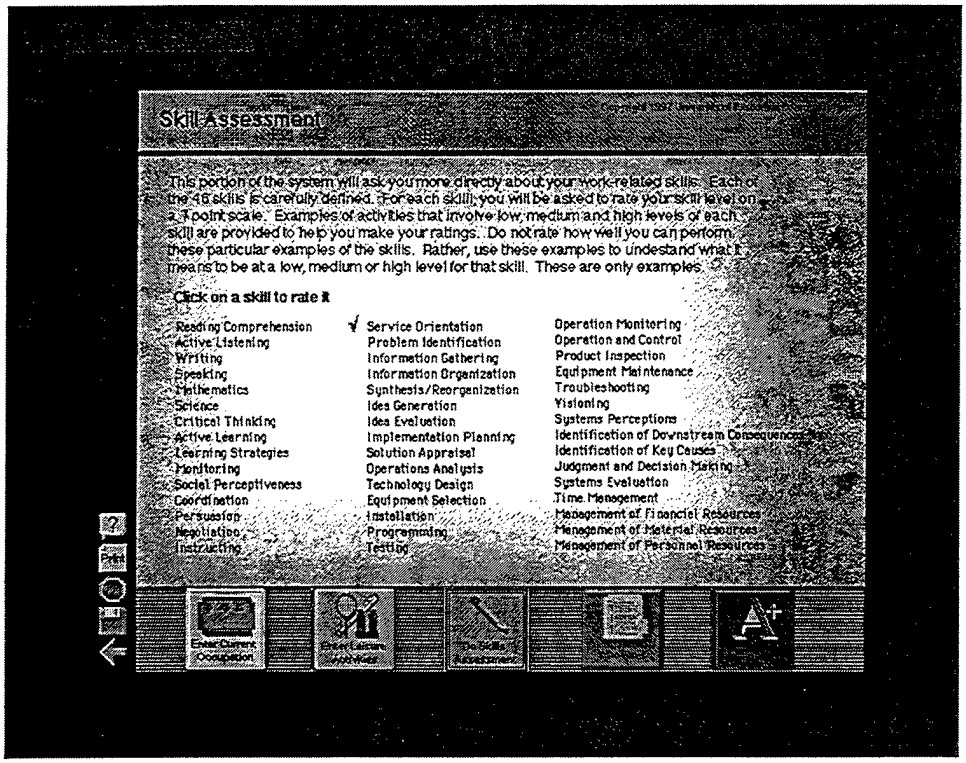

Enter Leisure Activities
My Leisure Activities
Ceramics; pottery making
Leisure Activities
Creative Activities
Crafts
Click on an activity
Enter Current Occupation
Enter Leisure Activities
Print


Enter Leisure Activities
My Leisure Activities:
Leisure Activities
Creative Activities
Crafts
Ceramics; pottery making
Please answer the three questions below
1. How many years have you been involved in this activity?
2. During the past year, about how often have you participated in or performed this activity?
Daily or more
Weekly
Monthly
Every 2-3 months
Every 6 months
Once a year
3. How would you describe your level of expertise or skill in this activity?
Expert: Highly skilled in this activity, may even teach or instruct others in this activity.
Average: Performs at an average level, proficient, effective, have learned most of the tasks involved with the activity but still need to fine tune skills.
Novice: Just starting to learn the activity, beginner.
Enter Current Occupation
Enter Leisure Activities
Do Skills Assessment


Enter Current Occupation
My current occupation: Aircraft Mechanics
Double-click on your current occupation
Agricultural Engineers
Agricultural Product Graders and Sorters
Agricultural Product Inspectors
Agricultural Related Supervisors
Agricultural Workers
Agronomists
Air Conditioning Technicians
Air Hammer Operators
Air Traffic Controllers
Aircraft Engine Mechanics
Aircraft Mechanics
Alcohol and Drug Abuse C
Amusement and Recreatior
Anesthesiologists
Animal Scientists
Do a skills assessment so we can help you find occupations that match your skills.
Enter Current Occupation
Enter Leisure Activities
Do Skills Assessment


Skill Assessment
This portion of the system will ask you more directly about your work-related skills. Each of the 46 skills is carefully defined. For each skill, you will be asked to rate your skill level on a 7 point scale. Examples of activities that involve low, medium and high levels of each skill are provided to help you make your ratings. Do not rate how well you can perform these particular examples of the skills. Rather, use these examples to understand what it means to be at a low, medium or high level for that skill. These are only examples.
Click on a skill to rate it
Reading Comprehension
Active Listening
Writing
Speaking
Mathematics
Science
Critical Thinking
Active Learning
Learning Strategies
Monitoring
Social Perceptiveness
Coordination
Persuasion
Negotiation
Instructing
Service Orientation
Problem Identification
Information Gathering
Information Organization
Synthesis/Reorganization
Idea Generation
Idea Evaluation
Implementation Planning
Solution Appraisal
Operations Analysis
Technology Design
Equipment Selection
Installation
Programming
Testing
Operation Monitoring
Operation and Control
Product Inspection
Equipment Maintenance
Troubleshooting
Visioning
Systems Perceptions
Identification of Downstream Consequences
Identification of Key Causes
Judgment and Decision Making
Systems Evaluation
Time Management
Management of Financial Resources
Management of Material Resources
Management of Personnel Resources
Help
Print
Quit
Enter Current Occupation
Enter Leisure Activities
Do Skills Assessment


Skill Assessment
This portion of the system will ask you more directly about your work-related skills. Each of the 46 skills is carefully defined. For each skill, you will be asked to rate your skill level on a 7 point scale. Examples of activities that involve low, medium and high levels of each skill are provided to help you make your ratings. Do not rate how well you can perform these particular examples of the skills. Rather, use these examples to understand what it means to be at a low, medium or high level for that skill. These are only examples.
Service Orientation: Actively looking for ways to help people.
1. Choose the number that best describes your skill in this area.
Examples
High 7
6
5
4
3
2
Low 1
Directing relief agency operations in a disaster area.
Making flight reservations for customers, using airline reservation system.
Asking customers if they would like cups of coffee.
2. Choose how much you would like to use this skill in work?
Avoid Using This Skill
Indifferent
Like Somewhat
Like It
Like Very Much
1
2
3
4
5
OK
Help
Print
Quit
Enter Current Occupation
Enter Leisure Activities
Do Skills Assessment


Skill Assessment
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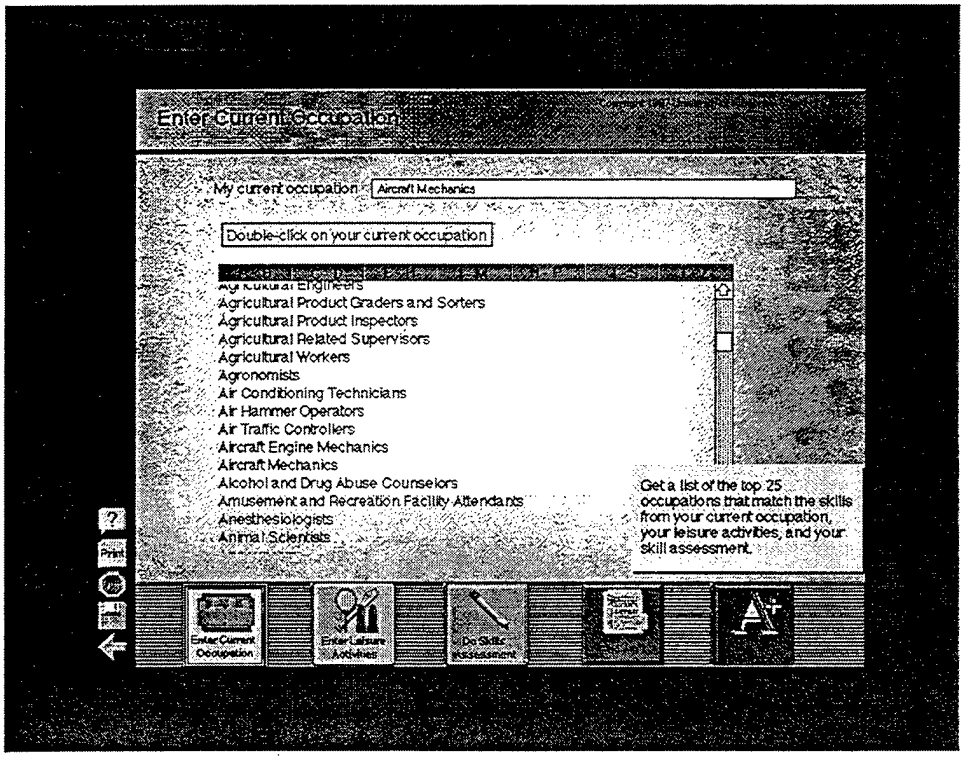
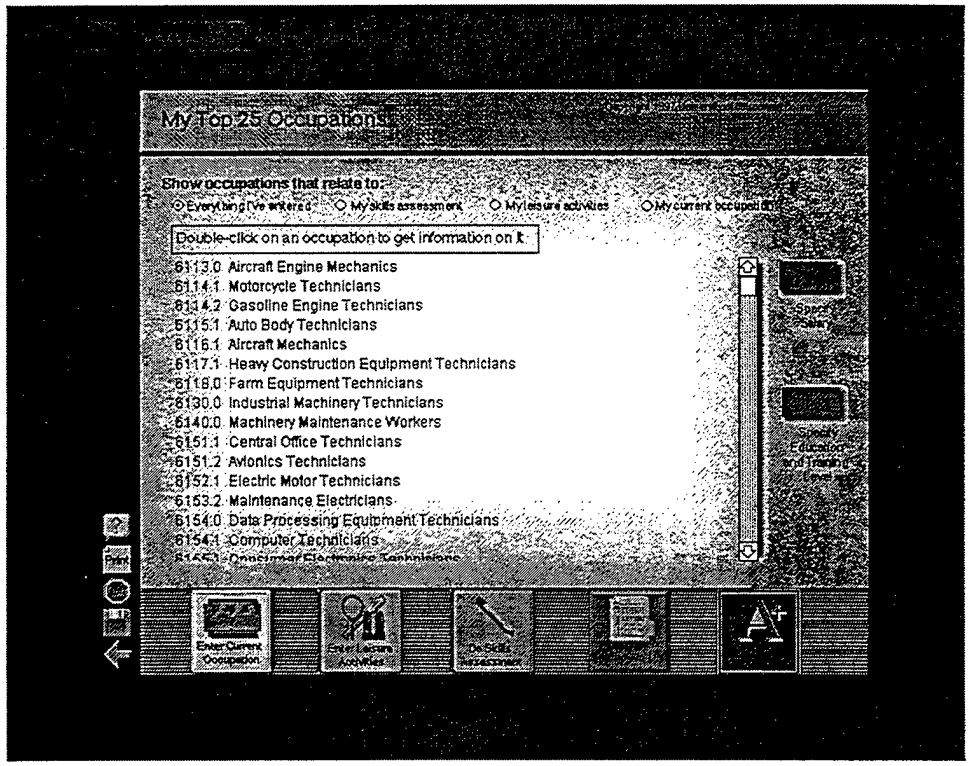
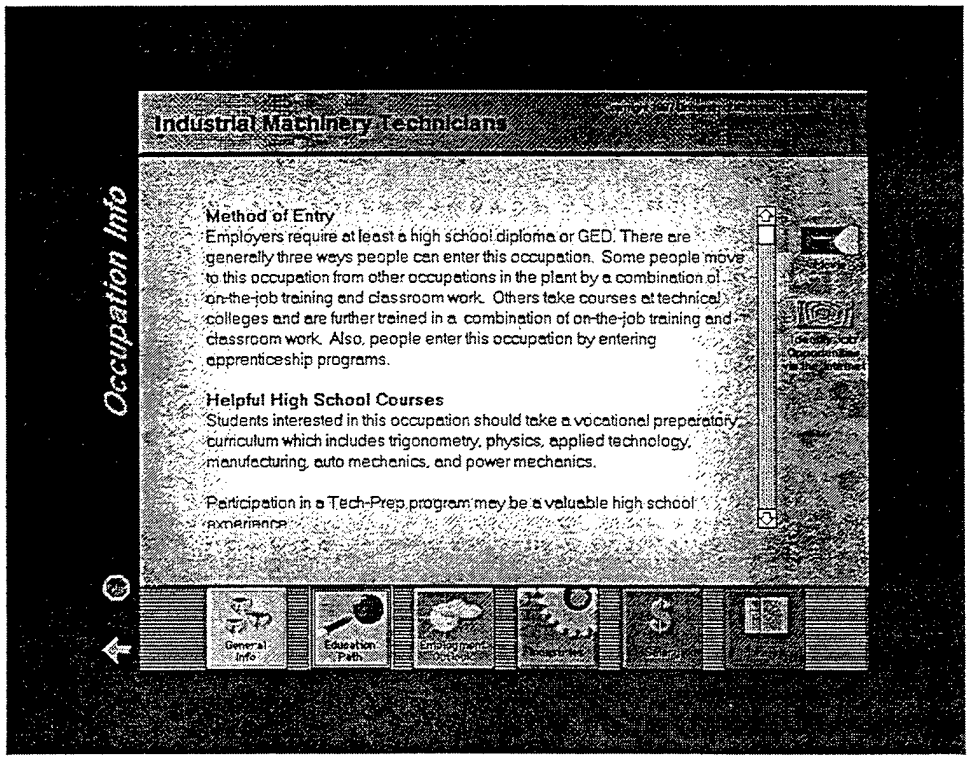
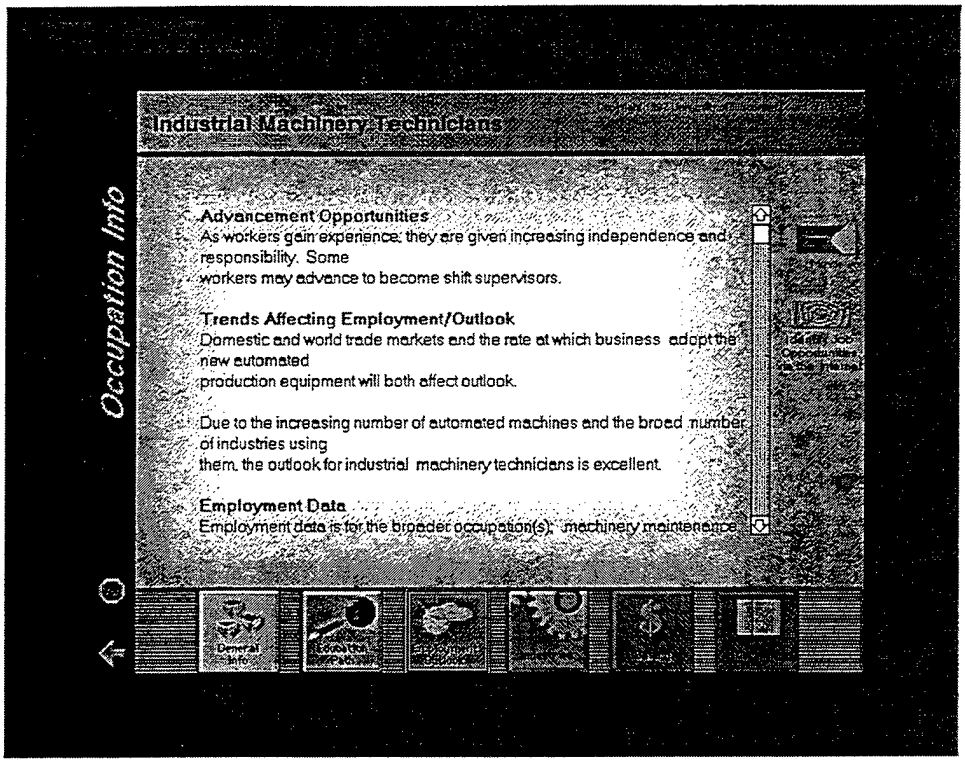
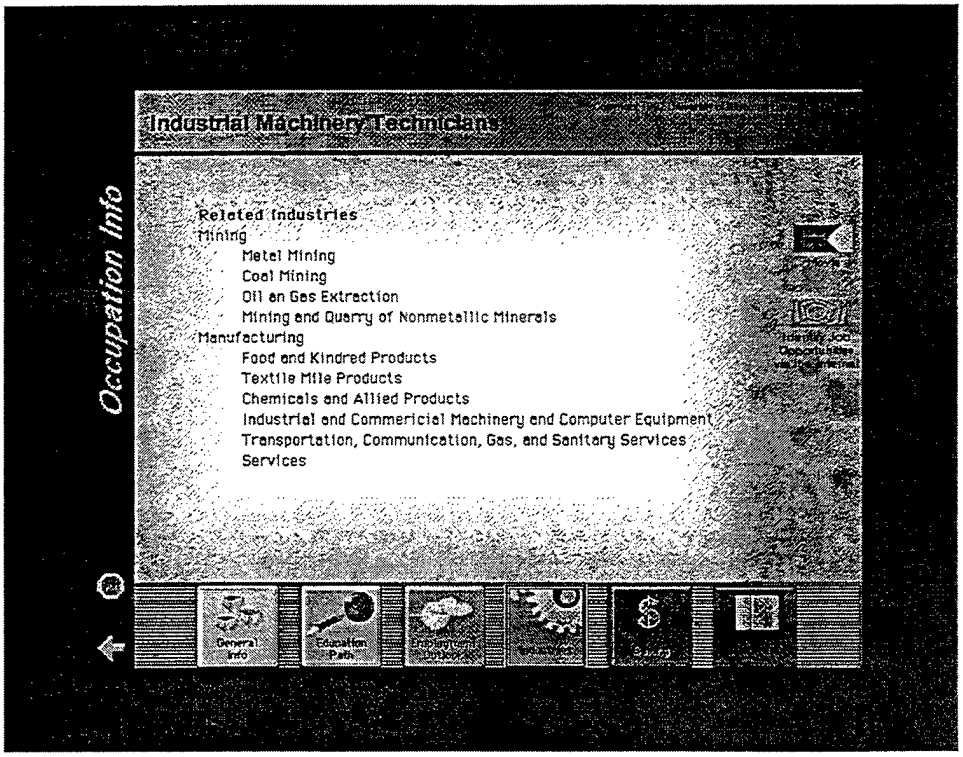
Click on a skill to rate it
Reading Comprehension
Active Listening
Writing
Speaking
Mathematics
Science
Critical Thinking
Active Learning
Learning Strategies
Monitoring
Social Perceptiveness
Coordination
Persuasion
Negotiation
Instructing
Service Orientation
Problem Identification
Information Gathering
Information Organization
Synthesis/Reorganization
Idea Generation
Idea Evaluation
Implementation Planning
Solution Appraisal
Operations Analysis
Technology Design
Equipment Selection
Installation
Programming
Testing
Operation Monitoring
Operation and Control
Product Inspection
Equipment Maintenance
Troubleshooting
Visioning
Systems Perceptions
Identification of Downstream Consequences
Identification of Key Causes
Judgment and Decision Making
Systems Evaluation
Time Management
Management of Financial Resources
Management of Material Resources
Management of Personnel Resources
Enter Current Occupation
Enter Leisure Activities
Do Skills Assessment

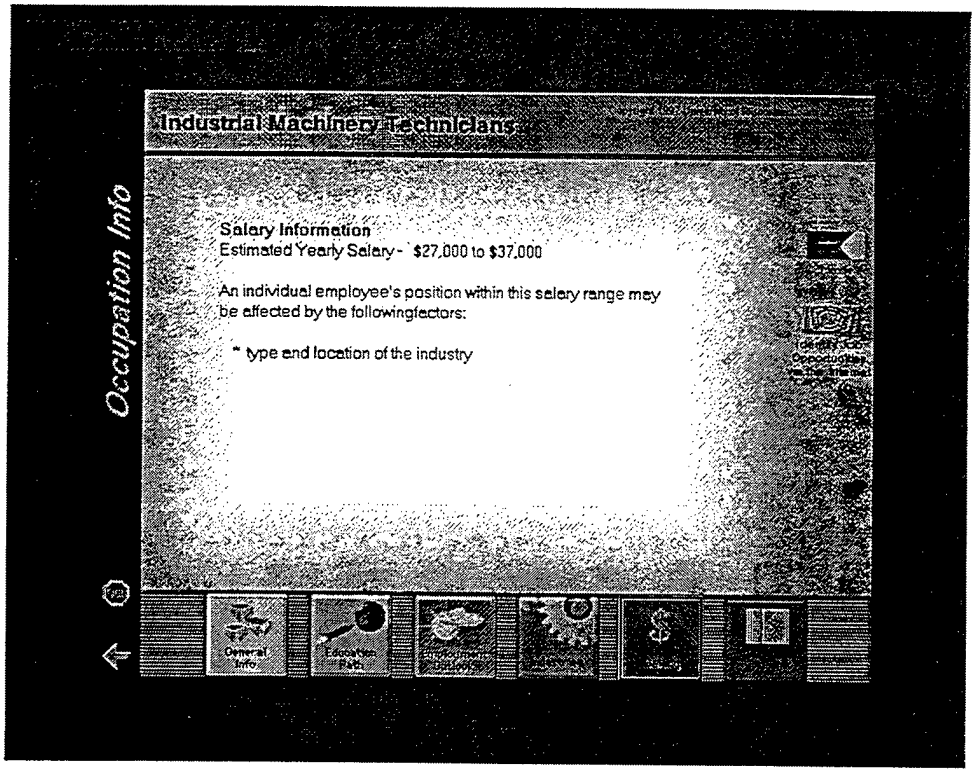

Enter Current Occupation
My current occupation: Aircraft Mechanics
Double-click on your current occupation
Agricultural Engineers
Agricultural Product Graders and Sorters
Agricultural Product Inspectors
Agricultural Related Supervisors
Agricultural Workers
Agronomists
Air Conditioning Technicians
Air Hammer Operators
Air Traffic Controllers
Aircraft Engine Mechanics
Aircraft Mechanics
Alcohol and Drug Abuse Counselors
Amusement and Recreation Facility Attendants
Anesthesiologists
Animal Scientists
Get a list of the top 25 occupations that match the skills from your current occupation, your leisure activities, and your skill assessment.
Enter Current Occupation
Enter Leisure Activities
Do Skills Assessment

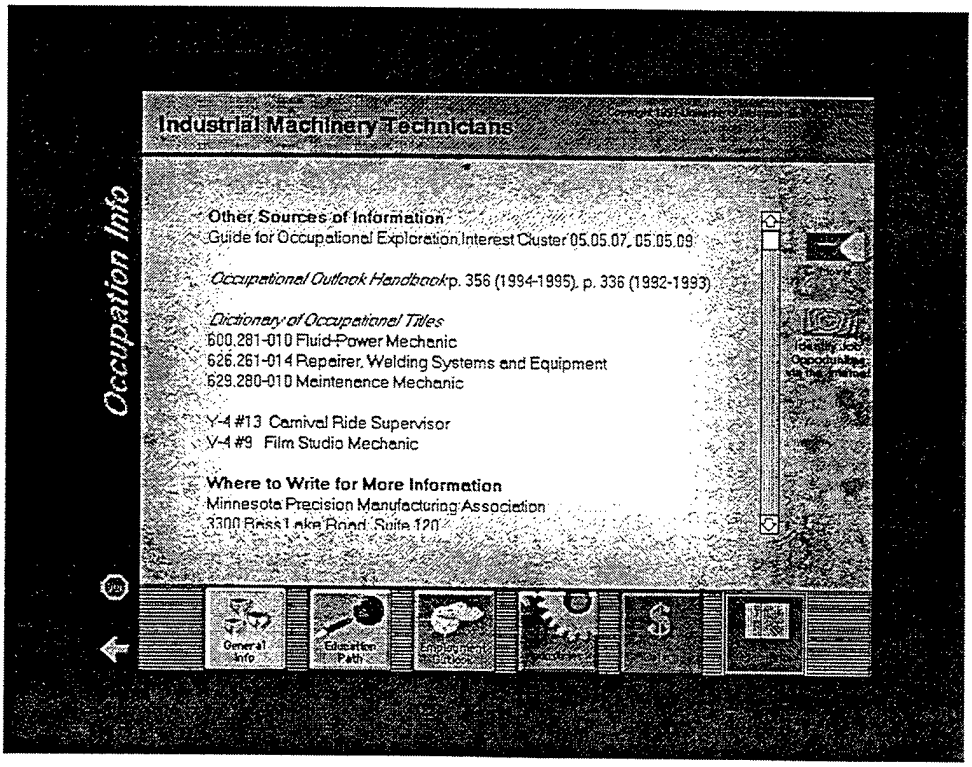

My Top 25 Occupations
Show occupations that relate to:
Everything I've entered
My skills assessment
My leisure activities
My current occupation
Double-click on an occupation to get information on it:
6113.0 Aircraft Engine Mechanics
6114.1 Motorcycle Technicians
6114.2 Gasoline Engine Technicians
6115.1 Auto Body Technicians
6116.1 Aircraft Mechanics
6117.1 Heavy Construction Equipment Technicians
6118.0 Farm Equipment Technicians
6130.0 Industrial Machinery Technicians
6140.0 Machinery Maintenance Workers
6151.1 Central Office Technicians
6151.2 Avionics Technicians
6152.1 Electric Motor Technicians
6153.2 Maintenance Electricians
6154.0 Data Processing Equipment Technicians
6154.1 Computer Technicians
Enter Current Occupation
Enter Leisure Activities
On-Skill Assessment

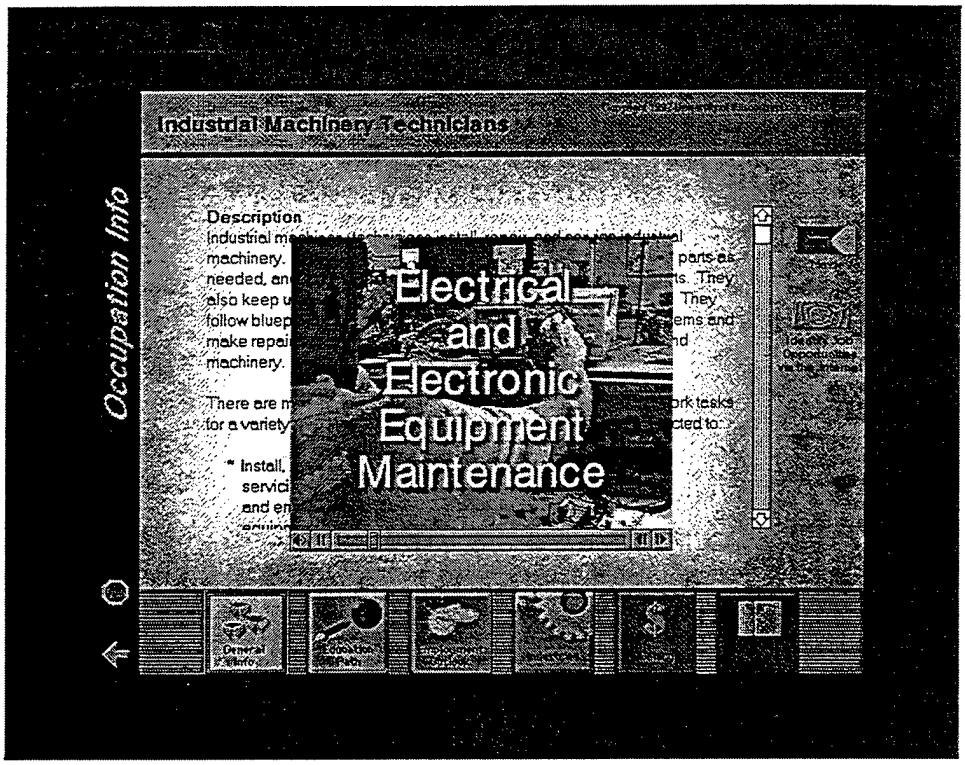

Occupation Info
Industrial Machinery Technicians
Method of Entry
Employers require at least a high school diploma or GED. There are generally three ways people can enter this occupation. Some people move to this occupation from other occupations in the plant by a combination of on-the-job training and classroom work. Others take courses at technical colleges and are further trained in a combination of on-the-job training and classroom work. Also, people enter this occupation by entering apprenticeship programs.
Helpful High School Courses
Students interested in this occupation should take a vocational preparatory curriculum which includes trigonometry, physics, applied technology, manufacturing, auto mechanics, and power mechanics.
Participation in a Tech-Prep program may be a valuable high school experience.
General Info
Education Path
Employment Outlook

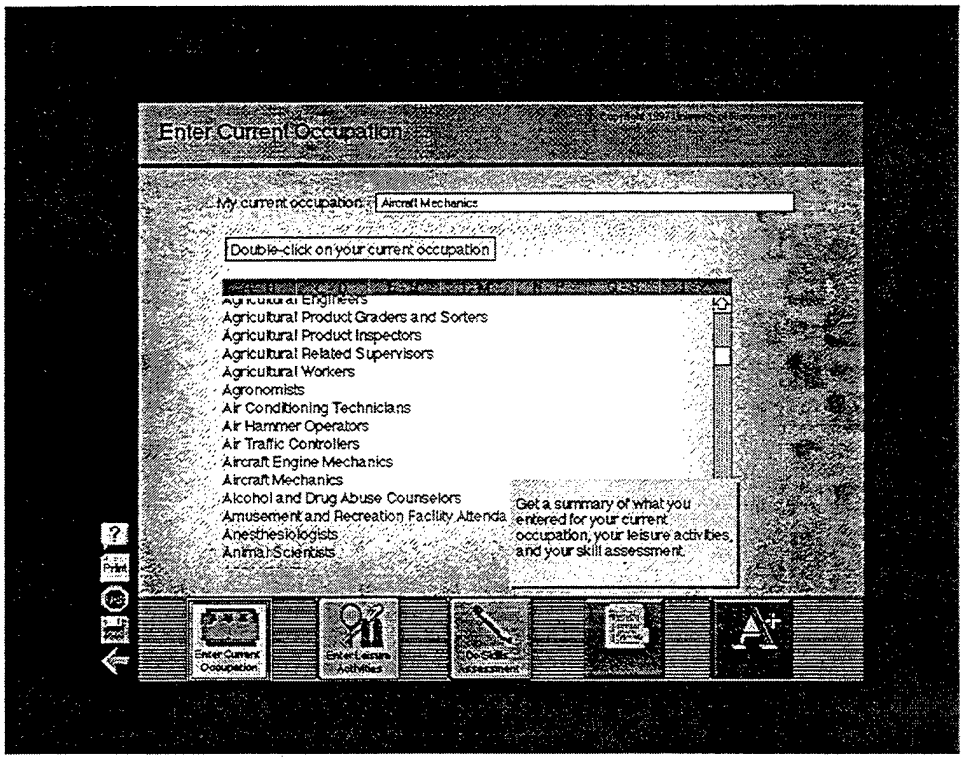

Occupation Info
Industrial Machinery Technicians
Advancement Opportunities
As workers gain experience, they are given increasing independence and responsibility. Some
workers may advance to become shift supervisors.
Trends Affecting Employment/Outlook
Domestic and world trade markets and the rate at which business adopt the new automated
production equipment will both affect outlook.
Due to the increasing number of automated machines and the broad number of industries using
them, the outlook for industrial machinery technicians is excellent.
Employment Data
Employment data is for the broader occupation(s): machinery maintenance
General Info
Education Path

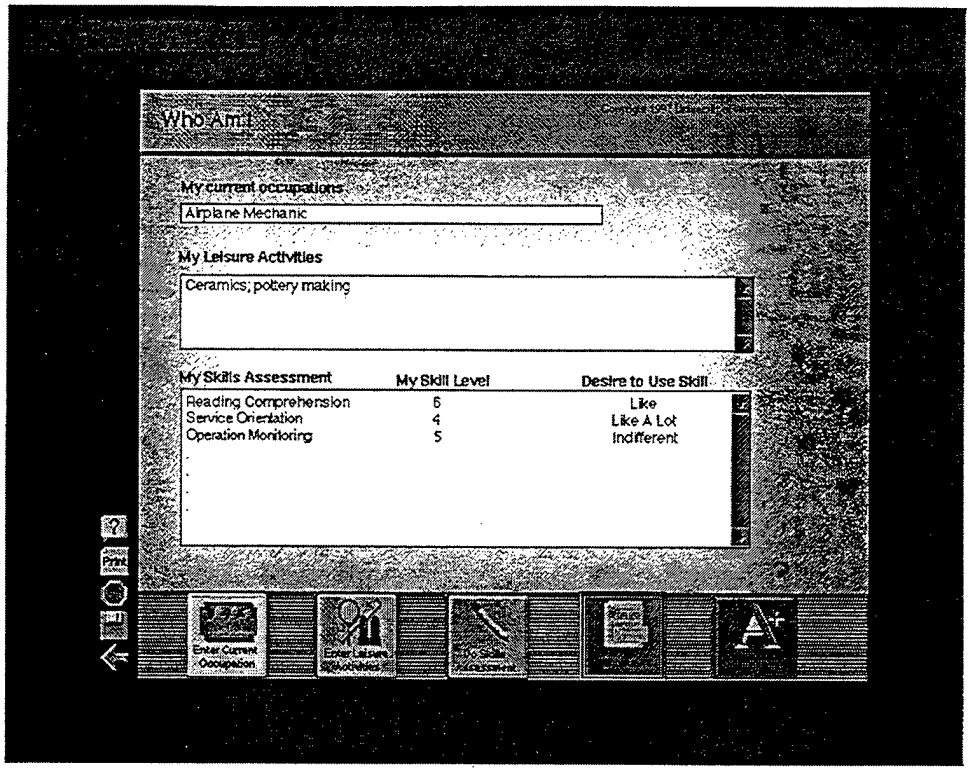

Occupation Info
Industrial Machinery Technicians
Related Industries
Mining
Metal Mining
Coal Mining
Oil an Gas Extraction
Mining and Quarry of Nonmetallic Minerals
Manufacturing
Food and Kindred Products
Textile Mile Products
Chemicals and Allied Products
Industrial and Commericial Machinery and Computer Equipment
Transportation, Communication, Gas, and Sanitary Services
Services
General Info
Education Path

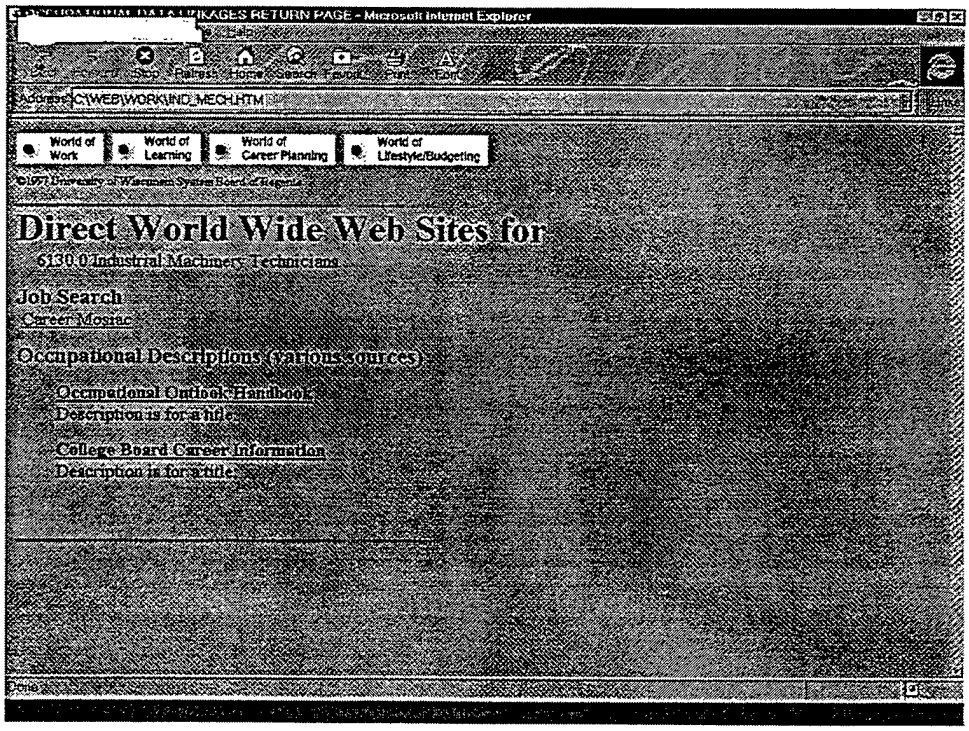

Occupation Info
Industrial Machinery Technicians
Salary Information
Estimated Yearly Salary - $27,000 to $37,000
An individual employee's position within this salary range may be affected by the followingfactors:
* type and location of the industry
General Info
Education Path

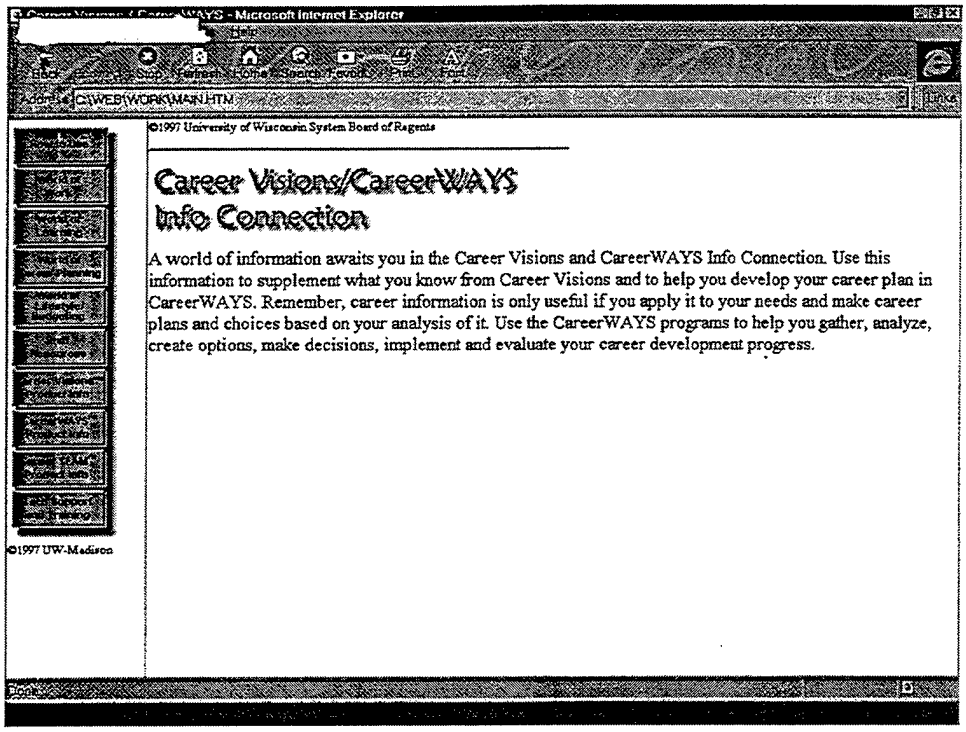

Occupation Info
Industrial Machinery Technicians
Other Sources of Information
Guide for Occupational Exploration Interest Cluster 05.05.07, 05.05.09
Occupational Outlook Handbook p. 356 (1994-1995), p. 336 (1992-1993)
Dictionary of Occupational Titles
600.281-010 Fluid-Power Mechanic
626.261-014 Repairer, Welding Systems and Equipment
629.280-010 Maintenance Mechanic
V-4 #13 Carnival Ride Supervisor
V-4 #9 Film Studio Mechanic
Where to Write for More Information
Minnesota Precision Manufacturing Association
3300 Bass Lake Road, Suite 120
General Info
Education Path


Occupation Info
Industrial Machinery Technicians
Description
machinery.
machinery.
Electrical and Electronic Equipment Maintenance


Enter Current Occupation
My current occupation: Aircraft Mechanics
Double-click on your current occupation
Agricultural Product Graders and Sorters
Agricultural Product Inspectors
Agricultural Related Supervisors
Agricultural Workers
Agronomists
Air Conditioning Technicians
Air Hammer Operators
Air Traffic Controllers
Aircraft Engine Mechanics
Aircraft Mechanics
Alcohol and Drug Abuse Counselors
Amusement and Recreation Facility Attenda
Anesthesiologists
Animal Scientists
Get a summary of what you entered for your current occupation, your leisure activities, and your skill assessment.


Who Am I
My current occupations
Airplane Mechanic
My Leisure Activities
Ceramics; pottery making
My Skills Assessment
My Skill Level
Desire to Use Skill
Reading Comprehension
6
Like
Service Orientation
4
Like A Lot
Operation Monitoring
5
Indifferent


LINKAGES RETURN PAGE - Microsoft Internet Explorer
C:\WEB\WORK\IND_MECH.HTM
World of Work
World of Learning
World of Career Planning
World of Lifestyle/Budgeting
Direct World Wide Web Sites for
6130.0 Industrial Machinery Technicians
Job Search
Career Mosaic
Occupational Descriptions (various sources)
Occupational Outlook Handbook
College Board Career Information


Microsoft Internet Explorer
C:\WEB\WORK\MAIN.HTM
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Career Visions/CareerWAYS
Info Connection
A world of information awaits you in the Career Visions and CareerWAYS Info Connection. Use this information to supplement what you know from Career Visions and to help you develop your career plan in CareerWAYS. Remember, career information is only useful if you apply it to your needs and make career plans and choices based on your analysis of it. Use the CareerWAYS programs to help you gather, analyze, create options, make decisions, implement and evaluate your career development progress.
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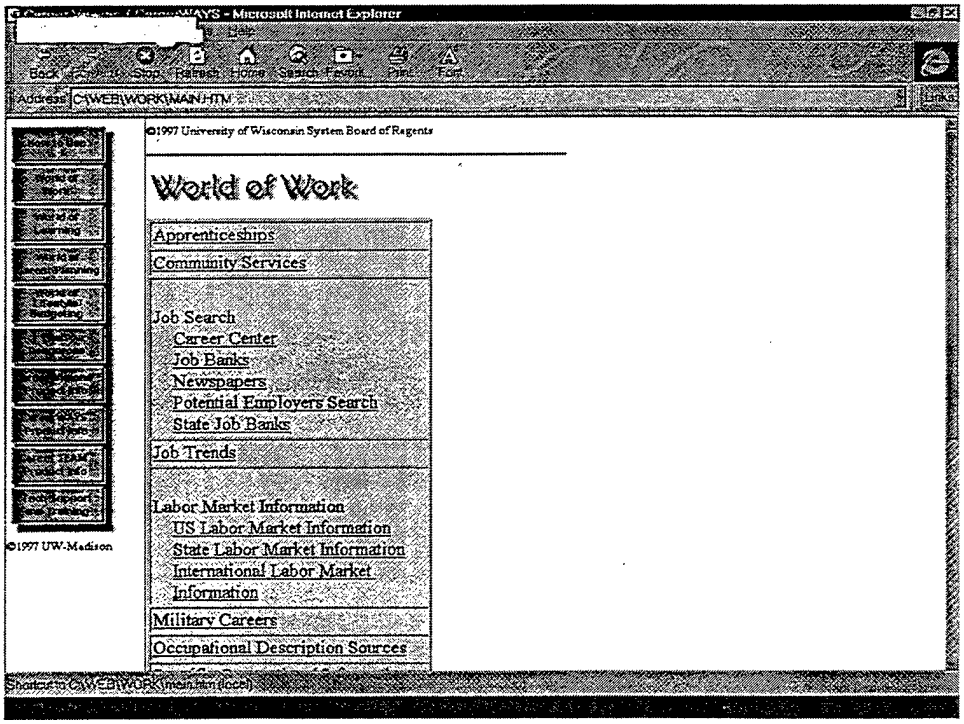
Microsoft Internet Explorer
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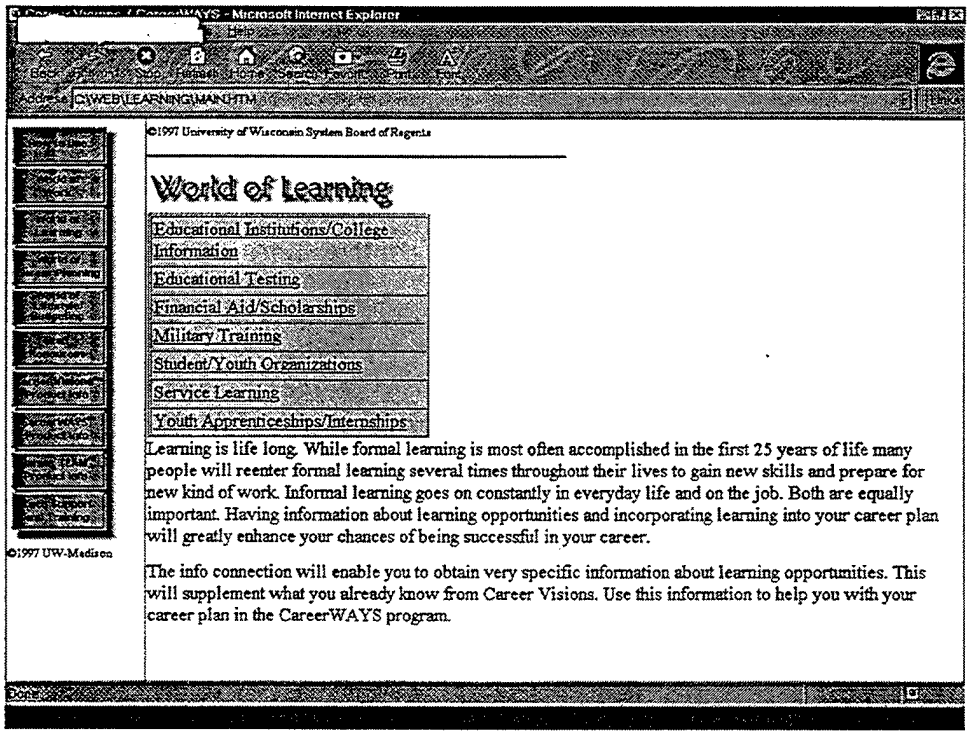
World of Work
Apprenticeships
Community Services
Job Search
Career Center
Job Banks
Newspapers
Potential Employers Search
State Job Banks
Job Trends
Labor Market Information
US Labor Market Information
State Labor Market Information
International Labor Market Information
Military Careers
Occupational Description Sources
©1997 UW-Madison


AYS - Microsoft Internet Explorer
C:\WEB\LEARNING\MAIN.HTM
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World of Learning
Educational Institutions/College Information
Educational Testing
Financial Aid/Scholarships
Military Training
Student/Youth Organizations
Service Learning
Youth Apprenticeships/Internships
Learning is life long. While formal learning is most often accomplished in the first 25 years of life many people will reenter formal learning several times throughout their lives to gain new skills and prepare for new kind of work. Informal learning goes on constantly in everyday life and on the job. Both are equally important. Having information about learning opportunities and incorporating learning into your career plan will greatly enhance your chances of being successful in your career.
The info connection will enable you to obtain very specific information about learning opportunities. This will supplement what you already know from Career Visions. Use this information to help you with your career plan in the CareerWAYS program.
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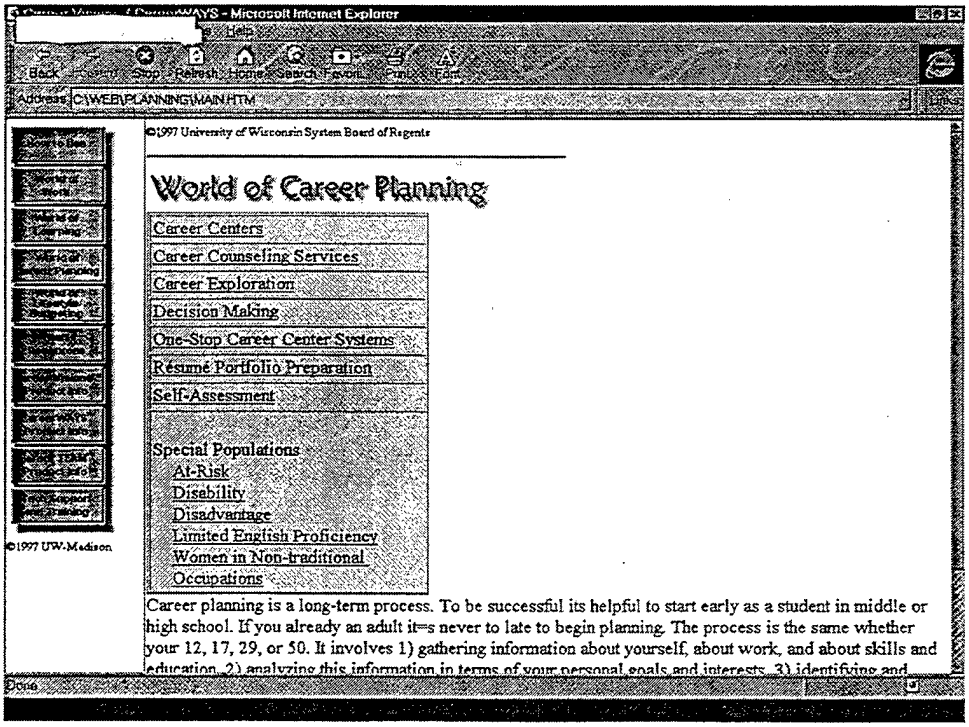
Done


AYS - Microsoft Internet Explorer
Back Stop Refresh Home Search Favorites Print Font
Address C:\WEB\PLANNING\MAIN.HTM
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World of Career Planning
Career Centers
Career Counseling Services
Career Exploration
Decision Making
One-Stop Career Center Systems
Résumé Portfolio Preparation
Self-Assessment
Special Populations
At-Risk
Disability
Disadvantage
Limited English Proficiency
Women in Non-traditional Occupations
Career planning is a long-term process. To be successful its helpful to start early as a student in middle or high school. If you already an adult it=s never to late to begin planning. The process is the same whether your 12, 17, 29, or 50. It involves 1) gathering information about yourself, about work, and about skills and education, 2) analyzing this information in terms of your personal goals and interests, 3) identifying and
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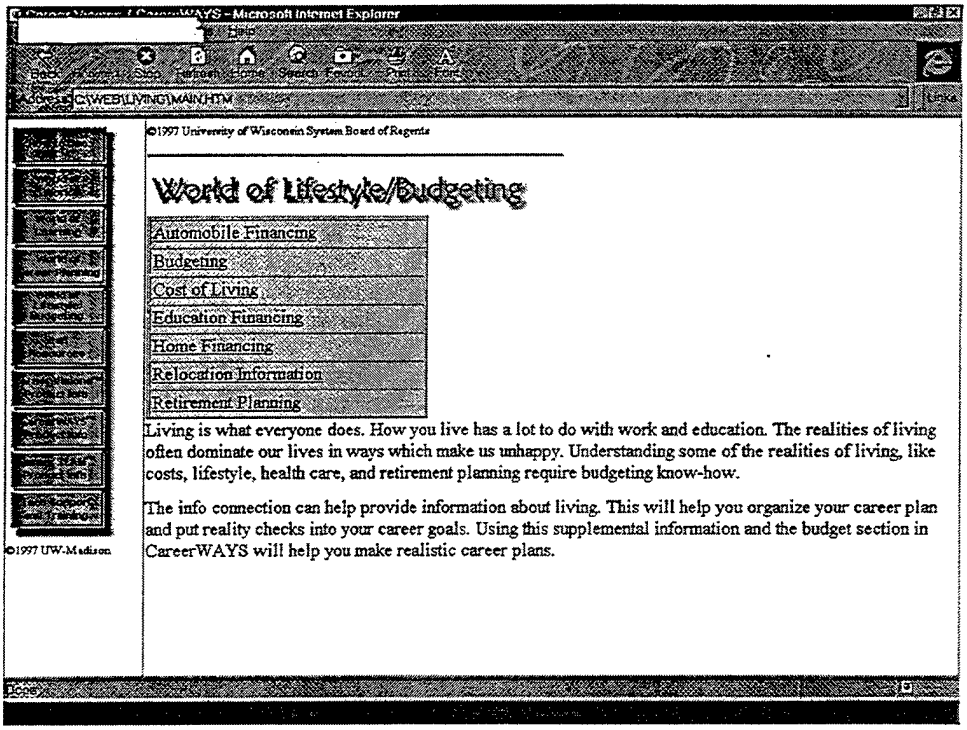
CareerWAYS - Microsoft Internet Explorer
C:\WEB\LIVING\MAIN.HTM
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World of Lifestyle/Budgeting
Automobile Financing
Budgeting
Cost of Living
Education Financing
Home Financing
Relocation Information
Retirement Planning
Living is what everyone does. How you live has a lot to do with work and education. The realities of living often dominate our lives in ways which make us unhappy. Understanding some of the realities of living, like costs, lifestyle, health care, and retirement planning require budgeting know-how.
The info connection can help provide information about living. This will help you organize your career plan and put reality checks into your career goals. Using this supplemental information and the budget section in CareerWAYS will help you make realistic career plans.
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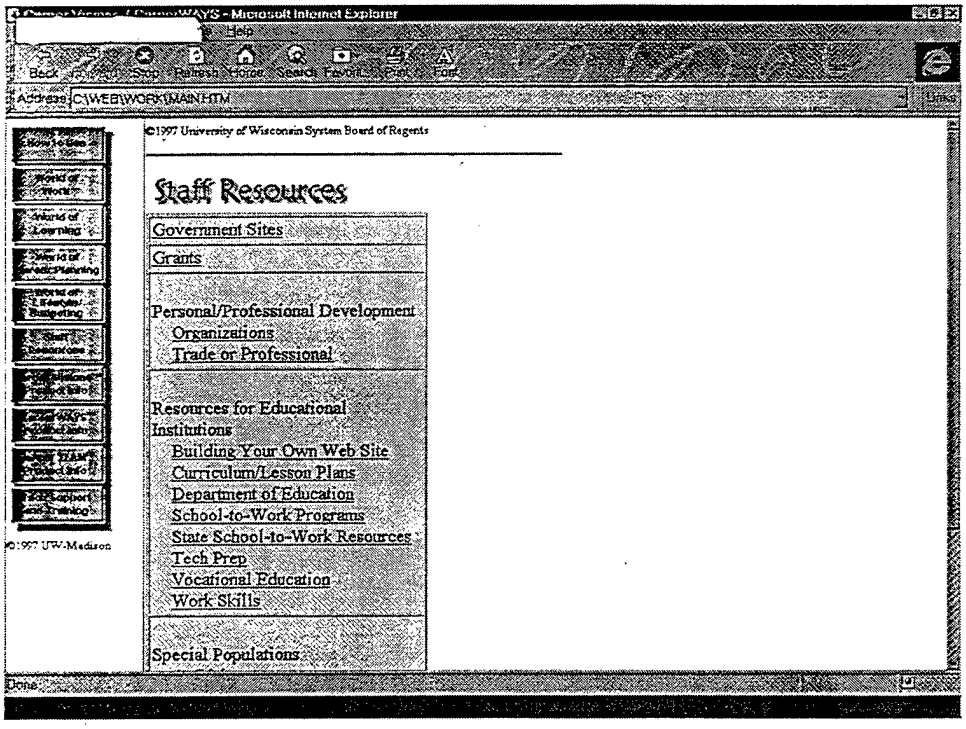
CareerWAYS - Microsoft Internet Explorer
Address C:\WEB\WORK\MAIN.HTM
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Staff Resources
Government Sites
Grants
Personal/Professional Development
Organizations
Trade or Professional
Resources for Educational Institutions
Building Your Own Web Site
Curriculum/Lesson Plans
Department of Education
School-to-Work Programs
State School-to-Work Resources
Tech Prep
Vocational Education
Work Skills
Special Populations
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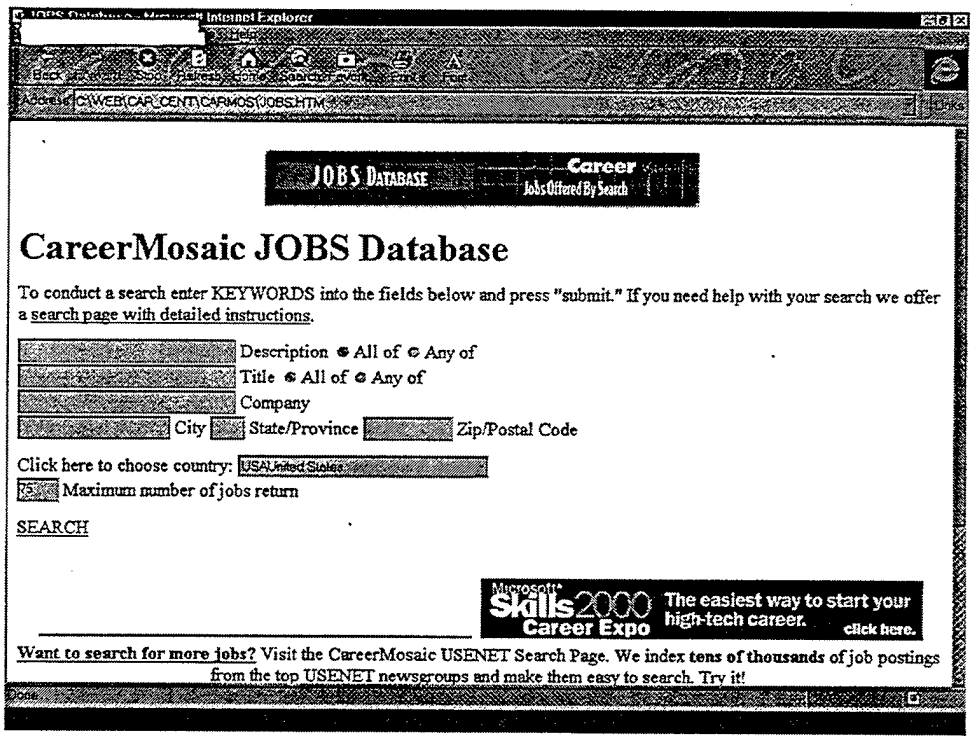


JOBS DATABASE Career Jobs Offered By Search

CareerMosaic JOBS Database

To conduct a search enter KEYWORDS into the fields below and press "submit." If you need help with your search we offer a search page with detailed instructions.

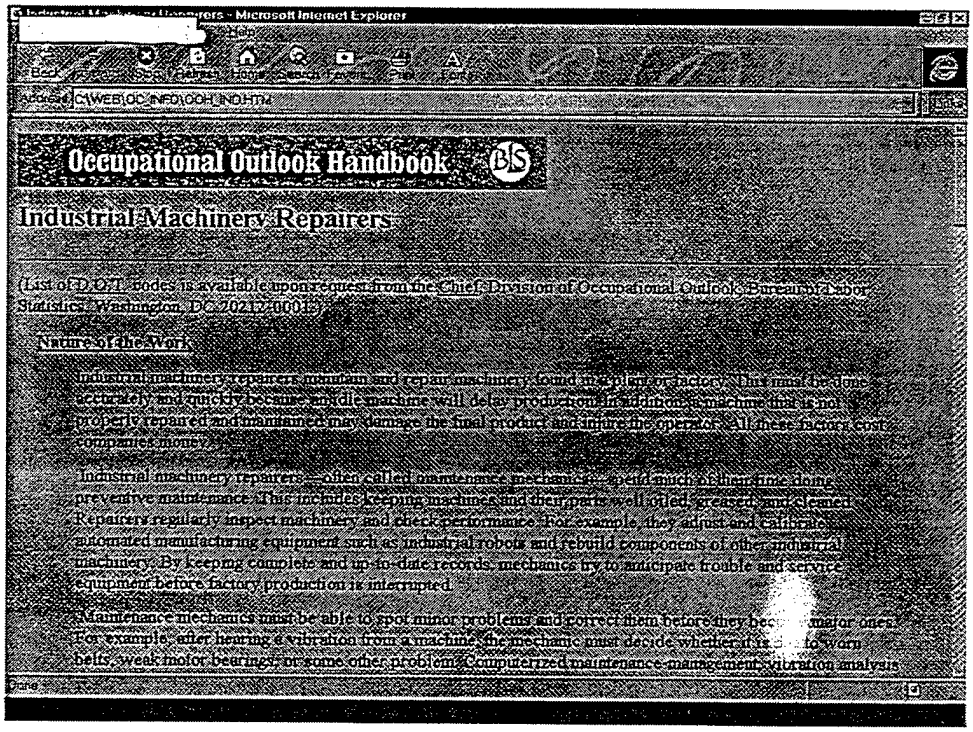
Description ◉ All of ○ Any of
Title ◉ All of ○ Any of
Company
City State/Province Zip/Postal Code

Click here to choose country: USA United States
75 Maximum number of jobs return

SEARCH

Microsoft Skills 2000 Career Expo The easiest way to start your high-tech career. click here.

Want to search for more jobs? Visit the CareerMosaic USENET Search Page. We index tens of thousands of job postings from the top USENET newsgroups and make them easy to search. Try it!



Occupational Outlook Handbook

Industrial Machinery Repairers

(List of D.O.T. codes is available upon request from the Chief, Division of Occupational Outlook, Bureau of Labor Statistics, Washington, DC 20212 (202) 691-5700.)

Nature of the Work

Industrial machinery repairers maintain and repair machinery found in a typical factory. This must be done accurately and quickly because any idle machine will delay production. In addition, a machine that is not properly repaired and maintained may damage the final product and injure the operator. All these factors cost companies money.

Industrial machinery repairers, often called maintenance mechanics, spend much of their time doing preventive maintenance. This includes keeping machines and their parts well oiled, greased, and cleaned. Repairers regularly inspect machinery and check performance. For example, they adjust and calibrate automated manufacturing equipment such as industrial robots and rebuild components of other industrial machinery. By keeping complete and up-to-date records, mechanics try to anticipate trouble and service equipment before factory production is interrupted.

Maintenance mechanics must be able to spot minor problems and correct them before they become major ones. For example, after hearing a vibration from a machine, the mechanic must decide whether it is [illegible] worn belts, weak motor bearings, or some other problem. Computerized maintenance management, vibration analysis